DEVELOPMENT OF A COMPREHENSIVE MOBILITY DISCHARGE ASSESSMENT FRAMEWORK FOR OLDER ADULTS TRANSITIONING FROM HOSPITAL-TO-HOME THROUGH EVIDENCE SYNTHESIS AND e-DELPHI PROCESS

Development of a Comprehensive Mobility Discharge Assessment Framework for Older Adults Transitioning from Hospital-To-Home Through Evidence Synthesis and e-Delphi Process

By

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Lay Abstract

Mobility problems lead to hospital readmission of older adults (60 years and older). However, healthcare workers often do not assess older adults' mobility prior to discharge home. This is why this research project was done. In Phase 1 of this PhD project, 84 factors that negatively or positively influenced mobility of older adults were identified by searching the literature. In Phase 2 of this PhD project, 60 people (seven older adults, nine family caregivers, 24 clinicians, and 20 researchers) rated and agreed upon the mobility factors critical to assess when older adults are being discharged home. They reached agreement on 43 factors; and provided their reasons for choosing these factors. Reasons included that each older adult is unique, and healthcare roles and practices differ. Identifying these 42 factors is the first step. Therefore, future research should determine the tools to measure the 43 factors and test how they can be used in clinical practice.

Abstract

Functional status independently predicts older adults' hospital readmission. Despite this, clinicians often do not complete mobility assessments during the hospital-to-home transition for older adults, mainly because factors within the seven mobility determinants have not been comprehensive represented in mobility measures.

Phase 1 of this PhD thesis (manuscripts 1, 2 and 3) comprised a series of scoping reviews that comprehensively described factors within each of the seven mobility determinants [cognitive, financial, environmental, personal, physical, psychological and social] and their association with self-report and performance-based mobility outcomes. A total of 772 largely cross-sectional articles published in 51 countries were reviewed which identified 84 factors: cognitive (n=8), psychological (n=18), social (n=9); personal (n=11), environmental (n=17), financial (n=3), and physical (n=18), and their association with mobility outcomes.

Phase 2 of this PhD thesis (manuscripts 4, 5 and 6) was an e-Delphi study aimed at prioritizing and achieving consensus on mobility factors across the seven determinants considered critical to include in the Comprehensive Mobility Discharge Assessment Framework (CMDAF) for older adults transitioning from hospital-to-home. Sixty international experts (seven older adults, nine family caregivers, 24 clinicians and 20 researchers) from nine countries prioritized 43 out of 91 factors across all the seven determinants to be included in the CMDAF, except for financial determinants. Experts provided reasons for their ratings. They conditionally placed importance on certain factors over other factors based on the uniqueness of each older adult; healthcare roles and practice-based approaches; and service availability and regional [context] meaning of some of the factors. The positive and negative role of factors influencing mobility was another reason experts rated the way they did.

This is the first step of developing CMDAF. Future research should examine how, and which measurement instruments best measure these 43 mobility factors to advance the CMDAF. Further examining the feasibility and practicality of using CMDAF in hospital-to-home clinical transition settings is recommended.

Acknowledgement

I am full of emotion as I write this acknowledgement section. It has been an incredible, fruitful journey filled with ups and downs, and I have reflectively learned and grown as a researcher and person through the help and mentorship of so many people. This thesis would not have been successful without the outstanding mentorship of my supervisor, Dr Vanina Dal Bello-Haas. I struggle to find the words that accurately reflect my deep appreciation for all you have done for me. Every minute of our meetings was loaded with words of wisdom, and an in-depth critique of my work in all aspects of this thesis, ranging from conceptualization to writing the thesis. You provided endless opportunities for my professional growth, created opportunities for my success and celebrated those successes with me. You offered me strategies to manage and handle roadblocks throughout my PhD journey. I sincerely appreciate it and do not take this impact experience for granted.

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I would also like to extend my appreciation to several research teams and networks, such as the Quality Optimal Living and Aging through Rehabilitation, MIRA trainee network, and Emerging Researchers and Professionals in Aging-African network. These networks have allowed me to discuss several aspects of my PhD work e.g., methods, research process, and findings. In addition, these networks have allowed me to practice several presentations, improving my presentation and academic discussion skills. To all McMaster University Science, Technology, Engineering and Mathematics and Master of Science (Physiotherapy) students that worked with me as reviewers in Phase 1 of my PhD thesis, thank you for the opportunity to work with you and learn different approaches to working with people.

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List of Tables, Figures, and Appendices

List of Abbreviations and symbols

4MWT = Four-Meter Walk Test

6MWT = Six-Minute Walk Test

10MWT = Ten-Meter Walk Test

ADL = Activities of Daily Living

AMED = Allied and Complementary Medicine Database

C = Clinicians

CA = Family Caregiver

CINHAL = Cumulative Index to Nursing and Allied Health Literature

CMDAF = Comprehensive Mobility Discharge Assessment Framework

CREDES = Conducting and Reporting of Delphi Studies

CST = Chair Stand Test

EMBASE = Excerpta Medica Database

FEV1 = Force Expiratory Volume

FVC = Forced Vital Capacity

HIREB = Hamilton Integrated Research Ethics Board

IQR = Interquartile Range

LLFI = Late-Life Function Index

LLFDI = Late-Life Function Disability Instrument

LSA = Life-Space Assessment

MESH = Medical Subject Heading

MMSE = Mini-Mental State Exam

OA = Older adults

OSF = Open Science Framework

PRISMA-Scr = Preferred Reporting Items for Systematic Reviews and meta-Analyses Extension for Scoping Reviews

R = Researchers

SC = Steering Committee

SCT = Stair Climbing Test

SD = Standard Deviation

SPPB = Short Physical Performance Battery

STS = Sit-To-Stand

TUG = Time Up and Go

Symbols

* - Boolean/phrases

> - Greater than

< - less than

≤ - Less than or equal to

≥ - More than or equal to

= - Equal to

© - Copyright

Declaration of Academic Achievement

This thesis is a two-phased project, structured as a sandwich thesis and consists of six manuscripts (chapters 2-7). Each manuscript is presented according to the published format or the submission for the target peer-reviewed journals. I, Michael Kalu, made a significant original contribution to all the co-authored studies in this thesis, and I am the first author for all included manuscripts. I present the summary of the contributions of other authors to the published or submitted manuscripts below. Detailed contributions are presented as preface before each manuscript.

Phase 1 (chapters 2, 3 and 4) - Scoping reviews

I, Michael Kalu, with the supervision of Dr Vanina Dal Bello-Haas, conceptualized the purpose and research question for this study. I designed the scoping review protocol and recruited reviewers for the scoping reviews. I led and conducted the scoping reviews, including title, abstract, full-text screening, data extraction and analysis, interpretation and manuscript preparation, revisions and submission.

Other authors' contributions: Dr Vanina Dal Bello-Haas, Dr Meridith Griffin, Dr Sheila Boamah, and Dr Jocelyn Harris reviewed and helped refine the research questions and objectives and provided feedback on the manuscripts. Because of the extensive nature of the scoping review, reviewers vary. The following authors participated in the title, abstract, full-text screening and data extraction:

1. Chapter 2 - Mashal Zaide, Daniel Rayner, Nura Khattab, Salma Abrahim, Tristan Richardson, Nicholas Savateeri, Yimo Wang, Christain Tkachyk.
2. Chapter 3 - Mashal Zaide, Daniel Rayner, Nura Khattab and Salma Abrahim.
3. Chapter 4 - Mashal Zaide, Daniel Rayner, Nura Khattab, Vidhi Bhatt, Claire Goodin, Ji Won (Beth) Song, Justin Smal, and Natalie Budd

Phase 2 (chapters 5, 6 and 7) - International modified e-Delphi study.

I, Michael Kalu, under the supervision of Dr Vanina Dal Bello-Haas, conceptualized the study purpose and research question for this study. I designed the study protocol, including study materials, such as recruitment fliers; applied and obtained ethical approval; conducted the research from recruitment of participants to data collection, and managing of the data, organizing and leading Steering Committee Meetings at each round of the e-Delphi process; conducted data analysis; and prepared, revised and submitted the manuscript for publication.

Other authors' contributions: Dr Vanina Dal Bello-Haas, Dr Meridith Griffin, Dr Jenny Ploeg and Dr Richardson Julie reviewed and provided feedback on the e-Delphi study protocol (chapter 5). Dr Vanina Dal Bello-Haas, Dr Meridith Griffin, Dr Sheila Boamah, Dr Jocelyn Harris and Dr Taina Rantanen participated in the Steering Committee Meetings. They provided feedback on the e-Delphi questionnaire, feedback summaries sent to e-Delphi expert members after each round, and manuscripts (chapters 6 and 7). Daniel Rayner assisted in the content analysis of the qualitative comments sections (chapter 7), and Dr Vanina Dal Bello-Haas reviewed the content analysis of the qualitative data (chapter 7).

NOTE: Revisions have been made in the thesis document based on feedback received at the oral defense. Changes made may or may not appear in current or future published manuscripts.

CHAPTER 1: THESIS INTRODUCTION

Most people are living longer, well into their sixth decade and beyond. By 2030, one in six people in the world will be 60 years or older; and the population of older adults is expected to double by 2050, increasing from 1 billion in 2020 to 1.4 billion in 2050 [1]. As the population ages, healthy aging, the process of developing and maintaining the functional ability that enables well-being in older age, has become a priority for most public health organizations across the globe [2]. One critical component of healthy aging is mobility.

Mobility, defined as the ability to move from one place to another either by self, use of assistive devices, transportation, or driving [3], is essential and allows older adults meet their needs, such as getting to the shops or hospitals, seeing friends and family, or participating in community life [2]. Getting older is associated with changes in mobility, resulting in functional limitations and disability [2]. Approximately one-third of individuals 65 years and older reported difficulty walking a mile or climbing a flight of stairs [4], and 20% of older adults (65 years or older) do not drive a motor vehicle or have access to transportation [5], limiting their ability to be functionally independent. Older adults with limited mobility are more likely to experience loneliness, have poorer quality of life, and have higher rates of chronic and other health conditions, disability, hospitalization, and death [2,6,7]. Furthermore, older adults with mobility limitations have additional health care costs [6]. For instance, the total annual healthcare cost was $2773 higher in older adults who reported difficulty walking one-quarter of a mile compared to those without difficulty [6]. This increase in healthcare cost, alongside the negative impact of mobility limitations experienced among older adults, has led to a worldwide increased focus on the determinants of mobility among older adults [8].

The Conical Model of the Theoretical Framework for Mobility in Older Adults [3], subsequently described as Webber's framework, represents the complexity of mobility and how cognitive, environmental, financial, personal, physical, psychological, and social determinants act directly, indirectly, or interactively to influence the mobility of older adults [3]. While Webber et al. [3] have described the interrelatedness of mobility determinants, they did not systematically synthesize the literature to explore the relationships between different forms of mobility (e.g., by self, use of assistive devices, public transportation, and driving) and the factors within each mobility determinant. This gap limits the research and clinical use of this framework, as researchers and clinicians may not know the factors within each mobility determinant that have a significant role in mobility. A systematic literature synthesis to identify factors within each determinant associated with mobility achieved independently or with the use of assistive devices transportation or driving was warranted. Phase 1 of this thesis addressed this gap by conducting a comprehensive scoping review of the factors within each determinant and their association with self-reported and performance-based mobility measures in older adults.

Webber and colleagues [3] anticipated their mobility framework would drive new research to establish the relative importance of mobility determinants in a different mobility context, leading to the development of integrated mobility assessment instruments. Currently, a comprehensive mobility assessment tool or framework capturing the cognitive, environmental, financial, personal, physical, psychological, and social factors influencing mobility does not exist [9,10], even though functional decline is an independent predictor of hospital readmission among older adults [11,12]. With no comprehensive mobility assessment framework, clinicians often experience challenges in offering comprehensive examinations and recommendations on which factors could predict mobility decline in older adults after discharge from hospital. However, discharge from hospital occurs very quickly [8], and assessing all the factors within each mobility determinant is not feasible. Therefore, prioritizing factors within each determinant critical to assess during an older adult's hospital-to-home transition is an important undertaking. Phase 2 of this thesis identified, through consensus, factors within each determinant critical to be included in a Comprehensive Mobility Discharge Assessment Framework to be used to assess older adults' mobility during hospital-to-home transition.

The purpose of this introductory thesis chapter is to define mobility and mobility measurement; describe older adults' perceptions of mobility; describe the impact of mobility limitations, describe mobility frameworks and the Webber's Conical Model of the theoretical framework for mobility in older adults and studies that have tested the model; discuss the importance of mobility assessment during hospital-to-home transitions; and state the thesis objectives and the structure of this thesis work.

Mobility definitions

Mobility definitions were initially focused more on measurements of walking independently or mobility-related activities, including climbing flights of stairs [13] or self-reported walking abilities [14]. However, scholars have advocated that mobility definitions should not be limited to walking abilities but should also incorporate transportation, driving, and walking-related activities beyond the home [3]. Patla and Shumway-Cook [15] conceptualized community mobility as locomotion in the environments outside the home or residence, similar to life-space mobility. May and colleagues [16] were the first to describe the specific spatial measure of life-space, defined as the area through which the subject moved every 24 hours spanning across five concentric zones, including the bedroom, the rest of the home dwelling, the garden, courtyard, or grounds surrounding the dwelling, the block around the home dwelling ,and the areas across a traffic bearing street.

Subsequently, Peel et al. [17] advanced the notion of life-space mobility to include the frequency of movement and any assistance needed, acknowledging that mobility can be achieved using an assistive device. Despite the advancements made in defining mobility, definitions that encompass life-space mobility achieved via different ways, such as by self (walking), use of assistive device, transportation and driving was lacking. In 2010, Webber and colleagues provided a comprehensive definition of mobility that captures life-space mobility achieved by self, use of assistive device, transportation or driving [3]. Webber et al [3]p.444 defined mobility as the "ability to move oneself (either independently or by using assistive devices or transportation) within environments that expand from one's home to neighborhood and to regions beyond." Webber et al.'s mobility definition was used in this thesis because it comprehensively captures life-space mobility and different manners in which mobility can be achieved.

Mobility can be assessed using self-reported, performance-based, and objective measures.. Objective measures capture what individuals do in their natural environment - real-life and "actual" mobility performance, using accelerometers, gyroscopes or modern technologies such as Global Navigation Satellite Systems [18, 19]. Performance-based mobility measures capture the physical ability to perform a specific mobility task or action and involve the direct observation by an assessor [20,21]. Performance-based measures are often completed in a lab [22], are time-consuming, and require space for assessment[22]. Self-reported mobility measures represent the person's perception of their mobility performance and can be used for older adults who, due to their illness, may not be able to complete performance-based testing [22]. Self-reported mobility measures are often not time consuming, but are prone to response bias, where an older adult over-reports or under-reports their mobility ability [22]. Although comparable, a combination of mobility measures is recommended as each capture different aspects of mobility and complement each other by providing critical information that one tool alone may not capture [22].

Older adults’ description of mobility

Older adults have provided their perspectives on mobility. Goins et al. [23] conducted a meta-synthesis of qualitative studies to explore older adults' perceptions of mobility. They included 12 studies with varied quality and reported that older adults view mobility (independently or assisted) as: a part of self and whole being; fundamental to living; and the key to moving forward. Similarly, a recent study interviewed 15 older adults to explore the importance and experience of mobility [24]. The study described that older adults' experiences of (im)mobility are connected to people and places and that mobility is fluid, contextual, and changes over time [24]. These qualitative findings highlight that mobility changes are not only a physical event but also include changes in social relations and psychological and environmental influences experienced by older adults, underscoring the need to conceptualize factors influencing mobility in older age.

Impact of mobility limitations on older adults

Mobility limitation has been described as self-reported difficulties in walking, performance deficits in objective mobility, and lack of access to assistive mobility devices, transportation, or driving [25]. About 30% of older adults (range of 22.5%-46.7%) in various studies) have mobility limitations [26]. There is reputable evidence on the impact of mobility limitation on older adults’ health, social and care outcomes. Older persons with mobility limitations experience multifaceted issues within physical, psychological, and social domains, which compromise their ability to perform and engage in daily living and social activities; in turn this negatively affects their supportive relationships, connectedness, autonomy, and independence [27]. Mobility limitations are considered the first sign of older adults' functional decline [28] and are linked to hospitalization, frequent falls, poor cognitive functioning, muscle atrophy, frailty, and overall decreased quality of life

[6].Older adults with mobility limitations often require assistance with their activities of daily living, leading to additional healthcare costs. For instance, Hardy et al. [6] reported that the total annual healthcare cost was $2773 higher in older adults reporting difficulty walking one-quarter a mile as compared to those with no difficulty. This increase in healthcare costs associated with mobility limitations warrants the need to explore the factors associated with mobility among the ageing population.

The overview of mobility frameworks

Researchers have conceptualized mobility with the intent to highlight the complexity of mobility. Early frameworks, such as the ecological model of adaptation in older adults or the person-environment fit model have been applied to explore mobility [29]. Put simply, the person-environment model explores the interplay between individuals' capacity or competency and their environment in relations to mobility. This model evolved from the ecological model that stipulated that an individual capacity should match the environmental demand to enable the individual to perform function adequately [29]. This model was foundational in understanding that mobility limitations could result from environmental constraints and not entirely individual in/capacity.

In 1999, Patla and Shumway-Cook proposed a new conceptual framework for understanding community mobility [15]. Community mobility is characterized by several complex factors associated with different aspects of gait, including: changes in direction and speed, travelling on uneven grounds, and concurrent execution of several tasks, such as turning, talking and looking at something while walking [15]. Patla and Shumway-Cook [15] described the community mobility continuum concerning the environments a patient can safely navigate. Such environmental continuum included: (a) independent community ambulator – an individual meeting the demand of moving freely within their community; (b) limited community ambulator – an individual moving freely but does not perform all associated tasks because of some environmental barriers; (c) household ambulator – an individual who performs mobility-related tasks in his home alone but could not perform ambulation in the community because of environmental barriers; and, (d) non-functional ambulator – an individual who cannot perform mobility at home or in the community.

In summary, Patla and Shumway-Cook [15], conceptualized eight environmental dimensions that influence the community mobility continuum ranging from non-function ambulators to independent ambulators. These eight dimensions include: minimum walking distance, time constraints, ambient conditions, terrain characteristics, external physical load, attention demands, postural transitions, and traffic levels, capturing the external demands that an individual needs to meet to be mobile in the community. Understanding how environmental factors influence mobility is critical to preventing and creating rehabilitation programs for mobility limitations in older adults. While these frameworks have provided information highlighting the critical role of the environment in older adults, a comprehensive mobility framework that encapsulates the factors influencing mobility using the biopsychosocial framework was lacking, leading to Webber's Conical Model of Theoretical Framework for Mobility in Older adults [3].

The Conical Model of Theoretical Framework for Mobility in Older Adults

Webber's framework described five determinants that influence older adults' mobility across varied environments within their homes and the community - cognitive, environmental, financial, physical, and psychosocial (see FIG 1). In addition, this framework described that other factors such as gender, culture, and biography indirectly influence older adults' mobility. For instance, culture influences mobility through its effect on social relationships and physical activity behaviors. Further, the five determinants and other person-related are all interrelatedly influencing mobility [3]. For instance, an older adult with a peripheral sensory impairment due to a chronic condition (physical), with or without an accompanying cognitive impairment (cognition), could develop a fear of falling (psychological), which is further heightened if there are obstacles on the sidewalks (environmental factors), leading to a reduction in social activity participation that can further cause social isolation (social). This interrelatedness of mobility determinants often differs across race, gender, and socio-economic status [30]. Furthermore, factors within each determinant can interact to influence older adults' mobility. On one hand, evidence has found that older adults with reduced social networks often do not participate in social activities, resulting in loneliness and further decreasing mobility [25]. On the other hand, older adults experiencing loneliness often have associated depressive symptoms which decrease their interest in social activities that could take them outside, resulting to muscle loss due to none use of muscle [25]. Hence, there is a need to comprehensively describe how the factors within each determinant, individually or collectively, influence older adults' mobility.

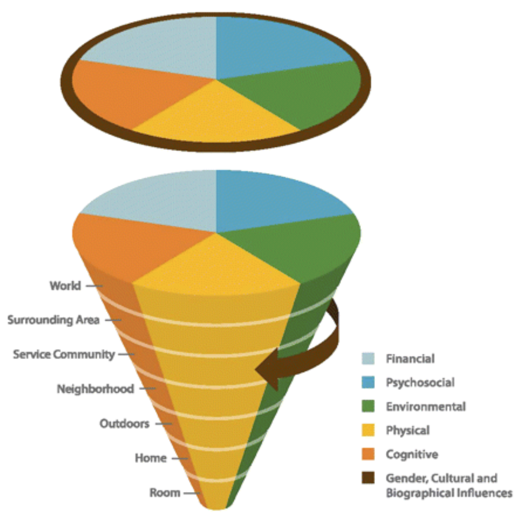

Figure 1. Conical Model of the Theoretical Framework for Mobility in Older Adults illustrating seven life-space and five mobility determinants including gender, culture and biographical influences. Reprinted with permission from Webber et al. [3] Oxford University Press and The Gerontological Society of America.

The Conical Model of Theoretical Framework for Mobility in Older Adults, with modifications based on the literature, guided this Ph.D. thesis. The framework was modified in two areas. First, the psychosocial determinant was divided into two separate determinants: psychological and social determinants. The psychosocial determinant was split because each determinant individually can influence mobility differently [31]. Psychological factors are mostly individual-level factors that influence behaviors that promote or hinder mobility, while social factors are societal level factors rooted in the structures and processes influencing mobility [32]. Second, by labelling gender, culture and biographical influences and added other factors based on the literature as personal determinants. These personal factors are defined as the particular background of an individual's life, including features not part of health and social condition [33]. Therefore, this PhD thesis was guided by the seven determinants of mobility [cognitive, environmental, financial, personal, physical, psychological and social] instead of five determinants as described in Figure 1.

Studies testing Webber’s Conical Model of Theoretical Framework for Mobility in Older Adults

Several studies have explored the interrelatedness of the mobility determinants as described in the Conical Model Theoretical Framework for Mobility in Older adults [3]. While two studies [34,35] have tested Webber’s Framework, five studies [36–40] have used Webber’s framework to identify all potential mobility determinants by predicting which of the factors within each determinants predicts older adults mobility.

Two studies [34,35] used structural equation modeling to test the model among older adults residing in the United States of America [34] and Iran [35]. While the factors selected for each determinant did not differ extensively across the two studies (e.g., both studies assessed psychosocial and physical factors using depression/social activity) and physical activity participation, mobility was measured with self-reported measures. The findings in these studies differ. While Jafari et al. [35] reported that all mobility determinants significantly predicted mobility limitations, Meyer et al. [34] reported that all, except financial factors, were community and personal mobility predictors. These study findings' differences could be related to how self-reported mobility was measured, highlighting that factors predicting mobility could differ depending on how mobility was measured.

Five studies have used Webber's framework [3] to guide the selection of factors that could predict older adults' mobility using life-space measures among those residing in nursing homes [38], discharged from geriatric rehabilitation [39] or community dwellings [36,37,38,40]. The studies' findings differ. While Kuspinar et al. [37] reported that all determinants predicted life-space mobility, only personal and physical predicted life-space mobility in Jansen et al.'s study [39]. The remaining studies reported that only physical, personal, and psychosocial predicted life-space mobility [36,38,40]. The differences in the findings across these studies could be because most of the studies selected different factors within each determinant; for example, environmental factors were measured using residential location [37], weather temperature [40,41], and neighborhood walkability - a composite of the land-use mix, traffic-related safety, and sidewalk characteristics [37]. Where the same factors were selected for each determinant, each study measured it using a different measure; for example, Kuspinar et al. [37] and Dunlap et al. [36] measured executive functioning using the Mental Alternation Test [42] and Trail Making Test A and B [43], respectively. While these studies highlighted the determinants that influence and predict mobility, research to date also underscores the lack of clarity regarding what factors clinicians and researchers should evaluate for each mobility determinant. Therefore, there is a need to create a comprehensive list of factors within each determinant and their associations with mobility outcomes, allowing further creation of a core outcome set defined as a recommended minimum set of outcomes or outcome measures for a particular health construct, condition, or population, which should be reported for all trials on that issue [44]. Having core outcome sets for mobility factors in a specific context, such as hospital-to-home transition, increases outcome consistency across studies, resulting in a reduction in selective reporting to ensure the potential of a study to contribute to meta-analyses of the key outcomes [44], ultimately increasing the utility of study findings in clinical and research practice.

Hospital-to-home transitions

Care transitions, the movement between one care setting and another (e.g., hospital-to-home), involve not only changes in the 'locus' [place], the 'nature' [features] and the 'people' involved but also entail changes in the living environment, the way of living, the family, and social relationships [45]. Older adults experiencing a hospital-to-home transition are at increased risk for poor health outcomes [46], and transitions are fraught with opportunities for adverse and serious events such as a decline in mobility and deterioration in other areas of function e.g., cognitive status and social functioning [47,48]. Based on the potential for complications during this phase, transitional care models, such as Naylor et al. [46] and Coleman et al. [45] were created to address potential issues associated with transitions. These models have focused on interventions to improve provider-to-provider or provider-to-patient/family caregiver communication, improve care coordination, and educate patients to self-monitor and manage their medical conditions [49].

None of the current hospital-to-home transition care models, such as Naylor et al. [46] and Coleman [45], have included mobility as a core component. Kalu et al.'s [9] scoping review of existing theories and conceptual models that inform care transitions found that the role of rehabilitation professionals is not explicitly described and that theories upon which transitional care models were developed were primarily based on nursing and medicine paradigms versus rehabilitation paradigms.

Importance of focusing on mobility during the hospital-to-home transition

The ultimate aim of ensuring effective care transition to home is to reduce hospital readmission, broadly defined as a hospital admission within a specified time frame (e.g., 30 or 90 days) after discharge from the first admission [50] by decreasing the risk for anticipated health problems and functional decline following discharge. Risk factors for hospital readmission are multifactorial and include socio-demographic factors such as: age, social status, social network, race, gender; depressive symptoms; smoking; previous history of admission; functional ability; length of hospital stay; chronic conditions (morbidity); and a recent history of falls [51–55]. Among all these factors, mobility-related factors, such as functional disability and history of falls, have been found to be independent predictors of hospital readmission [51–55]. Shih et al. [56], in a readmission risk prediction model using a sample of 120,957 patients from a uniform data system for medical rehabilitation, reported that models targeting functional status consistently outperform models based on medical comorbidities. Similarly, another study reported that medical patients with low functional status had a higher readmission rate (Rate [95%Cl]: 29% [25%-32%]) compared to those with high functional status [11]. This evidence highlights the importance of mobility as an independent predictor of hospital readmission, yet mobility assessments or interventions areas are not widely recognized as core components of hospital-to-home care transitions.

Researchers have argued that the lack of a comprehensive mobility discharge assessment framework or tool consisting of the seven determinants of mobility [cognitive, environmental, financial, personal, physical, psychological and social factors] and the lack of involvement of rehabilitation professionals could be the reason why mobility has not been included in the hospital-to-home care transitions [8-10]. This PhD thesis hopes to fill in one of these gaps by developing, through consensus, a Comprehensive Mobility Discharge Assessment Framework for older adults transitioning from hospital to home.

Thesis Purpose and Format

The overall purpose of this thesis is:

(a) To synthesize the available evidence for factors within each mobility determinant - cognitive, financial, environmental, personal, physical, psychological, and social, and their association with self-report and performance-based mobility outcomes – Phase 1

(b) To develop, through consensus, a Comprehensive Mobility Discharge Assessment Framework (CMDAF) for older adults transitioning from hospital-to-home in the community – Phase 2.

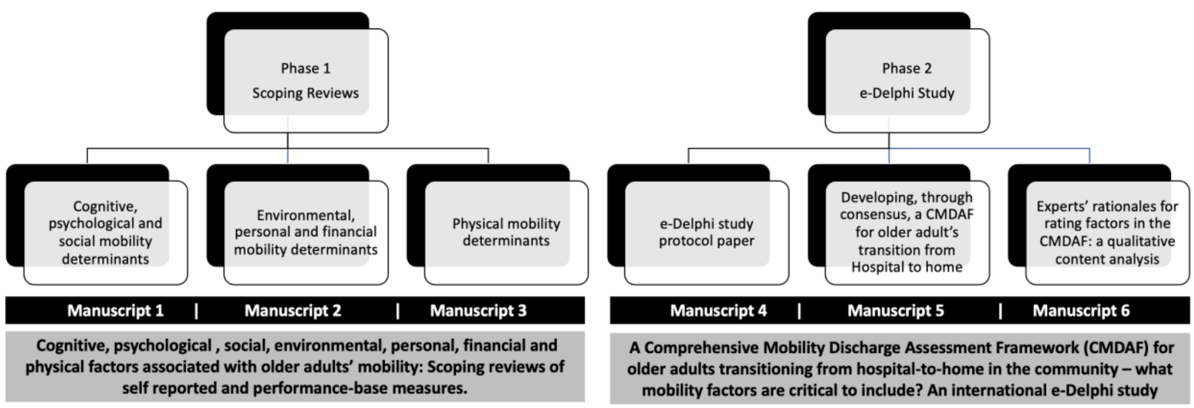

Figure 2 – PhD thesis phases and corresponding manuscripts

This thesis is a manuscript-style thesis comprised of eight chapters, including an introduction chapter, six manuscripts, and a conclusion chapter. An overview of the six manuscripts across the two thesis phases is provided in Figure 2. Each manuscript is formatted according to the journal's requirements for publication; as a result, reference styles may differ across manuscripts (chapters). Notably, there are some overlapping ideas, concepts, and discussions across the manuscripts because they are interrelated and build on each other.

Chapter 2 (Manuscript 1) is a scoping review that synthesizes the available evidence for factors comprising the cognitive, psychological, and social mobility determinants and their associations with self-reported and performance-based mobility outcomes in older adults (60 years and older). This manuscript is published: Kalu ME, Dal Bello-Haas V, Griffin M, Boamah S, Harris J, Zaide M, Rayner D, Khattab N, Abrahim S, Richardson TK, Savatteri N. Yimo W, Tkachyk C. Cognitive, psychological and social factors associated with older adults' mobility: a scoping review of self-report and performance-based measures. Psychogeriatrics 2022; 22: 553-573. doi: 10.111/psyg.12848.

Chapter 3 (Manuscript 2) is a scoping review that synthesizes the available evidence for factors comprising the personal, financial, and environmental mobility determinants and their associations with self-reported and performance-based mobility outcomes in older adults (60 years and older). This manuscript is currently under review: Kalu ME, Dal Bello-Haas V, Griffin M, Boamah S, Harris J, Zaide M, Rayner D, Khattab N, Abrahim S. A scoping review of personal, financial and environmental determinants of mobility among older adults.

Chapter 4 (Manuscript 3) is a scoping review that synthesizes the available evidence for factors comprising the physical mobility determinant and their associations with self-reported and performance-based mobility outcomes in older adults (60 years and older). This manuscript is published online: Kalu ME, Dal Bello-Haas V, Griffin M, Boamah S, Harris J, Zaide M, Rayner D, Khattab N, Bhatt V, Goodin C, Song JW, Smal J, Budd N. Physical mobility determinants among older adults: a scoping review of self-reported and performance-based measures. European Journal of Physiotherapy. doi:10.1080/21679169.2022.2153303.

Chapter 5 (Manuscript 4) is a protocol paper for an international e-Delphi study that aimed to prioritize and reach consensus on the factors for each mobility determinant that are critical to assess as part of the Comprehensive Mobility Discharge Assessment Framework (CMDAF) when older adults are discharged from hospital-to-home. This paper has been published: Kalu ME, Dal Bello-Haas V, Griffin M, Ploeg J, Richardson J. A comprehensive mobility discharge assessment framework for older adults transitioning from hospital-to-home in the community - What mobility factors are critical to include? Protocol for an international e-Delphi study. PLoS One 17 (9): e0267470. doi: 10.1371/journal.pone.0267470.

Chapter 6 (Manuscript 5) is an international e-Delphi study that aimed to prioritize and reach consensus on the factors for each mobility determinant that are critical to assess as part of the Comprehensive Mobility Discharge Assessment Framework (CMDAF) when older adults are discharged from hospital-to-home. This manuscript is currently under review: Kalu ME, Dal Bello-Haas, Griffin M, Boamah S, Harris J, Rantanen T. What mobility factors are critical to include in a Comprehensive Mobility Discharge Assessment Framework for older adults transitioning from hospital-to-home in the community? An International e-Delphi study.

Chapter 7 (Manuscript 6) is a qualitative content analysis of expert participants' rationales for how they rated mobility factors critical to be included in the CMDAF for older adults transitioning from hospital-to-home. This manuscript is under review: Kalu ME, Dal Bello-Haas, Griffin M, Boamah S, Harris J, Rayner D, Rantanen T. Qualitative analysis of experts' rationales for rating mobility factors deemed critical to assess as part of a Comprehensive Mobility Discharge Assessment Framework for older adults transitioning from hospital-to-home.

Chapter 8 is the discussion chapter that synthesizes the thesis work describe how the studies built on each other to bridge the gaps in the literature that were identified. This chapter also discusses the implications of the thesis as a whole, overall strengths and limitations, and future directions.

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CHAPTER 2: Cognitive, psychological and social factors associated with older adults' mobility: a scoping review of self-reported and performance-based measures

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Preface

This chapter is one of the three manuscripts from Phase 1 of the PhD thesis that focused on identifying factors within cognitive, psychological and social mobility determinants and their association with self-reported and performance-based mobility outcomes in older adults. Under the supervision of Dr V Dal Bello-Haas, I conceptualized the study, designed the study, developed research questions and search strategy, conducted the search, and participated in the title/abstract and full-text screening, extracted the data, and interpreted the findings, wrote, revised and submitted the manuscript. Dr. M Griffin, Dr. S Boamah, and Dr. J Harris provided feedback on the research questions, study designs and the manuscript. The following authors participated in the title/abstract and full-text screening and data extraction of the included articles: C Tkachyk and Y Wang for psychological factors; TK Richardson and N Savatteri for social factors; N Khattab and S Abrahim for cognitive factors. M Zaide and D Rayner participated in the title/abstract and full-text screening and data extraction of update search. The first search was conducted in November 2019 and updated in December 2021. This chapter is the manuscript as published in *Psychogeriatrics*.

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We have received permission to publish the manuscript in my thesis (See Appendix 2E).

Cognitive, psychological and social factors among mobility of older adults: a scoping review of self-report and performance-based measures

Short title: Cognitive, Psychological and Social mobility determinants among older adults.

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REVIEW ARTICLE

Cognitive, psychological and social factors associated with older adults' mobility: a scoping review of self-report and performance-based measures

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Abstract

Although many factors have been associated with mobility among older adults, there is paucity of research that explores the complexity of factors that influence mobility. This review aims to synthesise the available evidence for factors comprising the cognitive, psychological, and social mobility determinants and their associations with mobility self-reported and performance-based outcomes in older adults (60 years). We followed Arksey and O'Malley's five stages of a scoping review and searched PubMed, EMBASE, PsychINFO, Web of Science, AgeLine, Allied and Complementary Medicine Database, Cumulative Index to Nursing and Allied Health Literature and Sociological Abstract databases. Reviewers in pairs independently conducted title, abstract, full-text screening and data extraction. We reported associations by analyses rather than articles because articles reported multiple associations for factors and several mobility outcomes. Associations were categorised as significantly positive, negative, or not significant. We included 183 peer-reviewed articles published in 27 countries, most of which were cross-sectional studies and conducted among community-dwelling older adults. The 183 articles reported 630 analyses, of which 381 (60.5%) were significantly associated with mobility outcomes in the expected direction. For example, older adults with higher cognitive functioning such as better executive functioning had better mobility outcomes (e.g., faster gait speed), and those with poor psychological outcomes, such as depressive symptoms, or social outcomes such as reduced social network, had poorer mobility outcomes (e.g., slower gait speed) compared to their counterparts. Studies exploring the association between cognitive factors, personality (a psychological factor) and self-reported mobility outcomes (e.g., walking for transportation or driving), and social factors and performance-based mobility outcomes in older adults are limited. Understanding the additive relationships between cognitive, psychological, and social factors highlights the complexity of older adults' mobility across different forms of mobility, including independence, use of assistive devices, transportation, and driving.

Key words: *cognitive factors, mobility, older adults, psychological factors, social factors.*

INTRODUCTION

Mobility, defined as the ability to move oneself (independently or using assistive devices or transportation) within environments that expand from one's home to the neighbourhood and regions beyond, plays a fundamental role in maintaining active ageing.[1] Mobility decline often leads to loss of independence in performing everyday tasks, such as running errands,[2] and leads to increased pain, morbidity, mortality, and institutionalisation among older adults.[3] The prevalence of mobility-related disability among older adults (aged 65 years and older) increased from 22.6% in 2005 to 47.6% in 2015,[4] highlighting the need to determine the factors that influence mobility.

Webber *et al.*[1] provided a comprehensive framework explaining the link between mobility and primary predictors and modifiers of mobility and conceptualised mobility determinants into cognitive, environmental, financial, personal, physical, psychological, and social factors. While Webber *et al.*'s paper[1] highlights the interrelationship between mobility and these key determinants, they did not synthesise the relationships between different forms of mobility (by self, use of assistive devices, transportation and driving) and the inherent factors within each mobility determinant. This restricts the practical use of the framework in clinical and research practice, making it challenging to ascertain which factors within each determinant play an active role in mobility. Therefore, a systematic search of the literature to identify the inherent factors within each determinant is warranted. Based on this, we conducted a comprehensive review of the seven mobility determinants and grouped the review into three: contextual factors (environmental, financial, and personal); psychological, social and cognitive; and physical factors and their association with mobility outcomes. This review focuses on psychological, social and cognitive determinants of mobility.

Cognition refers to internal mental representations best characterised as thoughts and ideas involved in multiple mental processes and operations, including perception, reasoning memory, intuition, judgement, and decision making.[5] Cognitive functions include but are not limited to executive function, attention, memory, visuospatial function.[5] There is growing evidence of associations between cognition and mobility[6–8] and works demonstrating that mobility and cognitive impairment dynamically unfold together across life.[9–11] Because not all cognitive domains are affected similarly by the ageing process,[12] the associations between cognitive functions and mobility outcomes among older adults may depend on the cognitive domain and mobility outcome measured. More so, given the complexity of each cognitive factor and different mobility measures, a comprehensive examination of the associations between different forms of cognitive functions and different kinds of mobility, including using assistive devices and walking for transportation, is needed.

Psychological factors are individual-level processes, including thoughts, feelings, and attitudes that influence mental states and behaviour.[13] Psychological factors affecting mobility in older adults include fall-related psychological concerns, such as: self-efficacy[14] and fear of falling;[15] mental health-related factors, such as depression[16] and anxiety;[17] and personality.[18,19] Some psychological factors, such as fear of falling, have been investigated for decades mostly on falls,[20] but recently in mobility,[15] demonstrating a strong association between fear of falling and mobility decline.[21,22] Psychological factors mediate mobility differently highlighting their complex associations within different older adults' mobility forms. Therefore, a comprehensive review of psychological factors and their association with mobility outcomes is warranted.

Social factors are general factors at the level of human society concerned with social structure and processes that impact individuals' physical and social activities.[13] Social factors affecting older adults' mobility include but are not limited to social relations, social participation, social networks, and social isolation.[23] Extensive social relations have increased older adults' community mobility,[24] through their active participation in community/social activities,[25] suggesting that a strong social network may prevent mobility decline in older adults. Social relations such as the frequency of personal contacts with significant others (i.e., children, grandchildren, siblings, relatives, and friends) suggests that diverse social network resources are vital in improving mobility in older adults.[26] A bidirectional relationship exists between social factors and mobility.[26] While it is plausible that lack of social participation may result in increased mobility limitation, it is also possible that mobility limitation may hinder older adults' active social participation.[23] Thus, a comprehensive review is needed to clarify the dynamic interaction between social factors and mobility outcomes in older adults.

Systematic/scoping reviews exist that explore the relationships between cognitive, psychological and social factors and mobility; however, often only a singular aspect of mobility and/or the factor was examined. For instance, De Silva *et al.*'s review[6] explored the association between cognition and one self-reported mobility outcome, while other reviews focused on the association between one aspect of cognition such as global cognition and several performance-based mobility outcomes, such as gait speed only,[7] and gait speed, balance and lower limb strength.[8] Similarly, the associations between psychological and social factors and mobility outcomes have been explored: fear of falling and performance-based measures,[15] or social isolation and transportation,[23] but not comprehensively. While these reviews have highlighted the association between cognitive, psychological and social factors and specific mobility outcomes, not all factors were included. The relationship between various social factors such as loneliness, social networks, social support, or psychological factors such as anxiety, mood and depression and various forms of mobility including walking for transportation or driving, are lacking.

This paper aims to synthesise the available evidence for factors comprising the cognitive, psychological, and social mobility determinants and their associations with mobility self-reported and performance-based outcomes in older adults (60 years and older).

METHODS

We followed the five stages of scoping review according to Arksey and O'Malley's[27] framework and Levac *et al.*'s recommendation[28] for advancing the methodology of scoping reviews. We reported this scoping review using the Preferred Reporting Items for Systematic Reviews and Meta-Analyses extension for scoping reviews (PRISMA-Scr).[29] The protocol was registered with Open Science Framework: https://doi.org/10.17605/OSF.IO/7Y5VG.

Identifying the research questions

Two questions were addressed explicitly in this review: (a) what is the available evidence for factors comprising the cognitive, psychological, and social mobility determinants in older adults (60 years and older); and (b) what are the associations between cognitive, psychological, and social factors and mobility self-reported and performance-based outcome in older adults (60 years and older)? We followed Webber *et al.*'s[1] definition of mobility in this review. Mobility is the ability to move oneself (either independently or by using assistive devices or transportation or driving) within environments that expand from one's home to the neighbourhood and regions beyond. Mobility either by self, use of assistive devices, driving, or transport can be assessed using self-reported or performance-based measures.

Identify relevant studies

The search strategy was developed and optimised in consultation with an expert health science librarian. Webber *et al.*'s paper[1] was the seed article which highlighted the concepts to be searched in this scoping review. Search terms were developed using MeSH terms or keywords related to: (a) the study population, such as older adults; (b) exposure, including cognition, psychological and social factors; and (c) mobility outcomes, including gait speed, balance, self-reported mobility limitations. We adapted the MeSH terms and keywords for each database. Three different searches were conducted separately for cognitive, psychological, and social determinants in eight databases (PubMed, EMBASE, AMED, CINAHL, Psych INFO, AgeLine, Web of Science, Sociological Abstract databases) using the search strategy in Table 1. See Appendix 1 for an example of a search conducted in CINHAL for each determinant. We restricted our search from January 2000 to December 2021, as 2000 was the projected year that the impact of baby boomers on health outcomes would be most prominent across the developed countries in the world.[30] We searched the reference lists of the included articles for additional articles that met our inclusion criteria.

Selecting studies

Inclusion and exclusion criteria

We included studies if: (a) the *study population* was older adults (60 years or older); (b) the *exposure* included cognition (attention, executive functioning, memory, processing speed, visuospatial function, and general cognition), psychological factors (affect, anxiety, apathy, depression, self-efficacy, motivation, fear of falling, emotional well-being, self-perceived fatigue, extraversion, openness, agreeableness, and conscientiousness), and/or social factors (loneliness, social isolation, social participation, social network, social support); (c) the *mobility outcomes* were assessed by self-reported and/or performance-based measures; (d) the *study setting* was in a hospital, community,

Table 1 Search strategy for each determinant

Population (older adults)	Exposure		Outcome (mobility)
Elderly OR geriatric OR Aging OR Older people* OR Senior* OR Retirees OR Aged OR Older persons OR Gerontology OR Adult*	Cognition	Cognition OR Cognitive impairment OR Memory OR Perception OR Fluid cognition OR Executive function OR Processing speed OR Attention OR Visual spatial Memory OR Learning OR Pattern recognition OR Response inhibitions	Mobility limitations, OR Life space measures OR Mobility OR Walking OR Ability level OR physical mobility OR Movement OR Gait OR Balance OR Time up and Go OR Physical functioning OR, Six minutes' walk test OR Berg Scale OR Short physical performance battery OR Transportation OR Travel OR Driving OR Driving safety OR Crashes OR accident OR Road test OR Walking aid OR Ambulation aids OR Assistive devices OR Wheelchair* OR Scoote* OR Cane* OR Crutche* OR Prosthetic devices OR Orthotic devices OR walker
	Psychological	Depression OR Anxiety OR Psychological stress OR Emotional stress OR Self-efficacy OR Mental health OR Fear of falling OR Mood disorders OR Kinesiophobia	
	Social	Social support OR Social relationships OR Interpersonal relationships OR Social networks OR Social isolation OR Loneliness OR Social engagement OR Social participation OR Social behavio*r.	

Population terms AND Exposure terms AND Outcome terms for each determinant were adapted and searched in seven databases including PubMed, EMBASE, AMED, CINAHL, Psych INFO, Web of Science, Sociological abstract. MeSH and keywords - headings were adapted for each database using Boolean/phrases.

assisted living or long-term care facilities; and (e) the article was peer-reviewed, conducted in a quantitative or mixed-method paradigm, and published in English between January 2000 to December 2021.

We excluded articles if they: (a) were opinion papers with no primary data; (b) used measures assessing the functional decline in activities of daily living or instrumental activities of daily living without any specific measure of mobility; and (c) described physical activity or exercise (except walking) as a form of mobility.

We exported citations from each database and imported them into Rayyan QCRI©[31] separately for cognitive, psychological, and social determinants of mobility. Study selection was conducted separately for each determinant and in two stages: title/abstract and full-text screening for each factor using the above inclusion and exclusion criteria. Before the screening process at each stage, three author reviewers for each determinant (CT, YW, MK for psychological; and TR, NS, MK for social; and NK, SA, MK for cognition) conducted pilot testing of the first 50 articles to determine the inter-rater reliability. Raters' kappa scores for both title/abstract and full-text screening ranged from 0.80 to 0.96, indicating strong agreement between raters.[32] As a result, the remaining articles retrieved from the search were divided among each pair of author reviewers, and each individually performed title, abstract, and full-text screening for their assigned determinant. Disagreements were resolved in research meetings and discussions with the senior authors.

Charting of data

Before data extraction, all included articles for each determinant after full-text screening were downloaded into Microsoft Excel sheets. One author reviewer (MK) identify the overlapping articles across the cognitive, psychological and social determinants. Four author reviewers (NK, SA, DR and MK) met to develop a data extraction form in Microsoft Excel following a template from a previous review.[33] Each author reviewer (CT, YW for psychological; TR, NS for social; NK, SA for cognition; and DR, MZ for overlapping articles) independently extracted 10 articles to pilot-test the data extraction sheet to ensure consistency. Author reviewers met and compared the data extracted in each data extraction sheet. We resolved any disagreements by discussion and consulting with senior authors, leading to the final data extraction sheet. Articles were divided among author reviewers for each determinant to complete data extraction. The following data were extracted from the included articles: authors' names, the country in which the study was conducted, study aims, research questions or hypothesis, the setting from which participants were recruited, study type, study design, and population (older adults with no defined health conditions and those with defined health conditions, such as dementia), sample size, participants' age and gender distribution, cognitive, psychological and social factors studied, type of mobility outcome used. We extracted the mean (SD), median (interquartile range), *P*-values, odds ratios, hazard ratios, prevalence ratios, and correlations and their 95% confidence intervals of result findings related to our research questions.

Collating, summarising, and reporting the result

We reported the analyses by the association between factors within mobility determinants and mobility outcomes rather than by the articles themselves because most articles reported multiple associations for factors and several mobility outcomes. For example, one article may have reported the associations between multiple factors (e.g., depression, anxiety, social network, and attention) and multiple mobility outcomes (e.g., walking distance, walking speed, self-reported inability to walk one mile, and total walking distance per day). For the example above, 20 distinct associations were extracted from this article. We presented the result of this review in two parts: (1) studies and sample characteristics; and (2) the association between each factor within each determinant of mobility (assessed by both self-reported and performance-based mobility measures).

RESULTS

We retrieved 23 319 citations from the databases (cognition = 9926, psychological = 8825, social = 4568); 990 (cognition = 567, psychological = 290 and social = 133) underwent full-text screening and 183 were included (Fig. 1). The distribution of articles within each determinant is presented in a Venn diagram (Fig. 2).

Characteristics of the included articles

The included 183 articles' characteristics are presented in Table 2. The articles were conducted in 27 countries on five continents, excluding Africa. A little over half of the articles (n = 99, 54.1%) were conducted in North America, primarily the USA (n = 87, 47.5%) and Canada (n = 12, 6.6%). All included articles were quantitative studies; 101 (55.2%) and 73 (39.9%) were cross-sectional and longitudinal studies, with nine articles (4.9%) reporting quasi-experimental studies or randomised controlled trials' findings.

The majority (n = 129, 70.5%) of the included studies' populations were older adults with no defined conditions. The remaining 54 articles (29.5%) included older adults with dementia or cognitive impairment,[34–59] fragile X syndrome associated with tremor/ataxia, a condition resulting from a gene permutation,[60] stroke,[61,62] chronic obstructive pulmonary disease,[63] cancer,[64,65] diabetes,[66] Parkinson's disease,[17,67–74] cardiovascular disease,[14,75–80] lower back pain,[81] multiple comorbidities[82–84] and post-menopausal conditions.[85] Most studies recruited participants from the community (n = 164, 89.6%), and the remaining studies (n = 19, 10.4%) recruited from the hospital and long-term care setting or both the long-term care and community setting, or did not report the setting from which the participants were recruited.

Reported mean ages ranged from 61.1[73,76] to 91.1[59] years. Sixty-nine per cent (n = 126) of the included articles had more women than men in their sample and sample sizes ranged from 13[41] to 51 338.[86]

Of the 183 articles, 121 (66.1%) articles assessed mobility using performance-based measures only, 55 (30.1%) articles assessed mobility using self-reported questionnaires only, and seven (3.8%) articles assessed mobility using both (see Table 2 for details, and Appendix 2A–2D for specific mobility outcome measures).

Factors within each determinant and its association with mobility outcomes

Factors within each determinant and their definitions are found in Table 3. The 183 articles reported 630 analyses, of which 381 (60.5%) were positively (295 analyses, 77.4%) or negatively (86 analyses, 22.6%) associated with mobility outcomes in older adults. Only significant associations are described in

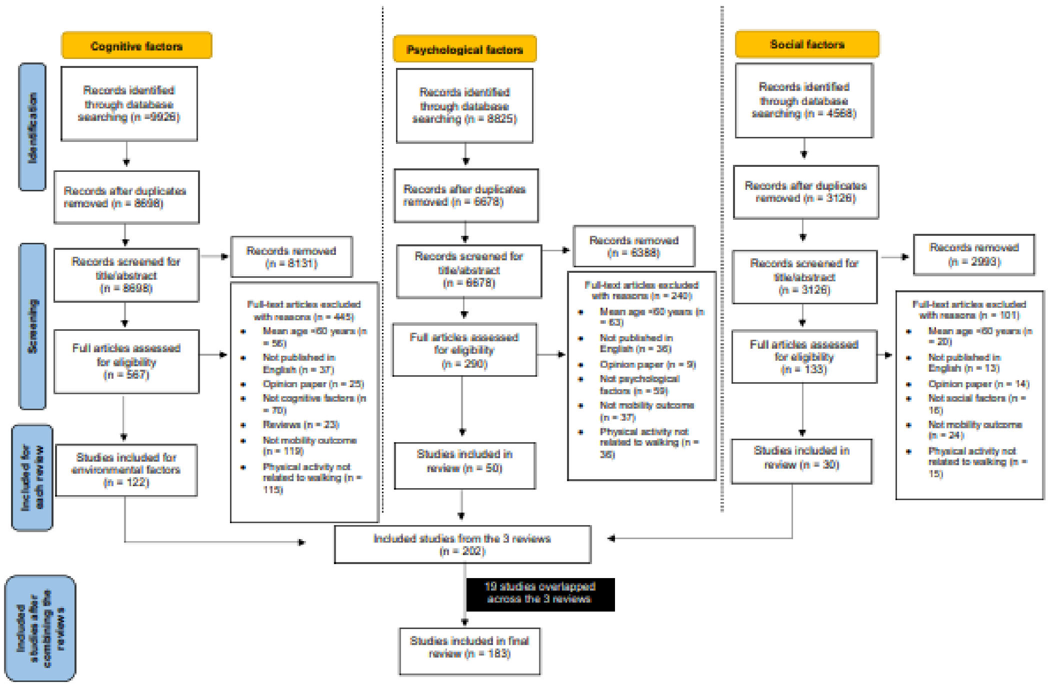

Figure 1 Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) flow chart of the scoping reviews.

this section. The non-significant associations, including *P*-values, odds ratios, hazard ratios, prevalence ratios, and correlations for each included article, are found in Appendix 2A (cognitive factors only), 2B (psychological factors only) and 2C (social factors only), 2D (more than one factor).

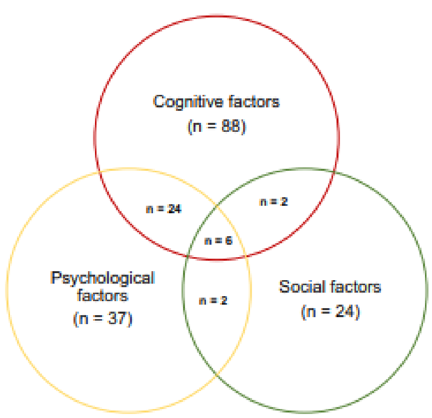

Figure 2 Venn diagram showing the number and distribution of articles across the three mobility determinants ($N = 183$).

Association between cognitive factors and mobility

One hundred and twenty articles reported 421 analyses, of which 251 (59.6%) reported significantly positive ($n = 176$, 70.1%) and negative ($n = 75$, 29.9%) associations between cognitive factors and mobility outcomes. Analyses were reported using six cognition domains: attention, executive function, language, memory, processing speed, visuospatial, and global cognition.

Executive function

Performance-based

Studies reported that greater executive function (e.g., a higher score in Trail Making Test) was associated with improved walking time,[86–89] faster gait speed,[52,89–96] higher cadence,[52,90,94] longer stride length,[52,94] greater

Table 2 Characteristics of the included articles (*N* = 183)

Characteristics	Cognitive factors (*n* = 88) *n* (%)	Psychological factors (*n* = 37) *n* (%)	Social factors (*n* = 24) *n* (%)	>1 factor (*n* = 34) *n* (%)
Gender				
• >Female	56 (63.7)	25 (67.6)	20 (83.3)	25 (73.6)
• <Female	28 (31.8)	7 (18.9)	3 (12.5)	8 (23.5)
• Female = Male	1 (1.1)	3 (8.1)	–	1 (2.9)
• Not reported	3 (3.4)	2 (5.4)	1 (4.2)	–
Geographical area: continent				
• Africa	–	–	–	–
• Asia	6 (6.8)	4 (10.8)	7 (29.1)	5 (14.7)
• Europe	23 (26.1)	7 (18.9)	7 (29.1)	7 (20.6)
• North America	49 (55.7)	21 (56.8)	9 (37.5)	20 (58.8)
• Oceania	7 (8.0)	1 (2.7)	1 (4.3)	2 (5.9)
• South America	3 (3.4)	3 (8.1)	–	–
• > 1 continent	–	1 (2.7)	–	–
Study design				
• Cross-sectional	60 (68.2)	16 (43.2)	4 (16.7)	21 (61.8)
• Longitudinal	27 (30.7)	18 (48.7)	16 (66.7)	12 (35.3)
• Quasi-experimental	–	2 (5.4)	2 (8.3)	–
• Randomised controlled trials	1 (1.1)	1 (2.7)	2 (8.3)	1 (2.9)
Participants recruited from				
• Community	82 (93.2)	28 (75.7)	20 (83.4)	31 (91.2)
• Hospital	4 (4.6)	5 (13.5)	2 (8.3)	–
• Long-term care	1 (1.1)	1 (2.7)	–	1 (2.9)
• Laboratory	–	3 (8.1)	2 (8.3)	–
• Mixed	–	–	–	2 (5.9)
• Not reported	1 (1.1)	–	–	–
Population of study				
• Defined health conditions (e.g., stroke, Alzheimer's)	30 (34.1)	13 (35.1)	4 (16.7)	8 (23.5)
• No defined health conditions	58 (65.9)	24 (64.9)	20 (83.3)	26 (76.5)
Sample size, *n*				
• ≤ 100	27 (30.6)	6 (16.3)	2 (8.3)	7 (20.6)
• 101 – 300	22 (25.0)	10 (27.0)	2 (8.3)	4 (11.8)
• 301–500	7 (8.0)	3 (8.1)	–	2 (5.9)
• 501–1000	14 (16.0)	8 (21.6)	3 (12.5)	11 (32.3)
• 1001–2500	9 (10.2)	3 (8.1)	4 (16.7)	4 (11.8)
>2500	9 (10.2)	7 (18.9)	13 (54.2)	6 (17.6)
Total number of mobility outcomes used for each determinant	154	63	24	41
Performance-based outcome				
Walking outcomes				
• Time	10 (7.4)	2 (3.9)	–	2 (8.7)
• Distance	–	6 (11.8)	–	2 (8.7)
• Speed	37 (27.2)	12 (23.6)	1 (25.0)	8 (34.8)
• Steps	6 (4.4)	3 (5.9)	2 (50.0)	1 (4.3)
• Other gait parameters	49 (36.0)	17 (33.3)	–	–
Observed driving-related outcomes	2 (1.4)	–	–	3 (13.1)
Balance	5 (3.7)	–	–	2 (8.7)

Table 2 Continued

Physical functioning				
• Short Physical Performance Battery scores	6 (4.4)	2 (3.9)	–	1 (4.3)
• Timed Up-and-Go Test scores	11 (8.1)	7 (13.7)	1 (25.0)	4 (17.4)
• Other physical functioning tests	10 (7.4)	2 (3.9)	–	–
Self-reported outcome				
Community mobility				
• Walking	–	–	3 (15.0)	1 (5.6)
• Life space mobility scores	6 (33.3)	2 (16.7)	–	12 (66.7)
• Other self-reported mobility questionnaires	4 (22.2)	2 (16.7)	7 (35.0)	2 (11.0)
• Driving-related outcomes	7 (38.9)	1 (8.3)	1 (5.0)	3 (16.7)
Mobility limitation	1 (5.6)	6 (50.0)	9 (45.0)	–
Use/difficulty in using mobility assistive devices	–	1 (8.3)	–	–

Performance-based mobility outcome: walking time defined as the time taken to complete 3, 5, 6 or 30-metre walk tests; walking distance defined as distanced walked within 6 or 2-min walk tests; other gait parameters included stride length, cadence, single/double support time, walk ratio, gait variability; observed driving ability - participants were followed or observed while driving in the community; balance tests included Berg Balance Test, Tandem Tests, Stance Test, BESTest; other physical functioning tests included Sit-to-Stand Test, Stair Climbing Test. Self-reported mobility outcomes: self-reported walking included the distance walked, number of times walked (seconds or minutes, per week/month), number of days outdoors; other self-reported mobility measures included Mobility Help and Tiredness Scale, Rivermead Mobility Index, EuroQol 5-Dimension Scale - mobility domain, Rosow-Breslau Mobility Disability Scale, and Late-Life Function and Disability Instrument; driving-related outcomes included driving performance (ability or inability), access to car, driving duration and frequency, driving distance, preference to be driver vs. passengers; mobility limitation defined as self-reported inability on all or either of the following: walking up and down a flight of stairs (10 steps) or several flights of stairs, walking a mile (1600 m) or half a mile (800 m) or a quarter-mile or a block (400 m) or 100–300 m, or across the room and running/jogging for 20–30 min; the mobility assistive devices included scooter, powered and manual wheelchairs, walking aids (cane, walker, crutches).

percentage changes in stride variability,[54,94,97] better balance scores,[52,68,87,98] better Short Physical Performance Battery (SPPB) scores,[52,99] completing Timed Up-and-Go (TUG)[42,88,100] and Chair Stand Tests[52,86] in a shorter time, better driving skills,[34,101] longer driving distance and time,[102] and driving safe.[103,104] Poorer executive function was associated with slower gait speed,[10,69,75,105–107] shorter step length,[105] longer stride time,[108] increased stride-to-stride variability,[108,109] completing Chair Stand Test[75] and TUG[110] in a longer time, and more likely to drive unsafely.[43,111]

Self-reported

Three studies reported that better executive function was associated with greater Life-Space Assessment (LSA) scores,[112–115] and one study reported poorer executive function was associated with greater mobility disability.[91]

Attention

Performance-based

Studies reported that better attention (e.g., higher scores in Test for Attentional Performance) was associated with faster walking speed,[72,95,116] longer stride length,[116,117] decreased stride length variability,[90] better SPPB scores,[99] completing TUG[42] and Chair Stand Tests[117] in a shorter time, longer driving distance and time,[102,117] better driving scores,[34] and faster breaking reaction time during driving.[118] Poor attention was associated with slower gait speed,[69,105,119,120] taking more time to complete a walking test,[121] increased gait variability,[69] and worse road test scores.[122]

Self-reported

One study reported that better attention was associated with a better Elderly Mobility Scale scores.[53]

Visuospatial

Performance-based

Studies reported that better visuospatial function (e.g., higher scores in the Hooper Visual Organisation Test) was associated with faster gait speed,[93,96] completing TUG in a shorter time,[35,46] driving safely,[111] longer driving distance and time,[102] better driving scores,[34] better road test scores,[122] faster break reaction time during driving,[118] fewer driving safety errors,[123–125] and being less likely to fail a road test.[70] Three studies reported that a decline in

Table 3 Factors identified for each determinant and their descriptions

Factors	*n* (%)	Lay description
Cognitive factors ($n = 264$)		
Attention	26(9.8)	The ability to focus on something while ignoring other things.
Executive function	54(20.5)	A set of mental skills that allows people to plan, decide, find solutions to problems, and control themselves from acting without thinking.
Global cognition	78(29.6)	Refers to the way people think, judge, learn, understand, remember, and see things.
Language	17(6.4)	Refers to sounds, signs, symbols and gestures that can be used to communicate ideas, thoughts and emotions from one person to another
Memory	38(14.4)	The ability to remember things about past events or knowledge.
Processing speed	23(8.7)	The time needed to take in information, make sense of it and begin to respond.
Visuospatial function	28(10.6)	How people understand what they see and how it relates to where they are, e.g., using a map to get from one place to another, walking through doorways rather than bumping into the door frames, judging how far away a car is and how fast it is moving.
Psychological factors ($n = 109$)		
Fall-related psychological concerns		
Fear of falling	13(11.9)	Worrying about falling so much that the person does not take part in activities
Self-efficacy	3(2.8)	The belief someone has in the abilities to carry out and complete a task
Mental health-related factors		
Depression	43 (39.5)	A feeling of sadness and loss of interest, which stops someone from doing normal activities
Anxiety	11(10.1)	A feeling that causes people to worry and can cause their heart rate to increase or make them breathe the faster
Apathy	2(1.8)	The lack of interest in life activities or interactions with others
Well-being related factors		
Affect	2(1.8)	How people feel and can be from good to bad
Self-perceived fatigue	1(0.9)	How people view themselves as being tired, that affects how they function.
Life purpose or motivation	2 (1.8)	The reasons people act or behave in a specific way
Emotional well-being	3(2.8)	The state of being mentally healthy and happy
Personality trait-related factors		
Agreeableness	4(3.7)	Personal feature that makes people more likely to agree with others
Conscientiousness	5(4.6)	Personal feature that makes people more likely to be organised, responsible, and hardworking
Extraversion	7(6.4)	Personal feature that makes people more likely to be with people than be by ourselves
Neuroticism	8(7.4)	Personal feature that makes people more likely to be easily annoyed
Openness	5(4.6)	Personal feature that makes people more likely to be open to new things
Social factors ($n = 38$)		
Living situation	4(10.5)	Describes living alone or with whom the older adults live, e.g., roommates, family members, or spouse/partner
Loneliness	2(5.3)	An unpleasant feeling associated with having few or no friends or having lost connections with people, places, or things or when close relationships are not meeting needs.
Social capital	1(2.6)	The connections, shared values and understandings in society that enable people to trust each other and work together
Social cohesion	2(5.3)	How strong relationships are in the community that encourage people to provide help and support to each other, e.g., if someone returns a lost item or gives a stranger direction
Social isolation	2(5.3)	The feeling people have when they do not have contact with others
Social network	7(18.4)	The type and number of social relationships that people have
Social participation or engagement	15(39.5)	Activities that allow people to connect with others in the community
Social support	4(10.5)	The help, comfort, concern and care people receive from family and friends to handle problems better
Social well-being	1(2.6)	Peoples' judgement of their social relationships, how others react to them, and how they interact with social institutions and the community

n, number of times it was reported in the included articles.

visuospatial function was associated with slower gait speed,[126] completing a walking test in a longer time,[121] and failing road tests.[71]

Self-reported

Two studies reported that better visuospatial function was associated with fewer road accidents,[122,127] and one study reported that poor visuospatial function was associated with restricted driving.[128]

Memory

Performance-based

Studies reported that better memory (e.g., better scores in word recall) was associated with faster gait speed,[76,90,92,94,95,129] higher cadence,[130] longer stride length,[116] better SPPB scores,[99,131] completing TUG test in a shorter time,[42,100] greater peak velocity during the Sit-to-Stand Test,[131] longer driving distance and time,[102] and better driving scores.[34] Poor memory was associated with slower gait speed,[69] increased double support time variability,[126] lower cadence,[10] completing a walking test in a longer time,[121] and driving errors.[16,132]

Self-reported

One study reported that better memory was associated with a higher LSA scores.[114]

Language

Performance-based

Studies reported that better language skills (e.g., better verbal skill) were associated with completing walking tests,[35] TUG[46] and Chair Stand Test[52] in a shorter time, faster gait speed,[36,52,90] higher cadence,[52] increased number of steps taken,[46] longer stride length,[52] greater changes in stride-to-stride variability,[54] and better SPPB scores.[52] Poor language was associated with slower gait speed,[10,69] completing walking tests[121] and TUG[110] in a longer time, and fewer steps taken.[46]

Self-reported

Only one study reported that better language skills were associated with better scores on the Elderly Mobility Scale.[53]

Processing speed

Performance-based

Studies reported that higher processing speed was associated with faster gait speed,[52,95,96,105,129,133] higher cadence,[52,94] longer step length,[105] longer stride length,[52,94] greater number of steps during a turn,[94] reduced step time and base support distance,[105] completing walking tests,[86–88,94] TUG[88] and Chair Stand Tests[52,86,87,133] in a shorter time, better balance scores,[52,86,87,133] higher SPPB scores,[52] better ability to drive at night,[134] a fewer number of unsafe driving acts,[135] and driving safely.[103] Two studies reported that a decline in processing speed was associated with slower gait speed.[89,126]

Self-reported

Four studies reported that slower processing speed was associated with lower LSA scores,[50,114] restricted driving,[128] and more accidents.[122]

Global cognition

Performance-based

Studies reported that better global cognition (e.g., high Mini-Mental State Exam (MMSE) scores) was associated with completing walking tests in a shorter time,[136] faster gait speed,[38,52,57–59,73,92,94,95,116,133,137–140] higher cadence,[52,94] a fewer number of steps during a turn,[73,141] greater percentage changes in stride variability,[54,94] longer stride length,[38,52,116] reduced double support time and reduced stride length and single support variability,[48] better balance scores,[52,68,98,133] better SPPB scores,[52,99,136] completing TUG[68,100,141,142] and Chair Stand Tests[52,76,133,138,140] in shorter time, and fewer driving safety errors.[123,124] In contrast, poor global cognition (e.g., cognitive impairment or dementia) was associated with longer time to complete a walking test,[40] slower gait speed,[10,37,40,55,60,65] fewer steps,[74] shorter step length,[55] increased swing time variability,[55] poor SPPB scores[40,45,65] or Physical Performance Test score,[143] longer time to complete the TUG[39,65,74,110] and Chair Stand Test,[65] more likely to fail a road test,[144] unsafe driving,[43,67,145] difficulty accessing the community, avoidance of unfamiliar areas, avoidance of high-traffic roads, avoidance of left-hand turns during driving,[47] and driving errors.[16]

Self-reported

Studies reported that better global cognition was associated with greater LSA scores,[115,146,147] reduced risks of mobility disability,[24] better Motor Functional Independence Measure scores,[148] longer driving duration and distance.[146] Studies reported that poor global cognition was associated with a lower Late-Life Function Index (LLFI) score,[40,45] lower LSA scores,[149–153] increased reports of car crashes[154] and poor driving scores.[43,155] One study reported that older adults with better LSA scores at baseline had reduced cognitive decline over 5 years.[156]

Associations between psychological factors and mobility

Sixty-nine articles reported 163 analyses, of which 93 (57.0%) reported significantly positive (n = 88, 94.6%) and negative (n = 5, 5.4%) associations between psychological factors and mobility outcomes. Analyses were grouped into four groups: (a) fall-related psychological concerns[157] (fear of falling, fall-related self-efficacy, and balance confidence); (b) mental health-related factors (depression, anxiety, apathy); (c) well-being (emotional vitality/well-being, life purpose and satisfaction, affect, self-perceived fatigue); and (d) personality trait (openness, conscientiousness, extraversion, agreeableness, and neuroticism).

Fall-related psychological concerns

Performance-based

Studies reported that *fear of falling* was associated with slower gait speed,[66,158] lower cadence, delayed step time, delayed swing time,[66] faster stride velocity,[159] poor balance scores,[158] lower SPPB scores,[160,161] completing a walking test,[158] TUG,[66,158,161] and Chair Stand Tests[66] in a longer time. While low self-efficacy was associated with shorter distance walked,[14] and better self-representational efficacy and high balance confidence (measured using the Activities-specific Balance Confidence Scale) were associated with completing the TUG test in a shorter time.[162]

Self-reported

Five studies reported that fear of falling was associated with lower LSA scores,[21,50,151] mobility restriction,[163] and the use of assistive walking devices.[158]

Mental health-related factors

Performance-based

Studies reported that depression was associated with shorter walking time,[44,79,88,164] shorter distance walked,[64,78,80,165,166] slower gait speed,[17,110,129,139,167,168] reduced number of steps taken,[169] poor performance in other gait parameters (e.g., reduced step length/width, and slower stride velocity[17,170]), completing TUG test in a longer time,[85,110,166] poor balance scores,[110] driving errors,[16] and not driving at night.[134] Anxiety was associated with slower gait speed,[17,110] shorter step length, and reduced stride velocity,[17] completing 3-metre timed tandem walk[85] or TUG[110] tests in a longer time, lower SPPB scores,[171] and lower balance scores.[110] The presence of apathy was associated with slower gait speed[172] and physical performance decline in older adults <80 years.[173]

Self-reported

Studies reported that depression was associated with lower LSA score,[63,84,112–114,149,151,174] mobility disability,[24,82,83,171,175–177] car crashes[154] and restricted driving.[128] Anxiety was associated with lower LSA scores,[151] mobility limitations,[171] walking onset disability,[176] and driving errors and violations.[178]

Well-being

Performance-based

Few studies reported that good psychological wellbeing[179] and positive affect[180] were associated with better walking speed. One study reported that positive affect was associated with more walking distance.[164] Self-perceived fatigue was associated with slower gait speed and low SPPB scores.[181]

Self-reported

Three studies reported that lack of purpose in life was associated with the risk of mobility limitation;[24] higher purpose in life was associated with higher LSA scores;[182] and poor well-being was associated with driving errors.[178] Two studies reported that perception of future happiness and life satisfaction[183] and emotional vitality[184] were associated with reduced onset of mobility limitations.

Personality trait

Performance-based

Studies reported that high extroversion (very sociable) was associated with faster gait speed,[19] walking longer distances,[185] completing a walking test[186] and TUG test[141] in a shorter time. Conscientiousness (being organised and practical) was associated with completing a dual-task TUG test in a shorter time,[141] and faster walking speed at baseline,[18] and a slower decline in walking speed.[18,19]

Self-reported

Three studies reported that neuroticism (easily annoyed) was associated with increased risk of mobility disability;[24] high openness (being creative and open to new ideas) was associated with improved functional status;[177] and high extraversion was associated with high LSA scores.[182]

Association between social factors and mobility

Thirty-four articles reported 46 analyses, of which 37 (80.4%) reported significantly positive (n = 31, 83.8%) or negative (n = 6, 16.2%) associations between social factors and mobility outcomes.

Performance-based

Studies reported that increased social activity,[186] increased social interaction,[77] and increased social integration and availability of emotional and tangible social support[187] were associated with better walking outcomes in older adults. Better social well-being[179] and increased social engagement[45] were associated with better physical functioning in older adults. Living alone and reduced social networks were associated with completing the TUG test in a longer time.[188]

Self-reported

Studies reported that increased social activity,[51,84,182,189] increased social engagement,[45,190,191] better social support,[61,112,192] and increased social networks[24,182] were associated with community mobility such as self-reported walking, driving-related outcomes among older adults. Three studies reported that higher levels of social isolation[153,182] and reduced social network[193] were associated with lower LSA scores. Living alone,[194,195] low social activity participation[196–198] or engagement,[199,200] and, loneliness[175,201,202] were associated with increased reporting of mobility limitations. High social capital,[203] higher neighbourhood social cohesion (e.g., people in the neighbourhood helping each other),[204] increased social engagement,[205] and having a family member close by,[206] were associated with fewer mobility limitations among older adults.

DISCUSSION

This review is the first to comprehensively summarise the available evidence about cognitive, psychological and social factors and their associations with performance-based and self-reported mobility outcomes among older adults. These relationships between cognitive, psychological, and social factors highlight mobility's complexity in older adults. Due to age-related changes, older adults present with cognitive decline, which often leads to psychological distress and depression, further leading to social isolation and social disengagement, inherently limiting mobility.[11] We included 183 studies conducted in 27 countries that examined a wide range of cognitive, psychological, and social factors and various self-reported and performance-based mobility outcomes, which contributes to the heterogeneity of the included studies. As reported in previous reviews,[6–8,15,23] all the associations between cognitive, psychological and social factors and mobility outcomes were in the expected direction. Summarily, older adults with impaired cognition, depressive symptoms and poor social networks walked slower, had poor balance, mobility limitations, and poor driving outcomes.

Our review reveals that the association between cognitive, psychological and social factors and mobility focuses mainly on community-dwelling older adults, with limited studies conducted among hospitalised older adults or those residing in a nursing home. Cognitive impairment, depression and loneliness are predictors of mobility decline among hospitalised older adults[60,62,64] or nursing home residents,[81,150] highlighting the need for more studies to explore the association between cognitive, psychological and social factors and mobility, both on admission and discharge into hospital or a nursing home.

Across the three mobility determinants, more studies examined the association between mobility outcomes and cognitive factors, followed by psychological and then social. This pattern is not surprising since several authors theoretically explained the complementary relationship between cognition and mobility. For instance, Ferrucci *et al.*[11] argued that mobility and cognitive impairment dynamically unfold together across life, explaining why mobility decline is evident in older adults when tasks that challenge cognitive function such as dual tasks are introduced. While it is plausible that psychological factors such as depressive symptoms[207] and social factors such as social isolation[208] can be precursors for cognitive decline, it is also possible that cognitive decline can cause depressive symptoms and increased social isolation. Since mobility and cognitive decline unfold dynamically across the life course, studying if psychological factors such as depression and social factors such as reduced social networks and cognitive factors additively impact mobility will explain some of the unsolved complexity associated with mobility. Another way to explore this could include determining if any psychological and social factors moderate or change the direction/strength of the association between cognition and mobility across life courses.

Although the combined use of self-reported and performance-based mobility has been recommended,[209] only seven studies (3.8%) included in our review used both to assess older adults' mobility. The performance-based mobility measures require physical space to set up, trained assessors for effective protocol administration, and are limited to assessing older adults' mobility in standardised conditions.[210] Self-reported measures capture an individual's perceptions of mobility, meaningful activities in older adults and can be used to capture mobility of older adults such as those unwell or injured, who may temporarily lack the ability to complete a walking assessment.[209] Combining both measures have provided critical information regarding mobility in older adults that one tool may not capture. Reuben *et al.*[209] used a dataset of 5138 older adults to explore physical functioning classification when self-reported and performance-based functional assessments were combined. They reported that combining self-reported and performance-based measurements can refine prognostic information, particularly among older persons with high self-reported functioning. However, if activities of daily living dependency is present, performance-based measures do not add predictive value regarding mortality.[209] Therefore, we recommend that researchers combine self-reported and performance-based measures in assessing mobility as they complement each other and provide different information.

Consistent with the literature,[15] fall-related psychological concerns, such as fear of falling, were negatively associated with older adults' mobility outcomes. Similarly, mental health issues including depression, were negatively associated with mobility outcomes in older adults. The mechanism through which these psychological factors leads to poor mobility outcomes is complex and not completely understood. Nevertheless, some explanations of this association have been discussed among scholars. For instance, depression can cause a reduction in psychomotor functions leading to unstable gait and antidepressants are known to cause postural hypertension and reduced postural control, leading to mobility restriction.[211] These relationships are further reinforced as mobility restriction can lead to depressive symptoms[212] Enhancing the emotional well-being of older adults improves mobility outcomes because higher levels of emotional well-being promote adherence to and participation in exercise,[162] and exercise has been shown to improve mobility among older adults.[213] The combination of focused psychological strategies such as cognitive-based therapy such as motivational interviewing and exercise interventions have resulted in favourable short- and long-term effects in reducing fear of falling and improving mobility outcomes among community-dwelling older adults.[214]

Studies on the association between the five-factor model of personality and mobility outcomes were limited.[18,19,24,141,177,182,185,186] The findings that extraversion, defined as being bold and outgoing and high openness to experience are associated with better mobility outcomes are plausible. The relationship between personality traits and mobility are complex and could be explained via various mechanisms. First, an extroverted older adult tends to be friendly toward others and usually has positive emotions and attitudes characterised by social behaviours that promote better physical health.[215] Highly extroverted older adults completed the TUG test in a shorter time, but when an additional task such as subtraction by three or carrying a tray, was added, older adults took longer to complete the TUG test.[141] Dual tasks require older adults to simultaneously perform cognitive and motor tasks.[216] Typically, older adults perform poorly in a dual task situation since their motor functioning requires attentional resources. Older adults who are extroverted have active, busy and engaged lifestyles, which require additional attention. It is reasonable to argue that when such individuals perform dual tasks, they might struggle to finish on time because of several competing attentional resources. On the other hand, highly conscientious individuals completed the dual-task TUG in a shorter time.[141] Because they are organised and practical, they effectively use their attentional resources to simultaneously perform motor and cognitive tasks. This finding is reasonable as previous studies reported that highly conscientious individuals are more likely to engage in physical activity,[217] and most physical activity involves dual task-related activities. Therefore, assessing older adults' personalities when prescribing exercise or physical activity could be promising in providing targeted and personality-focused intervention to improve mobility outcomes. In addition, understanding the relationship of personality traits with mobility outcomes in older adults could assist clinicians/researchers to identify mobility outcomes that could be an indicator of intervention efficacy.

As expected, higher social engagement/participation/activity, better social support and higher social networks/interactions improve older adults' mobility, while loneliness is associated with mobility decline. Our review reiterated the vicious cycle between multiple social factors and mobility outcomes. For instance, older adults with increased social integration are more likely to engage or participate actively in social activities in the community, which invariably would increase their social network, further promoting more social participation. Older adults with more social and civic participation tend to walk or travel to participate; this civic and social participation, mainly those meaningful to older adults, has been positively associated with several outcomes such as gait speed.[218] Most social factors such as a social network and participation relating to mobility are amenable to targeted interventions, since intervening in one of the social factors, such as increased social network, could lead to social participation and potentially increase mobility. Future studies should identify which social factors (when targeted) could lead to increased mobility among older adults, allowing interventionists to allocate resources and manage target interventions.

Our scoping review has both strengths and weaknesses. Our review covered a broad range of cognitive, psychological and social factors and included performance-based and self-reported mobility outcomes among older adults. While we made considerable efforts to ensure the robustness of our search strategy, we may not have identified potentially relevant studies, especially if the article keywords were not the MeSH terms used in our search strategy. For instance, while we included common mobility outcomes related to our definitions, such as gait speed, balance, use of assistive devices, driving and transportation, using key terms related to other forms of mobility outcome measures, such as the 5-Time Sit-to-Stand Test measuring lower limb strength,[219] may have yielded more studies. Also, we may have missed articles published in other languages as we limited our search to only articles published in English. Although we did not limit our search by country, we found no studies conducted in Africa and only six studies from South American countries. Most included studies were cross-sectional, which do not explain the cause-effect relationship between cognition, psychological and social factors and mobility outcomes. More longitudinal studies are required to explore the additive effect of these factors, especially the modifiable factors, on mobility outcomes along the older adult life course.

CONCLUSION

This review found that cognitive, psychological and social factors were consistently associated with mobility outcomes in the expected direction. Summarily, older adults with impaired cognition, depressive symptoms and poor social networks walked slower, had poor balance, mobility limitations, and poor driving outcomes. Studies exploring the association between cognitive factors, personality (a psychological factor) and self-reported mobility outcomes such as walking for transportation or driving, were limited. Future studies should explore the association between social factors and performance-based mobility outcomes in older adults.

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ETHICS STATEMENT

This article is a review; therefore does not require ethics approval.

DATA AVAILABILITY STATEMENT

The data that supports the findings of this study are available in the supplementary material of this article

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SUPPORTING INFORMATION

Additional supporting information may be found in the online version of this article at the publisher's website: http://onlinelibrary.wiley.com/doi//suppinfo.

Appendix 1 Example of search strategy for cognition, psychological and social determinants conducted in CINHAL

Appendix 2A Quantitative studies that examined the association between cognitive factors and mobility outcomes (*N* = 88)

Appendix 2B Quantitative studies that examined the association between psychological factors and mobility outcomes (*N* = 37)

Appendix 2C Quantitative studies that examined the association between social factors and mobility outcomes (*N* = 24)

Appendix 2D Quantitative studies that examined the association between >1 factors and mobility outcomes (*N* = 34)

CHAPTER 3: A scoping review of personal, financial and environmental determinants of mobility among older adults.

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Preface

This chapter is one of the three manuscripts from Phase 1 of the PhD thesis that focused on identifying factors within personal, financial and environmental mobility determinants and their association with self-reported and performance-based mobility outcomes in older adults. Under the supervision of Dr V Dal Bello-Haas, I conceptualized the study, designed the study, developed research questions and search strategy, conducted the search, and participated in the title/abstract and full-text screening, extracted the data, and interpreted the findings, and wrote, revised and submitted the manuscript. Dr. M Griffin M, Dr. S Boamah S, and Dr. J Harris provided feedback on the research questions and the manuscript. The following authors participated in the title/abstract and full-text screening and data extraction of the included articles: D Rayner, for personal factors and M Zaide for financial factors; N Khattab and S Abrahim for environmental factors. The first search was conducted in November 2019 and updated in December 2021.

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A scoping review of personal, financial and environmental determinants of mobility among older adults.

Short title: Contextual determinants of mobility among older adults.

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Key words: Mobility, older adults, personal, financial and environmental factors

Abstract

Review objective

To synthesize available evidence of factors comprising the personal, financial, and environmental mobility determinants and their association with self-reported and performance-based mobility outcomes in older adults.

Methods

A scoping review of PubMed, EMBASE, PsychINFO, Web of Science, AgeLine, Allied and Complementary Medicine Database, and Cumulative Index to Nursing and Allied Health Literature databases, limiting to articles published in English, since 2000, was conducted. Using predefined inclusion and exclusion criteria, multiple reviewers independently conducted title, abstract, full-text screening and data extraction. We reported associations between factors and mobility outcomes by analyses conducted within each article rather than by article in order to account for multiple associations generated in one article. Associations were categorized as significantly positive or significantly negative.

Results

A total of 300 articles were included with 269 quantitative, 22 qualitative and 9 mixed-method articles representing personal (n = 80), and financial (n = 1), environmental (n = 98), more than 1 factor (n = 121). We identified multiple factors for each category, except financial which captured two factors: personal and household income. The 278 quantitative and mixed-method articles reported 1270 analyses; 596 (46.9%) were positively, and 220 (17.3%) were negatively associated with mobility outcomes among older adults. Personal (65.3%), financial (64.6%), and environmental factors (62.9%) were associated with mobility outcomes, mainly in the expected direction with few exceptions in environmental factors.

Conclusions

Most associations between personal, financial and environmental factors and mobility outcomes were in the expected direction. Older adults with better personal factors (e.g., advanced educational attainment) and higher income and environmental factors (e.g., better street connectivity) are more likely to have better mobility than their counterparts. Gaps exist in understanding the impact of some environmental factors (e.g., number and type of street connections) and the role of gender on older adults' walking outcomes.

Keywords: mobility, environmental factors, financial factors, personal factors, older adults

Introduction

Being mobile is crucial to well-being and independence because it is directly related to accessing fundamental needs (e.g., food, clothing, healthcare) and maintaining social and recreational participation in older adults [1,2]. Mobility is defined as the movement across various environments (e.g., room, home, outdoors, neighborhood, community, and the world) independently, using assistive devices or via transportation or driving [3]. Approximately one-third of older adults (65 years and older) report difficulty walking or climbing stairs [4]. Older persons with mobility limitations experience multifaceted issues within physical, psychological, and social domains, which compromise their ability to perform and engage in daily living and social activities; in turn this negatively affects their supportive relationships, connectedness, autonomy, and independence [5]. Mobility limitations are considered the first sign of older adults' functional decline [4] and are linked to hospitalization, frequent falls, poor cognitive functioning, muscle atrophy, frailty, and overall decreased quality of life [6].

Mobility limitation has been described using self-report, performance-based and/or objective measures of mobility outcomes (e.g., use of accelroemeters) relating to walking by self, use of assistive device, transportation or driving. For example, Simonsick et al. [7] described mobility limitation as self-reported difficulty in walking one-quarter of a mile or climbing a flight of stairs while Saino et al. [8] described mobility limitation as gait speed less than 1.2m/s, the required speed to cross the street just before the light turns red. Levasseur et al. [9] described mobility limitation as limited or no access to public transportation or constrained driving. Summarily, Rantakokko, Mänty and Rantanen [10] describe mobility limitation as self-reported difficulties in walking, performance deficits in objective mobility in real-life or in a lab., and lack of access to assistive mobility devices, transportation, or driving.

While the role of cognitive, financial, environmental, personal, physical, psychological, and social factors on mobility has been explored extensively over the years, the factors are often examined individually [3]. Webber and colleagues [3] described a comprehensive Conical Model of Theoretical Framework for Mobility in older adults, henceforth referred as the Conical Model. This model conceptualizes cognitive, psychosocial, physical, environmental, financial, and personal histories/stories as determinants of mobility across seven life space locations (bedroom, home, outdoors, neighborhood, service community, surrounding area, and the world). Within each determinant, the authors describe factors, for example physical (physical activity levels, muscle strength, endurance and power), cognitive (memory and executive function), psychological (depression, fear of falling and anxiety) social (social networks and loneliness), environmental (street characteristics and social environment), personal (age, gender, sex, marital status, ethnicity and culture). The Conical Model [3] describes the interrelation between these mobility determinants, but what is not known is the associations amongst factors and mobility outcomes. The application of this model in research and clinical practice can be challenging, as researchers and clinicians do not know which factors within each determinant play a significant role in mobility outcomes. In order to support application, we are conducting a series of scoping reviews focused on describing the association between determinant factors and mobility outcomes. One of these reviews is on environmental, financial and personal determinants of mobility and self-reported and performance-based or objective mobility outcomes relating to walking by self, use of assistive devices, transportation and driving.

Personal factors are the particular background of an individual's life comprising features that are not part of health and social conditions [11], such as age, gender, education, income. The Conical Model states that gender, culture, and biography shape older adults' experiences and mobility behaviours, serving as a crosscutting influence on other mobility determinants. However, personal factors, such as education, occupation, ethnicity, employment status, which are routinely used as indicators of older adults' health outcomes, were not emphasized in the Conical Model. Importantly, several studies reported associations between these personal factors and older adults' mobility – for instance, older adults with higher level of education have better mobility [12–21], but they have not been synthesized in a review.

The Conical Model considers financial factors distinct because of its association with mobility among older adults and its interaction with other determinants [3]. Income, typically a combination of personal income, pension, spousal, and household/family income assets, directly influence older adults' mobility [3]. Lower income in older adults is associated with decreased walking speed, increased risk of developing mobility limitations, and inability to purchase mobility aids or modes of transportation [22]. Income dictates the extent an older adult actively participates in activities away from home especially if mobility limitations related to body structure (e.g., muscle weakness) are present [3].

Environmental factors refer to all aspects of the external world of an individual's life that may impact his or her functioning [23]. They include physical characteristics [e.g., distance, temporal characteristics, light and weather conditions], and social or environmental policies and resultant services, and systems, and public attitudes. Reviews that focused on relationships between environmental factors and mobility amongst older adults exist; however, these reviews focused only on some environmental factors or mobility outcomes. For instance, Barnett et al.'s review [24] focused on the built environment and its correlates to older adults walking for transportation, while Levasseur et al.'s review [25] focused on the importance of proximity to resources, social support transport and neighbourhood security for mobility in older adults. Although Hanson et al.'s review [26] has explored the intersection between built and social environments and older adults' mobility, their review was conducted almost 20 years ago and did not cover the comprehensive definition of mobility described in the Conical Model.

Although the Webber et al.'s paper [3] provided some examples for environmental, personal, and financial determinants of mobility the list is not exhaustive. Furthermore, the associations of each factor with each determinant and with several mobility outcomes have not been explored. To date, and to the best of our knowledge, no review has provided a comprehensive description of associations amongst environmental, personal and financial factors and various aspects of mobility such as walking by self, use of assistive devices, transportation and driving. Therefore, a systematic search of the literature to identify each mobility determinant's factors, as described in the Conical Model [3] is warranted.

The purpose of this paper is to present the results of a synthesis of the available evidence for factors comprising the financial, environmental, and personal mobility determinants and their association with mobility self-reported, and performance-based (including objective measures, such as accelerometer) outcomes in older adults. The subsequent reviews will focus on older adults' cognitive, physical, psychological, and social mobility determinants.

Methods

Study design

This study is a scoping review which was guided by the five stages described in Arksey and O'Malley's [27] framework, with recommendations from Levac et al. [28] for advancing this e methodology. The Preferred Reporting Items for Systematic Reviews and Meta-Analyses extension for scoping reviews (PRISMA-Scr) was used to report results [29]. The protocol was registered with Open Science Framework: https://doi.org/10.17605/OSF.IO/7Y5VG.

Stage 1: identifying the research question

The following questions guided this scoping review: (a) what factors comprise the financial, environmental, and personal mobility determinants in older adults 60 years and older? (b) What are the associations between financial, environmental, and personal factors and mobility self-reported and performance-based outcomes in older adults 60 years and older? We define an older adult as a person who is 60 years and older [30].

Stage 2: identifying relevant studies

The research team collaboratively developed the search strategy in consultation with an experienced health science librarian. We searched PubMed, EMBASE, AMED, CINAHL, Psych INFO, Web of Science, Ageline and Sociological Abstract databases to capture studies that identified factors for financial, environmental, and personal mobility determinants among older adults. We restricted our research from January, 2000 to December, 2021, as 2000 was the projected year the impact of baby boomers on health outcomes would be evident across the world's developed regions [31]. We also hand-searched the included articles' reference lists to identify any relevant studies to be included. We conducted three different searches for financial, environmental, and personal determinants using the search terms in Table 1. We adapted MeSH terms for each database, and Booleans were used when necessary.

Stage 3: Selecting studies

All citations from each database for financial, environmental, and personal determinants reviews were exported into Rayyan QCRI© [32] and saved separately. After removing duplicates for each factor, studies were selected for each mobility determinant in two stages: title/abstract and full-text screening. Four raters independently performed a "pilot test"- title/abstract and full-text screening of the first fifty articles for each determinant using the pre-defined inclusion and exclusion criteria to determine inter-rater reliability. Light's kappa for both title/abstract and full-text screening ranged from 0.84

to 0.97, indicating a high magnitude of agreement amongst raters [33]; thus, retrieved articles were divided among the four raters for each factor. Questions, concerns, and disagreements at any stage were discussed with senior authors.

Inclusion and exclusion

Articles were included if:

(a) The study population was older adults (mean age of study sample, at least 60 years). we choose to include studies whose study mean age is at least 60 years because some longitudinal studies included participants 55+; and to accommodate the definition of older adults in developing regions (e.g., Africa - 55 years and older).

(b) The factors were (not exhaustive): financial factors (e.g., income, employment status), environment factors (e.g., social, natural, or built environment), personal factors (e.g., age, gender, race, ethnicity, beliefs, mobility-related experiences, opinions).

(c) The outcome was an indicator of mobility: (i) performance-based measure such as gait speed, the Timed Up and Go Test, Stair Climb Test, and 6-Minute Walk Test; or (ii) self-reported measure such as the Late-Life Function and Disability Instrument, the de Morton Mobility Index, Life-Space Mobility Assessment; or (iii) use of assistive mobility devices (e.g., walkers, wheelchairs, scooters); or (iv) driving or transportation.

(d) The study setting was hospital (e.g., acute care, inpatient care), community, assisted living, or long-term care facilities.

(e) The article was peer-reviewed, conducted in the quantitative, qualitative, or mixed-method paradigm, and published in English between January 2000 to December 2021.

Articles were excluded if it:

(a) was an opinion paper with no data.

(b) measured the functional decline in activities of daily living or instrumental activities of daily living without any specific measure of mobility.

(c) described physical activity or exercise (except walking) as a form of mobility. For instance, studies that used an accelerometer and reported a sum score of moderate to vigorous physical activities in minutes without reporting the activities, such as walking or stair climbing, that led to the sum score were excluded in this study.

Stage 4: Charting of data

We adopted a standardized data extraction sheet used in a previous scoping review [34] to extract data from the included studies. Reviewers that screened articles for financial, environmental, and personal factors met to discuss any overlapping articles included for each factor. A comprehensive list identifying the overlapping articles was generated. Reviewers met every two weeks to discuss and resolve any discrepancies arising during data extraction. We extracted study authors', country, purpose setting, type (qualitative, quantitative, mixed-method), design, sample characteristics (older adults with no defined conditions vs those with health condition e.g., stroke, size, mean age, and sex), financial, environmental, and personal factors included, mobility outcome(s), and results related to our review purpose.

Stage 5: Collating, summarizing, and reporting the result

We collated the results in this review based on the type of study. For the quantitative studies and the mixed-methods quantitative component, we followed Barnett et al.'s [1] study protocol and reported associations between factors and mobility outcomes by analyses conducted within each article rather than by article in order to account for multiple associations generated in one article. For example, if one article reports the association between multiple factors (e.g., age, sex, residential density) and multiple mobility outcomes (e.g., walking speed, self-reported inability to walk one mile and total walking distance/day), six distinct findings were extracted. We considered a factor negatively or positive significantly associated with mobility outcome if the article reported such factor as significant based on their p-value. Environmental factors were grouped into built, natural and social environments ([3], see Table 2 for definitions).

For the qualitative studies and the qualitative components of the mixed-method studies, we used deductive content analysis [35]. Two authors independently mapped the themes that emerged across the environmental, personal and financial factors. To support content analysis, frequent meetings occurred, and any discrepancies were discussed with the research group.

Ethical consideration

The research is a review and did not directly involve participants. Therefore, ethical approval and informed consent from participants were not needed.

Results

The results of this review are presented in three parts: study characteristics, factors within each determinant and their associations with mobility outcomes, and the qualitative findings. Of 27,293 retrieved citations we read 1422 (762 for environmental, 164 for financial and 496 for personal factors) and extracted data from 300 articles (Fig. 1). Included articles focused on personal factors only (n = 80, 27.0%), financial factors only (n = 1, 0.3%), environmental factors only (n = 98, 32.7%), and more than one factor (n = 121, 40.0%) (Fig 2).

Characteristics of the included studies

The study characteristics of the 300 articles are described in Table 3. Most of the studies were based in North American (n = 132, 44.0%), Europe (n = 89, 29.7%), and Asia (n = 42, 14.0%) with studies from the United States of America being prominent (n = 105, 35.0%).

Participants descriptions/sample size. Mean age ranged from 60.8 years [36] to 88.9 years [37] with 233 (77.7%) studies reporting more females than males and 51 studies (17.0%) more males than females. The sample size ranged from 6 [38] to 75862 [39], with 57 (19.0%) articles having more than 2500 participants.

Study Sample. The majority (n = 272, 90.7%) of the samples were older adults with no defined conditions. Twenty-eight studies (9.3%) included older adults with defined health conditions such as stroke [36,40–43], cancer [44–46], and multiple chronic conditions (e.g. osteoarthritis, diabetes, heart disease) [47–52].

Study designs. Of the 300, 269 (89.7%) were quantitative studies, 22 (7.3%) were qualitative and 9 (3.0%) were mixed-methods studies. The most frequent designs were cross-sectional (n = 175, 65.1%), longitudinal (n = 75, 27.9%), and randomized control trials (n = 12, 5.2%). For qualitative studies, the most frequent designs were descriptive (n = 8), phenomenology (n = 3), qualitative interpretative (n = 2), ethnography (n = 2), and grounded theory (n = 2). Only three of the nine mixed-method studies reported the designs (concurrent [53], explanatory [54] and integrated [55]).

Study recruitments. Most included studies recruited participants from the community (n = 278, 92.7%), with 11 (3.7%) from a hospital setting, and four from a nursing home [56–59]. Seven (2.3%) studies recruited participants from more than one setting: community and hospitals [45,60–62] or community and retirement homes [63,64] or community and lab [65].

Mobility outcomes used. Of the quantitative and mixed-method articles (n = 278), 171 (61.5%) articles assessed mobility using self-reported questionnaires only, 91 (32.7%) articles assessed mobility using performance-based measure(s) only, and 16 (5.8%) articles assessed mobility using both (see Table 2 for details).

Factors within each determinant and its association with mobility outcomes

Factors within each determinant and their definitions are found in Table 2. The 278 quantitative and mixed-method articles reported 1270 analyses; 596 (46.9%) were positively, and 220 (17.3%) were negatively associated with mobility outcomes among older adults. Only significant associations are described in this section. Non-significant associations for each included article are found in Appendix 3A (personal factors only), 3B (environmental factors only), and 3C (more than one factor). All the articles included in this section controlled some variables, depending on their analysis and study outcome. For variables controlled for each study, see Appendices 3A, 3B, and 3C.

Association between personal factors and mobility outcomes.

Two hundred articles reported 654 analyses comprising multiple personal factors; 248 (37.9%) were positively, and 179 (27.4%) were negatively associated with mobility outcomes among older adults.

Age

Of 207 analyses, 165 (79.7%) reported a significant association between performance-based (n = 82, 49.6%) and self-reported (n = 83, 50.3%) mobility measures and age.

Performance-based outcomes. Studies reported that age was negatively associated with gait speed [13,17,72–79,18,52,66–71], stride length [70,80], cadence [70], walking distances [50,81–83], number of steps/day or week [61,68,76,84–88], step height during stair climbing [89], balance [70,73,90–94], time taken to complete Sit-to-Stand test [68,73,78,79,83], and Short Physical Performance Battery (SPPB) scores [50,91,93,95–98]; and, positively associated with single or double support time [80,85], step length [16,80], and width [80], time taken to complete a walking test [19,45,104,105,81,84,91,99–103], Time Up and Go (TUG) scores [16,73,111,112,83,94,100,106–110], and gait stability ratio score [70].

Self-reported outcomes. Studies reported that age was negatively associated with the number of times walked/travelled [20,42,113–120], distance walked/travelled [39,77,78,115,117,121–125], desire to walk [39,126], driving outcomes [hours/week [63,114,127], miles driven [128,129], number of trips [114,119]], public transit use [39,114,126,130], Life Space Assessment (LSA) scores [43,73,138,105,131–137] or other self-reported mobility measures [139], - [113,140], [57], [37]), and mobility limitation [50,141,150–154,142–149]; and, positively associated with driving cessation [129], avoidance of driving at night or highway [155], recovery from mobility limitation [156,157], and increased mobility assistive device use [56,158–161].

Sex

Of 169 analyses, 107 (63.3%) reported a significant association between sex and performance-based (n = 35, 32.7%) and self-reported (n = 72, 67.3%) mobility measures.

Performance-based outcomes. Studies reported that compared to males, females had: slower gait speed [17,19,69,77,162], shorter stride length and step width/length, reduced single or double support time [80], reduced walking distances [36,50,99,103,163], increased time to complete a walking distance[44,91,104,110,164] or Chair Rise Test [45], and lower balance scores [70,91,93,165] and SPPB scores [91,93,95,166,167]. Women walked longer distances in walking tests [82,168], had higher gait stability ratios [70], and higher cadence [70,80], faster height-adjusted gait speed, longer step length and wider width [80], and faster sit-to-stand transition [84] than men.

Self-reported outcomes. Studies reported that compared to men, women had significantly reduced walking distance [115,169], time [115], and frequency [39,74,140,170–173,113,116,119,121–125], reduced use of stairs [174], and, lower driving performance score [58] and LSA scores [32,36,295,63,85,161,166,211,212,215,222]. Women were more likely than men to: be non-drivers [63] or passengers [175], never have owned a car, lack access to a car [126], have ceased driving [129,176], avoid driving at night or on a highway, have lower public transit use [39,126]. Similarly, women are more likely to: report or develop mobility limitations [5,17,154,167,177–184,56,185–188,57,76,113,148–150,153] [156,157], feel tired [189] or require help during mobility [182,189], have lower LLFDI score [139], and use a cane, walker, or wheelchair [190].

Gender: Only one study explored gender, reporting that participants endorsing the feminine role or the undifferentiated role had a higher prevalence of poor physical performance than those endorsing the masculine role [167].

Education/occupation

Of 158 analyses, 89 (56.3%) reported a significant association between performance-based (n = 29, 32.6%) and self-reported (n = 60, 67.4%) mobility measures and levels of education or occupation.

Performance-based outcomes. Studies reported that compared to those with lower education, older adults with higher education had faster gait speed [12–21], took more steps [61], walked more [20,191], completed walking tests in a shorter time [100,102,104,110,111,192–194], had higher SPPB scores [12,92,95,195,196] and performed the Chair Rise Test in a shorter time ([15,21]. Compared to older adults with skilled and non-manual occupations, older adults with manual or unskilled occupations had slower walking times [21,193].

Self-reported outcomes. Studies reported that compared to those with lower education, older adults with higher education had higher LSA scores [130,133,134,136,138], were more likely to walk within the neighbourhood [197,198] or walk for transportation [121–124,199,200] and were more likely to drive [63,130,133,136,176]. Similarly, older adults with higher education were less likely to report mobility limitations [5,17,179,181,183,184,186,187,201–204,142,205–207,147,148,150,153,154,167,178], feel tired or require help during mobility [182,189,208]; and, had reduced prevalence of assistive mobility device usage [160,190]. One study reported that older adults with less than high school had reduced mobility limitations compared to those with high school education [181]. Compared to older adults with skilled and non-manual occupations, those who had manual or unskilled occupations had slower walking time [193], lower life space scores [136,138], were more likely to report mobility limitations [148,156,178,180,184,205,209] or requiring help during mobility [189].

Ethnicity/Race/Nationality/Place of birth

Of 68 analyses, 40 (58.8%) reported a significant association between performance-based (n = 14, 35.0%) and self-reported (n = 26, 65.0%) measures and ethnicity or race.

Performance-based outcomes. Studies reported that compared to Caucasians, Native Japanese or Japanese Americans walked faster and performed the Chair Raise Test in a shorter time [210]. Mexican Americans [211] and Blacks [167] had slower gait speeds than European Americans. White older adults had greater steps per day [84], walked longer distances, completed a walking distance test in a shorter time [104,191,212], had better SPPB scores [95] and faster gait speed [18] than African Americans and Hispanics. Brazilians performed the Sit-to-Stand Test in a shorter time than Italians [213]. Southern Europeans completed TUG test faster than Eastern Europeans [214]. Spanish men and women have slower gait speeds than Canadians [76].

Self-reported outcomes. Studies reported that compared to White older adults, Hispanics and Blacks: had a lesser number of walks/day/week [39,124,215], had lower LSA scores [138,216] or lower mobility self-efficacy scores [74,130]; are more likely to: cease driving or using transportation [39,176], to report mobility limitations [226,228,279,297,298,285], or use any mobility assistive devices [149,160,190]. One study reported that White women were more likely to report mobility limitations than Black women [207]. Among the Chinese population, the Mainlanders had the most reported mobility limitations compared to the Hakka ethnic group in one study [149]; but the reverse is the case in another study – Hakka ethnic group reported more mobility limitations than the Mainlanders [142]. In another study [144], Asian older adults overall walked considerably more than White older adults; but Chinese Americans were more likely to be non-walkers compared to Japanese Americans [144]. Older adults born in Canada were more likely to report higher mobility efficacy [140] or no mobility limitation [185] than those not born in Canada. Older Israelis, compared to Arabs, reported better function [217].

Marital status

Of the 52 analyses, 26 (50.0%) reported a significant association between performance-based (n = 8, 30.8%) and self-reported mobility measures (n = 18, 69.2%) and marital status.

Performance-based outcomes. Studies reported that compared to being single, separated, or divorced, being married was associated with completing walking tests in a shorter time [101,195,196,218], higher balance scores [195,196] and higher SPPB scores [195]. One study reported that separated-divorced older adults had higher LSA scores than those married or cohabiting, or widowed [219].

Self-reported outcomes. Several studies reported that compared to being single, separated or divorced, married older adult were more likely to walk more [61,191] and report driving cessation [128,129,176,220].

Association between financial factors and mobility outcomes.

Seventy-eight articles reported 79 analyses, of which 51 (64.6%) reported a significantly positive association between mobility outcomes and income.

Performance-based outcomes. *Studies reported that* compared to older adults with low income, older adults with higher income had faster walking speed [14,17,18,221,222], walked more [82], completed walking test in a shorter time [104], and higher SPPB scores [91].

Self-reported outcomes. Studies reported that compared to older adults with low income, older adults with higher income were more likely to walk for transport [20,39,117,121,130,198], had higher LSA scores [130,135,138,215,223], more likely to be unrestricted drivers [176]; and, were less likely to: report mobility limitations [5,17,56,142,145–148,151,156,167,178,180,184,185,204–206,223–228], report being tired or requiring help during mobility [189,208], cease driving [176] or use mobility devices [160].

Association between environmental factors and mobility outcomes.

Two hundred articles reported 537 analyses comprising multiple environmental factors; 229 (42.6%) were positively, and 109 (20.3%) were negatively associated with mobility outcomes among older adults.

Built environment.

Of 423 analyses, 278 (65.7%) reported a significant association between performance (n = 66, 23.7%) or self-reported (n = 212, 76.3%) mobility outcomes and built environment.

Performance-based outcomes. Studies reported that the presence of good street [86,229,230], residential [36,41,230,231] and sidewalk characteristics [50,88,232,233]; higher walkability [61,88,234]; perceived traffic-related safety [86,235]; and, good access to recreational facilities [230] were positively associated with better walking outcomes (e.g., faster gait speed, higher step counts) in older adults. Residence type was associated with poor performance with walking outcomes, specifically, older adults residing in a nursing home had fewer steps compared to community-dwelling older adults [236]. Poor sidewalk characteristics [66,237–240]; poor general neigbourhood safety [61]; and, poor traffic-related safety [229] were associated with poor performance with walking outcomes (e.g slower gait speed, longer time taken to complete walking test).

Studies reported that presence of good streets [158], residential [158,241], and sidewalk characteristics [241]; and, better land mix-use [241] were positively associated with increased cycling frequency and time in older adults. Long-distance to a central destination and many bus stops were associated with reduced frequency and/or duration of cycling in older adults [241].

Another study reported that good streets and residential characteristics; and, availability to destinations were positively associated with better balance [242]. The residential type was associated with better physical functioning; specifically, older adults residing in a retirement village had better balance compared to community-dwelling older adults [139]; poor housing conditions were associated with lower SPPB scores [243].

Self-reported outcomes. Studies reported that the presence of good street [117,118,121,244–254], residential [113,115,123,125,172,245,246,251,255–260, and sidewalk characteristics [121,173,246,251,261–265]; higher walkability [39,118,170,185,198,266–274]; more accessible neigbourhood [271,274–277]; better land-use mix [115,118,121,123,134,172,198,200,244,248,250,253,255,278–280]; better perception of crime safety [117,173,250], traffic-related [47,117,121,173,245,254,256,258,261,264,265,281], and general safety [47,122, 124,263]; and, good access to recreational facilities [118,172,197,246,252, 261,263,280,282,283], destinations [113,116,123,172,197,261,279,283–286], rest areas [246,262,282], and public transit [172,197,199,244,250,282] were positively associated with better self-reported community walking in older adults. Shorter distance to destinations is associated with better self-reported community walking [115,122,173,198,249,253–255].

In contrast, some studies reported that good street (higher street connectivity [39,253] and density [125,247], residential (greater population density [115]) and sidewalk characteristics [200]; good access to destination (medical care services within 400m and 800m [279], the presence of bench [264]); access to public transportation [281]; many number of bike-sharing station [172] or higher bus stop density [125] or greater number of public transport stops [253] in the neighbourhood were associated with poor self-reported community walking (e.g reduced number of steps taken daily).

Poor street [256,287] and sidewalk characteristics [254,264,287]; poor perception of crime safety [200] and neighbourhood crime rates [288]; and, lack of benches [288] were associated with poor self-reported community mobility (e.g. poor LSA scores).

Compared to living in rural/semi-urban, living in metropolitan/urban areas is associated with better self-reported community walking [135,171,261,289,290]. Older adults residing in a rural area had lower LSA scores than those residing in the urban area [98]. Older adults residing in residential living had greater walking participation than those residing in the community [64], while those residing in retirement villages had lower LLFDI scores than those residing in the community [139].

Studies reported that better street and sidewalk characteristics [63]; higher walkability [291]; perceived traffic safety [63]; a greater number of services accessed by driving [289] were associated with more driving. Poor street characteristics (poor road conditions) were associated with less driving [292].

Poor street [152,223,293], and sidewalk characteristics [294]; poor land use diversity [295]; dangerous crossroads and lack of resting places [223] were associated with increased mobility limitations. Studies reported that the presence of home barriers (e.g. stairs) was associated with difficulty going outside [296,297] or increases the likelihood of walking modification [153].

Perceived neighbourhood safety was associated with the ability to walk, for instance, one block or several blocks [146], and increases the likelihood of using adaptive walking (e.g. use of walking aids or reducing gait speed) than maladaptive walking (reducing frequency of walking longer distances) [153]; and, presence of local recreational facilities [297] and access to transportation [294] was associated with less likely to develop or report walking difficulties.

High house density (residential characteristics) was associated more report of mobility limitation in one study [295] and less report of mobility limitation in another [298]. Older adults residing in rural settings are more likely to report mobility limitations than those in urban settings [178,207]. Older adults residing in a nursing home had more problems with walking [299,300] than those residing in the community [37].

Poor street [299] and sidewalk characteristics [299,300]; or store barriers [51] were barriers to use of assistive mobility devices. Good sidewalk characteristics [301] and general accessibility [302] were associated with better wheelchair skill use and/or confidence.

Older adults with environmental barriers at home [303], or lesser number of outdoor barriers [304], or residing in retirement living [160] are more likely to use mobility assistive devices compared to their counterparts. Older adults with a more challenging home environment [305] or living in crowded places [299] are less likely to use a mobility assistive device than their counterparts.

Natural environment

Of 50 analyses, 25 (50.0%) reported a significant association between performance (n = 6, 24.0%) or self-reported (n = 19, 76.0%) mobility outcomes and natural environment.

Performance-based outcomes. Studies reported that positive perception of green spaces [235] and pleasant environment [61,235]; pleasing aesthetics [273]; and warmer weather [168] was associated with better walking outcomes (e.g. better cadence, or more steps). Lack of green space [76] and higher wind speed and presence of rain [168] were associated with poor walking outcomes (e.g. reduced walking time).

Self-reported outcomes. Studies reported that the view of greenery [115,245,306]; presence of gardens [287] or parks [249,254,264,282]; aesthetically pleasing neighbourhood [117,121,123,252,261,262,281]; better-perceived climate [77] were positively associated with self-reported community walking outcomes. Studies reported that the presence of parks and green strips [287]; the presence of snow, ice or rain [254,267] were associated with poor community walking outcomes.

Studies reported that the presence of local green areas [297,307] was associated with lower odds of developing walking difficulties. A study reported that older adults residing in neighbourhoods with the least green area were more likely to have walking difficulties [308].

Studies reported that winter was associated with less driving [292], and the presence of a hill is associated with unwillingness to use a mobility device [299].

Social environment

Of 64 analyses, 35 (54.7%) reported a significant association between performance (n = 4, 11.4%) or self-reported (n = 31, 88.6%) mobility outcomes and social environment.

Performance-based outcomes. A study reported that living in high deprivation socioeconomic areas was associated with shorter walking time [191]. Similarly, the lower proportion of older adults with gait speed impairment resides in the least deprived neighbourhoods [309]. Another study reported that older adults residing in an area with an employed population and those with medium household income were associated with reduced and increased cycling frequency, respectively [125].

Self-reported outcomes. Studies reported that seeing others while walking [261], more contact with neighbours, neighbours social support and community volunteering [310]; participation in social activities and presence of personal assistance [260]; having a dog [263]; people being active [252]; greater social network scores [43]; greater social ties [137]; high social cohesion [124,144,200,257,311]; high density of place of employment in the neighbourhood [245]; higher area of socioeconomic status [197,251]; and, high social capital

[288] were positively associated with better self-reported community walking outcomes. Two articles reported that social environment (unspecified) was positively associated with better self-reported community walking outcomes [252,271].

Living alone [133,136,138,312]; lower social engagement [312]; poor social diversity [137]; high level of neighbourhood poverty [39]; greater neighbourhood social disorder [273,311,313] were negatively associated with poor self-reported community outcomes.

Studies reported that lower network diversity [226], lower social participation and living alone [224,226] were associated with increased odds of mobility limitation. The presence of social support [150]; high social cohesion [314]; and living with others [315] were associated with decreased odds of mobility limitation. Another study reported that a lower proportion of older adults with mobility difficulties resides in the least deprived neighbourhoods [17].

A study reported that older adults living alone are more likely to use a cane than those living with someone [303].

Themes from qualitative studies and qualitative component of mixed method. Articles included in the qualitative and mixed method analysis are presented in Appendix 3D and 3E. The themes from the 22 qualitative studies and qualitative components of the 9 mixed-methods studies were mapped across:(a) **built environment**: residential characteristics [316–319]; street characteristics [55,265,319–322]; side walk characteristics [38,53,54,115,317,320–324]; land use mix [319]; access to recreation services [325,326], destination [38,46,320,322,327,328], transportation [115,177,324,329,330], rest areas [320,323,331]; traffic safety [55,265,320–324,332] or general safety [38,46,53,115]; (b) **natural environment**: aesthetics [53,322,332]; the presence of green space [320,323,325,331]; and weather [265,322,332]; c) **social environment**: social contact [329,332]; social engagement [38,329]; social capital [329](Franke et al., 2019); social isolation [330,333]; social support [54]; public attitudes [321,324,330,334]; and, (d) **other themes** include loss of independence [177,324,329,330,333]; walking for wellbeing [335]; personal walking experiences [336–339] ; lack of financial resources [321]; the impact of age [321], culture, gendered identity and personal biography [335] on mobility.

Discussion

The purpose of this paper was to provide a comprehensive list of factors comprising the financial, environmental, and personal mobility determinants and their association with mobility self-reported and performance-based outcomes in older adults. We noted multiple factors for each determinant, except financial that captured only two factors: personal and household income. Personal factors included age, sex, ethnicity/race, educational, occupation, and marital status; while environmental factors included several built, natural and social environments. Congruent with past study findings, evidence from our review suggests that personal, financial and environmental factors can positively and negatively impact mobility in older adults.

Personal factors and mobility outcomes

In general, females were more likely to report mobility limitations than males [57,113,142,178,189]). Differences in self-reported mobility limitation scores have been attributed to the ways males and females interpret subjective descriptors such as 'a little' versus 'great difficulty' [340]. Possible underlying reasons for the sex differences in self-reported mobility could be attributed to societal inequalities and biological factors. In most societies, males are considered the "strong" sex and they often under-report their health problems (e.g., mobility limitation) [341]. Research has found that females seek medical advice and medical attention more often than men, and thus are more likely to report mobility limitations [342]. It is important to note, the included studies used the terms ‘sex' and 'gender' interchangeably when referring to sex. We reported the terminology and findings as how the included studies reported the terminology and findings. Researchers are encouraged to state which constructs they intend to ask in their demographic questions: gender (men, women and other variations) versus sex (male or female). Only one study specifically focused on the relationship between gender and mobility (SPPB test) and found poor physical performance is more prevalent among those endorsing the feminine or androgynous roles [167]. Gender, “refers to the socially constructed roles, behaviors, expressions and identities of girls, women, boys and gender diverse people” [343], and influences how people perceive themselves, act or interact with each other. Because there is considerable diversity in how people understand, experience, or express gender through their roles, there is a need to examine further the association between gender and mobility in the literature.

While just over half of the analyses reported a significant association between race or ethnicity and mobility outcome(s), we observed a clear pattern. Whites and Caucasians had better mobility outcomes than Blacks and Hispanics in studies conducted in the USA. The differences in mobility, especially between older adult Blacks and Whites, could be due to the accumulated exposure to adverse health events and chronic stressors across the life course [344]. Race differences in social and environmental conditions resulting from several factors, including residential locations, could account for the residual race differences in mobility [18]. For instance, Blacks and Whites frequently reside in different environments, affecting the resources and opportunities pertinent to maintaining mobility, such as safe neigbourhoods, accessible and friendly walking routes, and better housing conditions. In terms of ethnicity, older adults of Asian origin performed better in mobility outcomes than Caucasians [210]. Asian households are more often multigenerational than Caucasian households. In these multigenerational households, older Asian adults, many of whom are women, usually take up most grocery shopping and childcare responsibilities, which may entail different forms of mobility [144]. While these patterns exist, interpretation should be cautioned because the proportion of ethnic minorities is negligible in most samples included in the studies in our review. In the analyses of the included studies, many racial and ethnic groups are often lumped together and labeled as 'mixed' or 'other’. Although this form of data reduction may be beneficial for analyses of smaller groups, it undermines the examination of key differences related to diversity that may present when studying mobility differences in majority and minority racial and ethnic groups [345]. More so, researchers have continued to use race and ethnicities interchangeably. While we understand that the classification of race and ethnicity is often blurred, researchers should explicitly choose the construct to examine. Each is important in understanding health and social inequalities (differences) and inequities (disparities) related to mobility and will provide information that might be used to better the mobility needs of specific racial or ethnic minority groups [346].

Our findings support that marital status has a significant impact on mobility. Previous literature has highlighted that being married is protective against mobility limitations [347]. Marriage can provide companionship, and partners can motivate each other to engage in social and community activities that often include mobility; however, many older people are single and live alone [348], which could place them at greater risk for mobility restrictions. Therefore, asking questions about marital status when examining mobility related outcomes could help guide or direct mobility interventions. For instance, should a clinician recommend walking with spouse as a form of walking intervention or refer participation to a group walking intervention.

Socioeconomic status and mobility outcomes

Socioeconomic status (SES) is a multifactorial measure of economic status typically defined by income, education, and occupation [349]. Older adults with higher income, education, and non-manual skilled jobs had better mobility than those with lower income, education, and unskilled manual jobs. These associations may be explained by the cumulative effects of SES over the lifespan. Previous studies have reported lower childhood SES was associated with increased mobility limitations in later life [350,351]. Efforts to reduce childhood poverty are recommended to improve health outcomes, including mobility in later life. Economic resources can dictate activity options beyond the home due to cost of and access to transportation thereby restricting mobility for those with lower income [352].

Environmental factors and mobility outcomes

Consistent with existing reviews [24], better mixed land use, good street connectivity, high residential density, or a combination of these variables were positively associated with different forms of mobility, for instance, walking for transport [353], or the total amount of time older adults spend walking each day [248]. We noted in our review that when land use brings more services (e.g., more stores) and people to a neighborhood, it can either encourage older adults to walk [172] or not [354]. For instance, older adults may choose to go to a store if they have more options, while some may decide not to go because they perceive the stores will be crowded, and potentially high crime areas. This finding highlights the complexity of how land should be used in a geographical area and can depend on the preference of the older adults residing in that neighbourhood. Seeking older adults' opinions has been successful in implementing age-friendly communities [355], including how land will be used for residential, commercial and industrial purposes in a given neigbhourhood. Therefore, policymakers should seek older adults' opinions residing in an area when deciding on how residential, commercial and industrial use of land are distributed in their neighbourhood.

The association between street connectivity and self-reported walking highlighted a unique finding. Older adults tend to walk less in an area with more than eight street connections or no street connectivity, but walk more in a neighbourhood with less than eight street connections [253]. It is possible that too many street connections might confuse older adults, especially those with cognitive impairment. Some older adults live with a pervasive sense of fear of not remembering the route back home [356], and this fear may be heightened when there are too many street connections resulting in less walking. Studies that evaluated the association between numbers of street connections and mobility outcomes are limited [253], highlighting a gap in the literature. Therefore, future studies should evaluate the associations between numbers of street connections and walking outcomes, [357].

Perceived crime-related and traffic-related safety were found to be positively associated with older adults' mobility. This finding is consistent with previous reviews [1,358,359]. Crime and traffic related safety has been described as a central mechanism that bridges other environmental factors such as connectivity and access to destination to older adults' mobility decisions [359]. Even though there may be well-connected streets with access to recreational facilities and other destinations, older adults are more likely to remain at home if they perceive the neighborhood as not safe. Older adults are more likely to walk for transport, walk for leisure and access destinations, including recreation facilities, if they perceive the neighborhood as safe [1]. The qualitative themes extracted from this scoping review, such as driver recklessness, too few traffic signs, fast timed pedestrian crossings provided a contextual experience and delineate the importance older adults place on traffic safety.

Of importance in our review was the inter-related relationship of access to the destination or recreational activities and transportation on older adults' mobility outcomes. For instance, access to a destination such as shops is of great importance, as shopping is one of the most prevalent reasons for older adults to leave their homes [360]. When destinations are not within walking distance, having access to transportation will enable older adults to travel outside their homes, increasing life-space mobility protecting worse health outcomes, such as mortality, falls, frailty, and cognitive decline [361]. Overall, access to these recreational facilities will promote social connectedness and social participation, and in turn, allow older adults to maintain their mobility and reduce the risk of social isolation and loneliness [362]. Quantitative evidence that explores how many, how far and the cost to access destinations and services as they related to older adults' mobility is lacking; and, future quantitative studies should consider explicitly how accessibility issues from the older adults' perspective, e.g., not just 'what' but how many, how far, and cost influence mobility.

Natural environmental factors, including aesthetics (how appealing the environment is as related to green areas, water, and vegetation), weather, and air quality, were the least studied environmental factors, with less than half of the studies exploring these factors and older adults' mobility. This finding is not entirely surprising, as our review used a concise definition of aesthetics that focused on the natural environment and not artificial elements. Previous reviews reported positive correlations between perceived greenery and aesthetically pleasing scenery to older adults' mobility included aesthetics related to the built environment, such as the amount of litter and graffiti [359]. A clear distinction between natural environmental factors, such as access to green space and water versus artificial beautification of environment should be made when studying the impact on mobility, as findings may vary providing different information to inform policies. Future researchers are encouraged to make this distinction.

Although the number of studies that reported on the social environment and mobility has increased from 19 articles in the 2012 Hanson and colleagues' review [26] to 62 articles included in this scoping review, just over half (54.5%) of the analyses reported a significant association in the expected direction. Previous reviews reported the positive role of social support from neighborhoods and families [26] and social participation [9] influencing walking among older adults. We found that most articles that reported a significant association between social environment on older adults' mobility focused on neighborhood walking, including walking for transportation, while those that reported no association focused on performance-based mobility outcomes (e.g., 3-Meter Walk Test). The plausible explanation for this finding could be because most performance-based measures are often administered in a supervised and controlled environment which may not reflect mobility performance in daily life [363]. Conversely, self-reported mobility measures reflect individuals' perceived difficulty in performing mobility-related activities [142]; evidence has shown that social interaction attenuates difficulty in performing mobility-related activities[9]. Besides, walking for transportation or recreation provides an opportunity for older adults to interact and connect with people in the community, enabling them to participate actively, which in turn, motivates them to get out of their homes maintaining mobility [329]. Since older adults might participate when activities are meaningful to them [364], the impact of engaging in social activities should not be underestimated. Continuous effort to encourage meaningful activities that promote socialization and interaction among older adults is needed to maintain their mobility.

Our review provided a comprehensive list of contextual factors (environmental, financial, and personal factors) described as determinants of mobility in the Conical model of the theoretical framework for mobility in older adults [3]. This comprehensive list has both research, clinical, and policy implications. Our review provided factors for each mobility determinant that clinician-researchers can use as a foundation to develop a comprehensive mobility-related assessments or interventions for specific older adult populations (e.g., post-hip fracture) and specific clinical settings (e.g., hospital-to-home transitions). For instance, researchers can conduct a Delphi process to reach a consensus on critical factors to assess when older adults are discharged from hospital-to-home. Clinicians might use the comprehensive list of factors as a guide to asking older adults who were hip fracture survivors to describe which mobility factors are vital to evaluate during their hospital visits.

While this review aims to be comprehensive, there are some limitations. We may have missed some articles relevant to our study aim because we searched only peer-reviewed literature published in English. Synthesis of articles published in different languages could expand our understanding of the impact of culture and ethnicity on mobility outcomes. Moreover, about two-thirds of the quantitative studies included in this review were cross-sectional design which does not explain the cause-effect relationships between environmental, financial, and personal factors and mobility outcomes among older adults. There is need for more longitudinal studies that would allow systematic analysis of several studies to understand long-term variations of personal, environmental and financial factors in mobility. Examining quality is optional for scoping reviews [29]. Caution should be applied when interpreting the findings of this review since we did not examine the quality of the included studies.

Conclusion

From the review, we identify multiple factors for each category, except financial that captured only two factors: personal and household income. Personal factors included age, sex, gender, ethnicity, race, educational level, occupation, marital status and religion, while environmental factors included several built, natural and social environments. Personal (65.2%), financial (64.6%), and environmental factors (62.9%) were associated with mobility outcomes, mainly in the expected direction with few exceptions in environmental factors (street connectivity and access to bus stops and benches) and ethnic groups (Japanese or Chinese Americans had better mobility outcomes than White Americans and African Americans).

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Online supplementary Appendices are place at the end of the thesis.

Appendix 3A: Details of included quantitative studies details for personal factors and mobility

Appendix 3B: Details of included quantitative studies details for environmental factors and mobility

Appendix 3C: Details of included quantitative studies with personal, environmental and financial factors and mobility

Appendix 3D: Details of included qualitative studies for personal, environmental and financial factors

Appendix 3E: Details of included mixed-method studies for personal, environmental and financial factors

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Table 1: Keywords adapted for each database.

Determinants	Mobility	Older adults
Financial	mobility limitations, OR life space measures OR mobility OR walking OR ability level OR physical mobility OR movement OR gait OR Time up and Go OR physical functioning OR, six minutes' walk test OR Berg Scale OR Short physical performance battery OR Transportation OR travel OR driving OR safety OR	Elderly OR geriatric OR aging OR older people* OR older person* OR retiree OR aged OR gerontology OR older adult*
Income OR socioeconomic status OR socioeconomic factors OR education OR occupation OR employment status		
Environmental		
Physical characteristic* OR climate* OR natural OR landscape OR settings OR surrounding* OR geographic OR terrain OR architectural barriers OR Social polic* OR Accessibility issue* OR attitudinal barriers OR environment design, built environment OR social environment OR neighbo*rhoods OR residence characteristics OR parks OR environment OR open space OR Safety OR aesthetics OR greenness OR walkability		
Personal		

Culture OR ethnicity OR traditions OR customs OR nationality OR race OR gender OR sex OR female OR transgender OR views OR beliefs OR perceptions OR mindset OR opinion OR life experiences OR biography OR past experiences OR life goals OR personal goals OR ambition OR life purpose OR religion OR faith OR worldview OR spirituality OR education OR occupation	crashes OR accident OR road test OR Walking aid OR ambulation aids OR assistive devices OR wheelchair* OR scooter* OR cane* OR crutches* OR prosthetic devices OR orthotic devices OR walker	

Table 2: Factors identified for each determinant and their descriptions

Factors	n (%) of articles that studies each factor	Factor Description
Environmental factors (n=743)		
Built environments are artificial structures, features, facilities, and layouts of a community where people live and work		
Street characteristics	77(10.4)	How streets look, how well the streets are connected to one another and where the streetlights are located
Residential characteristics	99(13.3)	The number of people, houses, public parks in an area, and the location of houses.
Land use mix	47(6.3)	How land is used within a community, for example, how much land is used for homes, shops, and offices.
Sidewalk characteristics	101(13.6)	How the sidewalks look, for example, are there any cracks or bumps; how big the sidewalks are, how close the sidewalks are to the road.
Crime-related safety	39(5.2)	How safe the community is based on the number of people around and how unfriendly or friendly people are.

Traffic-related safety	59(7.9)	How safe it is to cross the roads in the community, based on crosswalks, stop signs, stoplights and the timing of stoplights, and the speed limit for cars.
Access to recreational facilities	36(4.8)	How many community fitness or recreation centers are close by, how much does it cost to attend, and how easy it is to get there, such as how far it is to walk, take public transit, or drive.
Access to destination	71(9.6)	How many shops, services, senior centers that are close by, how much does it cost to attend the senior centers, how we can get there, and how far it is to walk, take public transit, or drive.
Access to rest areas	12(1.6)	How many rest areas such as benches or public washrooms are there in the community, and how much does it cost to use.
Access to public transit	30(4.0)	How easy it is to take public transit, including how many routes, how far away from bus stops are, and a ticket's cost.
Natural Environment is defined as open outdoor spaces that allow the individual to be surrounded by the elements of nature (trees, plants, grass, mountains, water) and environmental conditions (weather and air quality) (Calogiuri & Chroni, 2014).		
Natural scenery /Aesthetics	54(7.3)	Refers to green open areas, water, trees, flowers and trails in the community.
Weather	15(2.0)	Refers to temperatures, seasons (e.g., summer/winter conditions), and wind
Environmental quality	2(0.3)	Refers to air quality (air pollution)
The social environments are social relationship and cultural milieus within which defined groups of people functions and interactions		
Social factors	51(6.9)	The number of people we know and how we interact with people in the community include but are not limited to social contacts, social ties, social interactions, formal community engagement within your community.
Social cohesion	17(2.3)	How strong relationships are in the community that makes them provide help and support to each other, for example, if someone returns a lost item or gives a stranger direction.
Social capital	8(1.1)	Shared resources that allow people to act together.
Social disorder	5(0.7)	Can include noise, loud music, and other minor violations of "social norms" that may encourage people to socialize and/or become a nuisance to others.
Financial factors		
Financial factors are typically income and often the combination of personal, household and family income (n=73)		
Income	73(100)	Personal income is defined as the total amount of money a person receives from all sources (e.g., work salary, government benefits, investments).
		Household income is defined as the total amount of money all people who are related and unrelated, who are 16 years or older, living in the same house receive.
		Family income is defined as the total amount of money all people who are related by birth, marriage,

		or adoption, who are 16 years or older, living in the same house receive.
Personal factors		
Personal determinants were defined as the particular background of an individual's life and living and comprise features of the individual that are not part of health and social conditions (n=538)		
Age	156(29.0)	The number of years a person has lived
Sex	137(25.4)	The sex (male or female) at birth and on the birth certificate.
Ethnicity	11(2.0)	How a group of people identify based on their family origins and their culture and cultural traditions such as Arab, French, Caribbean, African
Race	44(8.2)	How a group of people identify based on their skin color, facial shape, and hair (e.g., White/Caucasian, Brown, Black).
Educational level	112(20.8)	The number of years of schooling one has had
Occupation	21(3.9)	This can be a job, business, profession, or employment that an individual manages to earn money
Marital status	48(8.9)	A person's state of being single, married, separated, divorced, or widowed.
Culture	2 (-)	The way of life of groups of people including their customs, activities, beliefs, and values
Gender	1 (-)	how society thinks men and women should act and what they should do.
Nationality/birthplace	3 (-)	
Religion	4 (-)	

n - number of times it was reported in the included articles
Note: Some studies did not state specifically which environmental factors that they study, rather they asked question about environmental facilitators and barriers. The lay descriptions were derived from combinations of descriptions from the included studies.
non-specific environmental factors (n=20) included perceived or general environmental facilitators (n=3) or barriers (n=5), social environment facilitators/barriers (n=3), physical environment facilitators/barriers (n=8), and ageism (social attitude) (n=1).

Table 3 Characteristics of the included articles (n = 299)*

Characteristics	Environmental factors (n = 98) **n (%)**	Personal factors (n = 80) **n (%)**	>more than factors (n = 121) **n (%)**
Sex			
• >Female	74(75.5)	65(81.3)	95(78.5)
• <Female	18(18.4)	10(12.5)	22(18.2)
• Female = Male	2(2.0)	1(1.2)	-
• Not reported	4(4.1)	4(5.0)	4(3.3)
Geographical area: Continent			
• Africa	-	1(1.2)	1(0.8)
• Asia	9(9.2)	13(16.2)	20(16.5)
• Europe	32(32.7)	24(30.0)	33(27.3)
• North America	46(46.9)	29(36.3)	56(46.3)
• Oceania	5(5.1)	2(2.5)	4(3.3)
• South America	4(4.1)	5(6.3)	6(5.0)
• > one continent	2(2.0)	6(7.5)	1(0.8)
Study design			
• Cross-sectional	63(64.3)	53(66.3)	58(47.9)
• Longitudinal	7(7.1)	21(26.2)	48(39.7)
• Case-Control	2(2.1)	-	-
• Quasi-experimental	1(1.0)	3(3.8)	-
• Randomized Control Trials	3(3.1)	2(2.5)	7(5.8)
• Qualitative studies	16(16.3)	1(1.2)	4(3.3)
• Mixed method	5(5.1)	-	4(3.3)
• Not reported	1(1.0)	-	-
Participants recruited from			
• Community	91(92.9)	68(85.0)	113(93.4)
• Hospital	1(1.0)	5(6.3)	5(4.1)
• Long term care	-	4(5.0)	-
• Laboratory	4(4.1)	1(1.2)	-
• Mixed	2(2.0)	2(2.5)	3(2.5)
Population of study			
• Defined health conditions (e.g., stroke, Alzheimer's)	12(12.2)	9(11.3)	7(5.8)
• No defined health conditions	86(87.8)	71(88.7)	114(94.2)
Sample size (n)			
• ≤ 100	34(34.7)	22(27.5)	11(9.1)
• $101-300$	13(13.3)	20(25.0)	21(17.4)
• 301-500	11(11.2)	6(7.5)	10(8.3)
• 501-1000	14(14.3)	6(7.5)	22(18.2)
• 1001-2500	18(18.4)	17(21.3)	17(14.0)
• >2500	8(8.1)	9(11.2)	40(33.0)
#Mobility outcome	(n=136)	(n=144)	(n=172)
Performance-based outcome			
Walking outcomes			
• Time	5(3.7)	13(9.0)	7(4.1)
• Distance	1(0.8)	8(5.5)	3(1.7)

• Speed	9(6.6)	22(15.3)	9(5.2)
• Steps	4(2.9)	3(2.1)	6(3.5)
• Other gait parameters	22(16.2)	11(7.6)	4(2.3)
General mobility	4(2.9)	1(0.7)	2(1.2)
Balance	2(1.5)	6 (4.2)	5 (2.9)
Physical functioning			
• Short Physical Performance Battery scores	2(1.5)	10(6.9)	4(2.3)
• Time Up and Go Test scores	4(2.9)	13(9.0)	3(1.7)
• Other physical functioning tests	-	15(10.4)	5(2.9)
Self-reported outcome			
Community mobility			
• Walking	30(22.1)	4(2.8)	32(18.6)
• Active transport	28(20.6)	-	22(12.8)
• Non-active transport	2(1.5)	5(3.5)	2(1.2)
• Life Space Assessment scores	-	3(2.1)	13(7.6)
• Other self-reported mobility questionnaires	6(4.4)	4(2.8)	12(7.0)
• Driving related outcomes	4(2.9)	14(9.7)	5(2.9)
Mobility limitation	4(2.9)	7(4.9)	34(19.8)
Use/difficulty in using mobility assistive devices	9(6.6)	5(3.5)	4(2.3)

*We included 300 articles, the table shows only 299 articles, one qualitative article focused on a financial factor (Franke et al., 2019).
#only quantitative or mixed method studies in which quantitative data could be extracted. Some studies assessed older adults' mobility using more than one mobility measure.
Performance-based mobility outcome: Walking time defined as time taken to complete 3, 5, 6 or 30-Meter Walk Tests; ***Walking distance*** defined as distanced walked within 6 or 2- Minutes' Walk Tests; ***Other gait parameters*** included stride length, cadence, single/double support time, walk ratio, gait variability; ***General mobility*** included the number of trips in the community, cycling (frequency and time), observed driving ability; ***Balance tests*** included Berg Balance Test, Tandem Tests, Stance Test, BEStest; ***Other physical functioning tests*** included Sit-to-Stand Test, Stair Climbing Test.
Self-reported mobility outcomes: Self-reported *walking* included the distance walked, number of times walked (seconds or minutes, per week/month), neighbourhood walking, waking preference, self-reported walking speed, self-reported walking capabilities, number of days outdoors (unspecified of any means); ***Active transportation*** included self-reported walking/cycling for transportation or recreation; ***non-active* transportation** included self-reported use of transportation; ***Other self-reported mobility*** measures included Mobility Help and Tiredness Scale, mobility domain of the Stroke Impact Scale, Mobility Efficacy Scale, Rivermead Mobility Index, EuroQol-five-Dimension Scale - mobility domain, and Late Life Function and Disability Instrument; ***Driving related outcomes*** included driving performance (ability or inability), access to car, driving duration & frequency, driving distance, preference to be driver vs passengers; ***Mobility limitation*** defined as self-reported inability on all or either of the following: walking up and down a flight of stairs (10 steps) or several flights of stairs, walking a mile (1600meter) or half a mile (800meter) or a quarter mile or a block (400meter) or 100-300meter, or across the room and running/jogging for 20-30 minutes; ***The mobility assistive devices*** included scooter, powered and manual wheelchairs, walking aids (cane, walker, crutches).

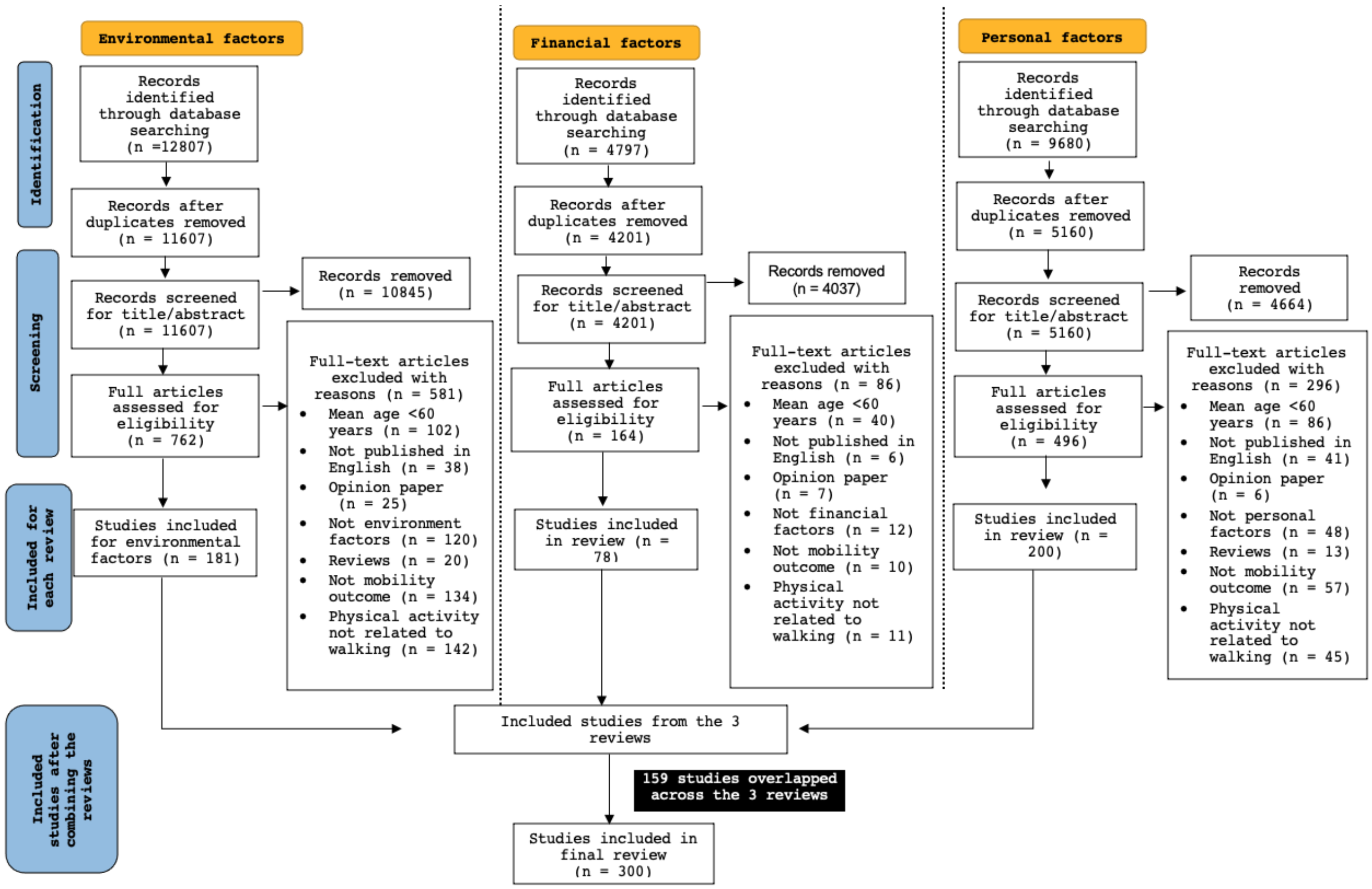

Figure 1: Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) flow chart of the scoping reviews

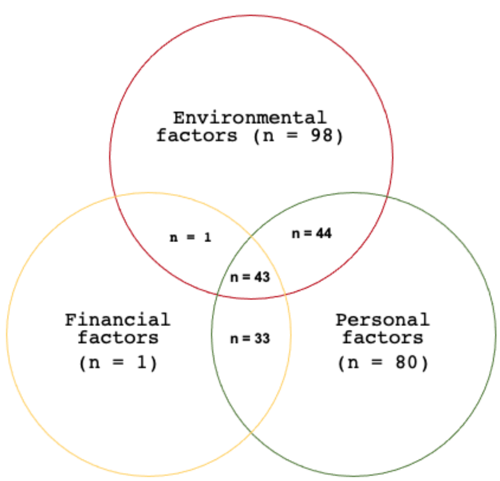

Figure 2: Venn diagram showing the articles distribution across the three mobility determinants (n = 300)

CHAPTER 4: Physical mobility determinants among older adults: a scoping review of self-reported and performance-based measures.

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Note: The format differs from the published version.

Preface

This chapter is one of the three manuscripts from Phase 1 of the PhD thesis that focused on identifying factors within physical mobility determinants and their association with self-reported and performance-based mobility outcomes in older adults. Under the supervision of Dr. V Dal Bello-Haas, I conceptualized the study, designed the study, developed research questions and search strategy, conducted the search, and participated in the title/abstract and full-text screening, extracted the data, and interpreted the findings, wrote, revised and submitted the manuscript. Dr. M Griffin, Dr. S Boamah, and Dr. J Harris provided feedback on the research questions and the manuscript. C Goodin, JW Song, J Smal and N Budd, participated in the title/abstract and full-text screening and data extraction of the included articles for the first search conducted in November 2019. D Rayner, M Zaide, N Khattab and V Bhatt participated in the title/abstract and full-text screen and data extraction of the included articles for the update search in December 2021.

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Physical mobility determinants among older adults: a scoping review of self-reported and performance-based measures.

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Abstract

Objective: To synthesize the available evidence on physical factors, such as muscle strength and power, body mass index and their association with older adults' self-reported and performance-based mobility outcomes.

Method: This review followed the *Askey and O'Malley* Framework. We systematically searched PubMed, EMBASE, PsychINFO, Web of Science, AgeLine, Allied and Complementary Medicine Database, and Cumulative Index to Nursing and Allied Health Literature databases, from Jan. 2000 to Jan. 2022. Teams of two reviewers independently conducted title, abstract, full-text screening, and data extraction using predefined inclusion and exclusion criteria.

Result: A total of 239 quantitative articles, mostly cross-sectional design, conducted in 32 countries were included in this review. We identified 18 physical factors significantly associated with mobility outcomes in the expected direction. Muscle strength, body composition, falls (number and history of), and chronic conditions (number of and type) were the most studied physical factors.

Conclusion: Older adults with muscle weakness, weight concerns, history of falls, and chronic conditions had poorer mobility outcomes, such as slower gait speed, poor balance, limited community mobility and poor driving outcomes compared to their counterparts. Studies exploring the role of physical factors on the use of an assisted device, transportation, or driving, are limited.

Keywords: Mobility, Physical factors, Older Adults, Ageing, Movement

Data availability statement: The data associated with this study is presented in the paper and as Appendix (placed at the end of the thesis).

Appendix 4A: Details of the included articles

INTRODUCTION

Mobility has been described as a hallmark of healthy ageing [1,2]. Mobility, defined as the ability to move from one place to another by one's self or with the use of assistive devices, or via transportation or driving, is fundamental for meaningful social interactions and community participation [3]. Ageing-associated changes in sensory, cognitive and various physical structures (e.g., muscle) can pose threats to older adults' mobility [4]. Mobility limitations have been described as self-reported difficulties in walking, performance deficits in objective mobility, and lack of access to assistive mobility devices, transportation, or driving [5]. Mobility limitations increase the risk of disability, falls, hospitalization, mortality and decreased quality of life [1]. Older adults with mobility limitations often require assistance with their activities of daily living, leading to additional healthcare costs. For instance, Hardy et al. [6] reported that the total annual healthcare cost was $2773 higher in older adults reporting difficulty walking one-quarter a mile as compared to those with no difficulty. This increase in healthcare costs associated with mobility limitations warrants the need to explore the factors associated with mobility among the ageing population.

Factors influencing mobility are often multifactorial. Webber et al. [3], in the Conical Model of Theoretical Framework for Mobility in Older Adults (henceforth referred to as the Conical Model), described mobility determinants to include cognitive, environmental, financial, personal, physical, psychological, and social factors. The Conical Model provides a holistic perspective on the relationship between these mobility determinants and recognizes that these determinants will have different levels of relevance depending on the older individual's living situation and capacities to navigate the seven mobility zones - the room where one sleeps, the home, the outdoor areas surrounding the home, the neighbourhood, the area in the community, within one's country and the world. For instance, mobility becomes more complex as one moves away from home and neighborhood, making it difficult for older adults to go out and visit with friends and family or continue doing their activities independently. The Conical Model describes the interrelationship between mobility determinants and how they compound the complexity of mobility but does not indicate how each factor within each determinant influences mobility, making it difficult for researchers and clinicians to use this model to improve mobility in older adults as they move away from their home. To assess the usefulness and increase the practical use of this model, we conducted a series of scoping reviews for each determinant to identify factors within each determinant and describe their associations with mobility outcomes. This paper focuses on the physical mobility determinants in older adults.

Physical factors, such as muscle strength and power, proprioception, range of motion, balance, and comorbidity, have been found to influence older adults' mobility [7]. Several studies have shown that age-related physical changes, such as reduced muscle strength and power, impact mobility [7,8]. For example, after age 40 years, people typically lose 8 percent or more of their muscle mass each decade, a process that accelerates significantly after age 70 [9]. Sensory impairments, such as visual or hearing impairment and a sedentary lifestyle in older adults, can contribute to the decline in mobility [10]. Further, the severity of the mobility decline is compounded when more than one physical determinant is impaired [11]. Age-related physical changes are early indicators of mobility limitations. Although the age-related physical changes can be easily identified and defined by clinicians and researchers, how these physical factors interact individually or in combination to influence mobility is complex and multifactorial, highlighting the need to describe the associations between physical factors and mobility in older adults.

Reviews exploring the associations between physical factors and mobility outcomes among older adults are limited; most reviews report the risk factors for self-reported mobility limitations in older adults. While Yeom and colleagues [12] used the social-ecological model to describe risk factors for mobility limitations in older adults, Frieberger et al. [1] described physical age-related changes as risk factors for mobility decline. Both reviews reported some physical factors, including obesity, physical activity, muscle strength, and power, as risk factors for mobility decline, but their reviews are narrative rather than systematic. A systematic review of the literature has been published [13]; however, it focused on the association between self-reported risk factors and self-reported mobility limitations. While these reviews have highlighted the risk factors for self-reported mobility decline in older adults, not all physical factors or mobility outcomes (e.g., gait speed, balance, use of assistive devices, driving and transportation) were included.

The combined use of self-reported and performance-based mobility assessment has been recommended because each measure assesses different aspects of older adults' physical functioning [14], providing unique and critical information, and ultimately complementing each other. For instance, while self-reported measures capture an individual's perceptions of mobility, performance-based measures capture an individual's real-time mobility ability [15]. No systematic literature review has examined all physical factors on self-reported and performance-based mobility outcomes in older adults (60 years and older). Our review fills this gap by systematically and comprehensively describing the association between each physical factor and mobility outcomes in older adults. This review, alongside our previous reviews on the associations between self-reported and performance-based mobility outcomes, and environmental, personal, and financial factors [16]; and cognitive, psychological, and social factors [17], is needed to advance the use of the Conical Model [3] in clinical and research practice. This paper aims to synthesize the available evidence on physical determinants of the Conical Model and their association with self-reported and performance-based mobility outcomes in older adults.

METHODS

This scoping review was guided by the methodological framework proposed by Arksey and O'Malley [18] and Levac et al. [19]. This methodology is appropriate because physical factors influencing mobility are complex and heterogeneous; exploring the extent, range, and nature of available research on the associations between physical factors and self-reported and performance-based mobility outcomes in older adults will enable us to identify research gaps in the literature [20]. Preferred Reporting Items for Systematic Reviews and Meta-Analyses extension for scoping reviews (PRISMA-Scr) guided the reporting of this scoping review [21]. The protocol was registered with the Open Science Framework: https://doi.org/10.17605/OSF.IO/7Y5VG.

Step 1: Identifying the research questions

The two research questions of this scoping review are: (a) what is the available evidence for the physical factors related to mobility in older adults (60 years and older); and (b) what are the associations between physical factors and mobility self-reported and performance-based outcomes in older adults 60 years and older? We followed Webber et al.'s [3] definition of mobility: the ability to move from one place to another either independently or with assistance including mobility aids (e.g., cane, wheelchair, walkers) and use various modes of transportation (e.g., car, bus, bicycle). We defined an older adult as a person who is 60 years and older [22]. Based on the literature, we defined physical mobility determinants as those physiological functions of the body systems, including the musculoskeletal system, respiratory system, cardiovascular system, nervous and sensory system, as well as other physical factors (e.g., physical activity and exercise levels), and body composition.

Step 2: Identification of relevant studies

We developed the search strategy in consultation with a health science librarian. Broadly, our search concepts include physical factors (e.g., muscle strength, muscle power, number of falls, physical activity levels), mobility outcomes (self-reported - e.g., mobility limitations, life-space mobility and performance-based - e.g., gait speed, balance, lower limb function test) and older adults (e.g., ag*ing, older people). See https://doi.org/10.17605/OSF.IO/7Y5VG for a complete search strategy. Seven databases (PubMed, EMBASE, AMED, CINAHL, Psych INFO, Web of Science, and AgeLine) were searched from January 2000 to January 2022; the year 2000 was chosen because the impact of baby boomers on health outcomes would be most prominent across the developed countries [23]. We hand searched the reference lists for additional articles that met our inclusion criteria were included.

Step 3: Study selection

Retrieved citations were exported from each database and imported into Rayyan QCRI© [24], and duplicates were removed. We selected studies in two stages: title/abstract and full-text screening, using the inclusion and exclusion criteria in Box 1. Four raters independently performed a pilot of the title and abstract screening of the first 100 articles to determine inter-rater reliability. The Kappa agreement was 0.74, indicating moderate agreement [25]; based on this, we conducted the title and abstract screening in pairs and resolved any conflicts during research meetings. Similarly, a pilot full-text screening was conducted independently by all four raters, and the Kappa agreement was 0.98, indicating a high magnitude of agreement [25]. Therefore, full-text screening was divided evenly between the four raters. Disagreements were resolved in research meetings and discussions with the senior authors.

Step 4: Charting the data

We adapted a data extraction sheet from a previous review [26], pilot-tested and refined it based on the feedback during a research meeting. We extracted the following information: authors' name, the country in which the study was conducted, study aim(s)/research question(s)/hypothesis or hypotheses, the setting where participants were recruited, type of study (qualitative, quantitative, mixed-method), study design, study population (older adults with no defined conditions and those with a health condition, e.g., stroke), sample size, participants' mean age and sex distribution, physical factors being studied, type of mobility outcome used, and study findings related to our review questions.

Step 5: Collecting, summarizing and reporting the result

We first listed and described all the physical factors being studied from the included studies. Second, we reported the associations between each physical factor and the mobility outcomes. Specifically, we presented the associations per analysis rather than per article because it enabled us to describe the association distinctly, as one article may report multiple associations between different physical factors and outcomes. For instance, one article reported the association between multiple physical factors (Body Mass Index, number of chronic conditions and muscle strength) and multiple mobility outcomes (walking distance, walking speed, self-reported inability to walk quarter a mile); thus, nine distinct findings were extracted. This type of reporting allowed us to understand the distinct associations between physical factors and mobility outcomes at a granular level. We considered whether a factor negatively or positive significantly associated with mobility outcome if the article reported such factor as significant based on their p-value.

RESULT

A total of 12,679 citations were identified through the database searches. After removing duplicates, 9786 underwent title and abstract screening, excluding 9219. The remaining 567 articles underwent full-text screening, and 239 articles were included in this review (FIG 1).

Characteristics of the included studies.

Table 1 presents the main characteristics of the included studies. Studies were conducted in 32 countries on five continents, including Asia, Australia, Europe, North and South America. Close to half of the articles (n = 108, 45.2%) were conducted in North America, primarily in the United States of America (n = 97, 40.6%) and Canada (n = 11, 4.6%). All were quantitative studies; close to three-quarters (n = 175) were cross-sectional studies, and 207 (86.7%) recruited participants from the community. The mean age of the participants in the included articles ranged from 60 [27] to 93.1 [28] years. Sample sizes varied considerably, ranging from 13 [29] to 164,597 [30].

Of the 239 articles, 175 (73.2%) articles assessed mobility using performance-based measures only, 42 (17.6%) articles assessed mobility using self-reported measures, and 22 (9.2%) articles assessed mobility using both (See Table 1 for details).

Association between physical factors and mobility outcomes.

Eighteen physical factors were identified, and the most studied was muscle strength (n = 84, 19.4%), followed by body composition (e.g., Body Mass Index; n = 83, 19.2%), chronic conditions (number and type; n = 45 (10.4%) and falls (number and history of falls; n = 44, 10.2%) (See Table 2). Only significant associations are described in this section. The non-significant associations, including p-values, odds ratios, hazard ratios, prevalence ratios, and correlations for each included article, and specific physical factors are found in Appendix 4A.

Musculoskeletal System-related Factors.

Muscle strength. Performance-based: Studies reported that increased muscle strength (e.g., measured as lower limb strength using dynamometer) was associated with increased number of daily steps [31,32], faster gait speed [33–52], higher cadence [46], longer step [34], and stride lengths [49], longer swing time [49], reduced double support time [53], higher Short Performance Physical Battery (SPPB) scores [33,54–57], better balance scores [33,40,46,53,57–60], walking longer distance in timed walk tests (e.g., Six-Minute Walk Test (6MWT) - [38,41,50,56,60–68] or distance walked as measured by Global Position System [32]); and, completing walking tests (e.g., 4meter Walk Test (4MWT) - [27,50,58,69–72]), the Time-Up and Go (TUG) test [27,50,78–80,60,67,71,73–77], the Stair Climbing Test (SCT) [33,39,74,81,82], and the Chair Stand Test (CST) [33,44,45,59,60,70,80,81,83,84] in less time. Muscle weakness was associated with slower gait speed [85–88], poor balance scores [86,89,90], lower SPPB scores [86,91], taking longer to complete walking tests [92] and the CST [86,93]. **Self-reported:** Studies reported that increased lower limb muscle strength was associated with better Late-Life Function and Disability Instrument (LLFDI) scores [33,56,94], better Life-Space Assessment (LSA) scores [95,96], better De Morton Mobility Index scores [97], and a lower incident of mobility limitation [43]. Muscle weakness was associated with lower LLFDI score [98], increased risk of mobility limitations [88,99–105], and the increased use of an assistive device [106].

Muscle power. Performance-based: Studies reported that increased lower limb muscle power (measured for example, using Nottingham Power Rig [107] or double leg press occurred between 56-78% of the one-repetition maximum [108]) was associated with an increased number of daily steps [109], faster gait speed [37,81,109–113], longer stride length [111], higher SPPB scores [54,56,110,113,114], walking longer distance on a 6MWT [56], completing walking tests (e.g., 4MWT - [112,114,115], the SCT [112,114,116,117], the TUG test [115], and the CST [33,81,112,117] in less time. Reduced muscle power was associated with taking longer time to complete the TUG test [118]. **Self-reported:** Two studies reported that increased muscle power was associated with better LLFDI scores [33] and reduced risk of mobility disability [119]; one study reported that reduced muscle power predicted a greater likelihood of a decline in mobility function, as measured by LLFDI scores [98].

Muscle endurance. Performance-based: Studies reported that increased muscle endurance (e.g., Truck Muscle Endurance Test [120]) was associated with faster gait speed [59], better balance scores [57,59], higher SPPB scores [57], walking longer distance on a 6MWT [66], completing the CST [59] and the TUG test [78] in less time. Reduced muscle endurance was associated with taking longer to complete the TUG test [118]. **Self-reported:** Studies reported that increased muscle endurance was associated with better LLFDI scores [33,94] and better lower extremity function [59]. One study reported that reduced muscle endurance predicted a decline in mobility function as measured by LLFDI scores [118].

Muscle coordination. Performance-based: Studies reported that better muscle coordination test scores (e.g Heel-to-Shin Test [59]) were associated with faster gait speed [121] and completing the CST [59] in less time. Poor muscle coordinator test scores were associated with slower gait speed, lower SPPB scores, poor balance scores, and taking longer to complete the CST [122]. We found no study reporting the association between muscle coordination and self-reported mobility outcomes.

Range of Motion (ROM). Performance-based: Studies reported that lower limb joint ROM within the normal range (measured by goniometer) was associated with faster gait speed [59,123–125], better balance [46,59] and completing the CST [59] in less time. Abnormal joint ROM (hyper or hypo joint mobility) was associated with slower gait speed [35,50,126,127], poor balance scores [126] and taking longer to complete the 10-Meter Walk Test and the TUG test [50,127]. **Self-reported:** Studies reported that joint ROM within the normal range was associated with better LLFDI scores [33,94]. Abnormal joint ROM was associated with increased mobility difficulties [98,126,128].

Sensory and Nervous System-related Factors

Pain. Performance-based: Studies reported that increased or persistent pain was associated with fewer daily steps [129], shorter distance walked [41,130], slower gait speed [39,41,59,129,131–133], lower cadence [133], shorter step [132,134] and stride length [129,132,135], poor performance in other gait parameters (e.g., longer double stance times - [34,129,134,135]), lower SPPB scores [136–138], poor balance scores [131,139], taking longer to complete walking test [140], the TUG test [118,135,141], the SCT [39], and the CST [59]. Having lower pain scores were associated with faster gait speed [34], walking a longer distance in a timed walk test and completing walking tests in less time [142]. **Self-reported:** Studies reported that increased pain was associated with greater mobility difficulty [59,138,143–146], lower LSA scores [96], and incident use of assistive walking devices [106,147].

Vision. Performance-based: Studies reported that visual impairment was associated with shorter distance walked in timed walk test [92], slower gait speed [148–151], lower cadence [34], increased double support times [34], poor balance scores [149] and driving errors [152]. One study reported that better vision was associated with faster gait speed [35]. **Self-reported:** Studies reported that poor vision or visual impairment was associated with greater mobility difficulty [100,144,151,153–156], difficulty climbing stairs [153,156], lower LSA scores [96], and reduced driving [152,157]. One study reported that visual acuity was associated with higher scores in Independent Mobility Questionnaire [158].

Hearing. No studies examined the association between hearing and performance-based mobility outcomes. **Self-reported:** Five studies reported that poor hearing was associated with greater mobility difficulty [100,144,151,159] and reduced driving [160].

Proprioception. Performance-based: Studies reported that poor proprioception (defined as the inability to identify the lower limb in position) was associated with poor balance scores [161] and taking longer to complete the TUG [75,161]. One study reported that the ability to identify lower limb in position was associated with completing the TUG in less time [27]. We found no studies reporting the association between proprioception and self-reported mobility outcomes.

Dizziness. Performance-based: Two studies reported that dizziness was associated with slower gait speed [162] and poor balance scores [161]. No studies reported the association between dizziness and self-reported mobility outcomes.

Respiratory and cardiovascular system-related factors

Respiratory parameters. Performance-based: Studies reported that better respiratory function parameters (e.g., increased Force Expiratory Volume (FEV1) or Forced Vital Capacity (FVC)) were associated with longer distance walked in a timed test [62,65,66,163–167], faster gait speed [168,169], and completing a walking test in less time [69]. A decrease in FEV1 was associated with walking shorter distances [170], slower gait speed [171,172], poor balance scores [171], lower SPPB scores [170] and taking longer to complete the TUG [118]. One study reported that dyspnea was associated with slower gait speed, and respiratory muscle weakness was associated with lower SPPB scores [172]. Another study reported that low breathing reserve, defined as the difference between the maximal voluntary ventilation and the maximum ventilation measured during the exercise test, was associated with completing a 400meter walk in a less time [173]. **Self-reported:** One study reported that a decrease in FEV1 was associated with mobility difficulty [170], and another study reported dyspnea severity was associated with lower LSA scores [95]. One study reported that older adults using a ventilator were more likely to use a walker compared to those not using ventilators [174].

Cardiovascular parameters/biomarkers. Performance-based. Studies reported that heart rate within the expected range was associated with faster gait speed, better balance scores, and completing the TUG test and the CST in less time [175]. One study reported that a high ankle-brachial index score was associated with faster gait speed and better balance scores [176]. Studies reported that a low ankle-brachial index score (indicative of peripheral arterial disease) was associated with slower gait speed, poor balance scores, taking longer time to complete the CST [177] and walking shorter distance on a 6MWT [178]. High blood pressure [179,180] and high levels of calcium in the coronary [181] were associated with slower gait speed. **Self-reported:** Studies reported that a high ankle-brachial index score was associated with reduced mobility limitations [176] and a faster self-reported walking pace [182]. One study reported that high blood pressure and abnormal heart rate were associated with self-reported walking speed [182].

Other factors

Exercise and Physical Activity (Type and frequency). Performance-based: Studies reported that increased physical activity was associated with an increased number of daily steps [183], greater likelihood of being able to walk 10 meters independently [184], faster gait speed [46,185], higher cadence [46,58], longer stride [46] and step length [186], and walking longer distance on a 6MWT [187], better balance scores [46,58,188], completing a walking test [58,183] in less time. Low levels of exercise were associated with slower gait speed [38,182]. **Self-reported:** Studies reported that being inactive or having lower levels of physical activity were associated with reduced mobility limitation [104,144,189], lower LSA scores [95], and incident use of assistive walking devices [106]. One study reported that increased physical activity levels were associated with high LSA scores [190].

Falls (number or history of falls). Performance-based: Studies reported that falls were associated with fewer daily steps [191,192], slower gait speed [40,180,193–200], lower cadence [40,193,201,202], poor performance in other gait parameters (e.g., wider stride width or shorter stride length - [193,196,199,202–206]), walking shorter distance on a 6MWT [207], poor balance scores [202,208–212], lower SPPB scores [213], and taking longer time to complete the TUG test [192,195,200,208,211,214–216], and the CST [210,214]. Compared to fallers, non-fallers had faster gait speed [217–219], performed better in gait parameters (e.g., longer stride length - [204,217,218,220]), and had better balance [193]. An increase in gait speed and distance walked was associated with a reduced no of falls [221]. **Self-reported:** Eight studies reported that an increased number of falls were associated with mobility limitation [30,141,189,216], lower LSA scores [148], use of walking aid [209,212] and reduced use of public transit [222].

Frailty. Performance-based: Higher frailty score was associated with lower balance scores [188]. **Self-reported:** Studies reported that frailty was associated with lower LSA scores [223], and increased incidents of mobility limitations [104].

Chronic condition (number of, type). Performance-based: Studies reported that having chronic conditions (one or more) was associated with fewer daily steps [95,129,224], slower gait speed [83,129,225–234] lower cadence [233,234], shorter stride [129,226,227] and step length [233], poor performance in other gait parameters (e.g., higher stride/step time - [129,225,227,232–235], a shorter distance walked in timed walk test [83,224,236–239], poor balance scores [89,131,139,188,238,240–242], lower SPPB scores [243], and completing the TUG test [83,230,238,241], the CST [237] and the SCT [83] in less time. **Self-reported:** Studies reported that having chronic conditions (one or more) were associated with mobility limitation [100,144,189,244] or reduced driving [157,160].

Non-chronic conditions (e.g., fracture) & non-specific symptoms (e.g., Fatigue). Performance-based: Studies reported that having a fracture was associated with a slower gait speed [53,245], increased double support time [53], poor balance score, taking longer to complete the CST [245]. One study reported that having a foot deformity was associated with poor balance scores [129]. Two studies reported that fatigue was associated with slower gait speed [246] or lower LSA scores [96]. **Self-reported:** One study reported that a history of fracture was associated with incident use of walking aid [106], and another reported that fatigue was associated with mobility limitations [104].

Body composition (e.g., BMI, waist circumference etc.). Performance-based: Studies reported that being underweight, overweight or obese (measured by BMI or waist circumference, etc.,) was associated with fewer daily steps [31,247], slower gait speed [38,47,180,182,195,234,248–251], poor performance in other gait parameters (e.g., increased double support time - [234,247,252,253]), a shorter distance walked in timed walk test [63,87,142,248], poor balance scores [76,139,248,250,253–255] and completing walking distance [64,248,249,253,254,256], the TUG test [63,75,118,249,250,257,258], the CST [64,258], and the SCT [63] in less time. Body composition (within normal range for BMI or higher lean mass) was associated with a greater number of daily steps [31], faster gait speed [37,38,44,195,259,260], walking longer distance on a 6MWT [63,239], completing the TUG test [258,261], and the CST [84,258], in less time. **Self-reported:** Studies reported that being underweight, overweight or obese (e.g., measured with BMI or waist circumference) was associated with mobility limitation [99,100,103,144,244,262–264] or lower LSA scores [96]. One study reported that higher lean mass was associated with fewer incident mobility limitations [265].

DISCUSSION

We systematically reviewed the literature for physical factors and their associations with performed-based and self-reported mobility outcomes in older adults. We included 239 articles from 32 countries, primarily cross-sectional studies recruiting participants from the community. Eighteen factors were found and were grouped into musculoskeletal system-related (e.g., muscle strength), sensory and nervous system-related (e.g., pain), respiratory (e.g., FEV1) and cardiovascular (e.g., cardiovascular biomarkers) system-related, and other factors including type and frequency of exercise, the number and types of chronic and non-chronic conditions, falls and body composition. Not surprisingly, associations between physical factors and mobility outcomes were in the expected direction. Older adults with muscle weakness, poor vision, reduced FEV1, low physical activity levels, abnormal body compositions (e.g., being underweight, overweight, or obese), and many chronic conditions walked slower and had poor balance scores, mobility limitations, and poor driving outcomes. Compared to other factors, including environmental, cognitive, psychological, social, personal, and financial, physical factors are consistently associated with older adults' mobility [32,96,189,190] and are easily identified by clinicians, older adults, and family members, highlighting the critical role that physical factors play in explaining the complexity associated with older adults' mobility.

Although the InCHIANTI study found that low power was associated with a 2-3-fold increase in mobility limitations than low strength [266], more studies in our review focused on muscle strength rather than muscle power. Arguments explaining why muscle strength has been consistently studied more muscle power include but are not limited to the lack of validation across popular muscle power tests [267] as well as frequent discrepancies across testing protocols between studies [268]. Even though studies validating these different muscle power tests are needed to encourage researchers further in exploring the role of muscle power on older adults' mobility, investigating the additive role of muscle strength and muscle power on mobility outcomes is pertinent. Could exploring the additive role of muscle power and strength provide more insight into understanding the complexity of mobility and possible focused assessment and intervention? Future research should explore this since each independently predict mobility outcomes among older adults.

Poor physical health indicative of chronic conditions is a strong predictor of community mobility [189]. Approximately 85% of older adults have at least one chronic health condition, and 60% have at least two chronic conditions [269]. Our review revealed that chronic conditions are often not examined independently; they are often examined in association with other factors, indicating that multiple risk factors may significantly impact mobility. However, studies exploring the additive effect of multiple factors, including chronic conditions, was scarce, indicating the need for future research to explore these possible relationships. Future studies should highlight the additive-predictive power of chronic conditions relating to mobility outcomes.

Our review also highlighted the complexity in association between physical factors and mobility. For instance, obese or overweight older adults are at higher risk of developing chronic conditions such as hypertension, diabetes, etc. Subsequently, diabetes could lead to vision and sensory impairment, causing pain which further limits older adult mobility. Reciprocally, limited mobility may lead to muscle weakness, further limiting participation in physical and social activities, which could accelerate age-related changes in cognitive and affective domains; thus, facilitating the continuous cycle mobility decline in older adults. Since older adults often report multiple physical factors concurrently, combinations of multiple risk factors may have a more significant impact than the sum of their individual effects, and future studies should explore these compounding effects [13]. Future interventions targeting mobility maintenance should be multidimensional, focusing on targeting modifiable risk factors concurrently.

Our review noted some gaps or areas to address regarding physical factors and mobility. First, the associations between physical factors and mobility focused mainly on community-dwelling older adults, with limited studies conducted among hospitalized older adults or those residing in nursing homes. Older adults experience a decline in several physical factors, including muscle mass, strength, function, and pulmonary functions during hospitalization, leading to difficulty in performing activities of daily living (ADL) and limitations in community mobility [270,271]. Reduced community mobility has been associated with other adverse health outcomes for older people after discharge, including loneliness, depression, and mortality [272], highlighting the need for studies to explore the association between physical factors and mobility, both on admission and discharge.

Understandably, assessing nursing home residents' mobility can be challenging as most residents might not be able to complete performance-based or self-reported mobility measures, especially nursing home residents with cognitive impairment or dementia. However, recent technology advancements, including wearable sensors (such as smartwatches and Fitbits), although currently used to explore activity levels of nursing home residents and track falls [273], measure several mobility outcomes, including gait parameters (e.g., gait speed) and balance [274]. Therefore, future studies should use routinely collected mobility data in nursing homes to explore the association between several mobility outcomes and physical factors; this is promising to inform care plans and interventions that could improve mobility for nursing home residents.

Second, despite the impact of the cardiovascular system on mobility in older adults, only eight included studies explored the association between the cardiovascular system and mobility among older adults. While five studies crosssectionally examined the association between high blood pressure [275] and cardiovascular biomarkers, such as ankle-brachial index [176,177,180,181] and mobility outcomes, three longitudinal studies [178,179,182] highlighted the impact of cardiovascular functions on older adults' mobility across the life course. These longitudinal studies provided cardiovascular cut-offs for clinicians to ascertain which older adults are at higher risk of mobility decline based on their cardiovascular parameters allowing early intervention to reduce the age-related cardiovascular decline[276]. However, these studies are from a USA sample population (primarily Caucasian), limiting the application of these findings in populations different from the USA population. Cardiovascular parameters, including blood pressure, have been correlated to genetic variations found within continental regions. For instance, compared to Europeans and white Americans, people of Sub-Saharan Africa and African descent in America and Europe have higher systolic and diastolic blood pressure, whereas South Asians have lower systolic blood pressure but similar diastolic blood pressure with Europeans and White Americans [277]. Therefore, it is plausible that the influence of cardiovascular parameters on mobility could differ across regions globally. Hence, studies exploring the longitudinal association between cardiovascular parameters and mobility outcomes among older adults in other regions, including Africa and Asia, are needed.

The findings from this review and our previous reviews on the associations between self-reported and performance-based mobility outcomes, and environmental, personal, and financial factors [16]; and cognitive, psychological, and social factors [17] provided information for advancing the use of Conical Model. Our study provided a comprehensive list of factors that can guide further development of core factors within each determinant that influences mobility in a different context. For instance, this may take the form of exploring which factors within each determinant are critical to assess when older adults are being discharged from hospital-to-home. With the associations between each factor within each determinant synthesized, it can create a foundation for transdisciplinary collaborations to explore further the complexity of mobility and more effective ways to actively incorporate and assess the interrelationship effect of each determinant or combined effect on mobility across different settings.

Despite our effort to develop a comprehensive search strategy, some articles, specifically those focused on transportation and driving, may have been missed, especially of the article keywords were not in the MESH terms in our search strategy. Also, we may have missed some articles published in other languages than English. Although we did not limit our search by country, we found no studies conducted in Africa. Our study defined older adults as individuals 60 years and older, which could explain why studies in Africa did not meet our inclusion criteria. Most gerontological studies in Africa define older adults as individuals 50 years and above [278]. We argue that the association between most physical factors and mobility outcomes may not differ across regions, except for some physical factors, such as blood pressure cut-offs and chronic conditions, which have regional variations. About two-thirds of the studies included in this review were cross-sectional and were unable to determine cause-effect relationships between physical factors and mobility outcomes. There is a need for more longitudinal studies to allow a systematic analysis of either independent or additive physical factors in order to produce predictive models of mobility in older adults.

CONCLUSION

We found 18 physical factors and their association with older adults' mobility. Not surprisingly, associations between physical factors and mobility outcomes were in the expected direction. Older adults with poor physical health such as muscle weakness, poor vision, and many chronic conditions have poor mobility outcomes including poor gait speed, poor balance, and poor driving outcomes. Longitudinal studies exploring the additive association of physical factors with mobility outcomes are recommended to highlight the complexity and enhanced intervention and prevent mobility decline.

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Declaration of interest statement

We do not have any conflict of interest to declare.

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Table 1: Characteristics of the included articles (n = 239)

Characteristics	n (%)
Sex	
• More Female	173(72.4)
• Fewer Female	47(19.7)
• Female = Male	9(3.8)
• Not reported	10(4.2)
Geographical area: Continent	
• Africa	0(0)
• Asia	42(17.6)
• Europe	68(28.5)
• North America	108(45.2)
• Oceania	13(5.4)
• South America	6(2.5)
• More than one continent	2(0.8)
Study design	
• Cross-sectional	175(73.2)
• Longitudinal	60(25.1)
• Quasi-experimental	1(0.4)
• Randomized Control Trials	3(1.3)
Participants recruited from	
• Community	209(87.4)
• Hospital	22(9.2)
• Assisted living	2(0.8)
• Community & hospital	5(2.1)
• Not reported	1(0.4)
Population of study	
• Defined health conditions (e.g., stroke, Alzheimer's)	78(32.6)
• No defined health conditions	161(67.4)
Sample size (n)	
• ≤ 100	86(36.0)
• $101-300$	55(23.0)
• 301-500	21(8.8)
• 501-1000	33(13.8)
• 1001-2500	17(7.1)
• >2500	27(11.3)
***Total number of mobility outcomes**	561
Performance Based (n = 496)	
Walking outcomes	
• Time	32(5.7)
• Distance	34(6.1)
• Speed	102(18.2)
• Number of steps	10(1.8)
• Other gait parameters	153(27.3)
Observed driving related outcomes	1(0.2)
Balance	45(8.0)
Physical function	
• Short Physical Performance Battery scores	23(4.1)

• Time Up and Go Test scores	45(8.0)
• Other physical function tests	51(9.1)
Self-reported outcome (n = 65)	
Community mobility	
• Walking	10(1.8)
• Life Space Assessment scores	5(0.9)
• Other self-reported mobility questionnaire	10(1.8)
• Driving related outcomes	5(0.9)
• Use of transportation	1(0.2)
Mobility limitation	29(5.2)
Use of/difficulty in using mobility assistive devices	5(0.9)

NOTE: Some studies assessed older adults' mobility using more than one mobility outcome

Performance-based mobility outcomes: Walking time defined as time taken to complete 3, 5, 6 or 30-Meter Walk Tests; ***Walking distance*** defined as distanced walked within 6 or 2- Minutes' Walk Tests; ***Other gait parameters*** included stride length, cadence, single/double support time, walk ratio, gait variability; ***observed driving related outcomes*** - participants were followed or observed while driving in the community; ***Balance tests*** included Berg Balance Test, Tandem Tests, Stance Test, BEStest; ***Other physical function tests*** included Sit-to-Stand Test, Stair Climbing Test, Four Square Step Test (FSST), Shuttle Walking Test (Incremental and Endurance).

Self-reported mobility outcomes: Self-reported *walking* included the distance walked, number of times walked per day/week/month, amount of time walked (second or minutes), self-reported walking speed, self-reported walking capabilities, number of days outdoors; ***Other self-reported mobility*** questionnaire included Rivermead Mobility Index, Independent Mobility Questionnaire (IMQ), RAND-36 Physical Functioning Questionnaire, Walk 12-G Questionnaire, Functional Mobility Scale, EuroQol- five-Dimension Scale - mobility domain, and Late Life Function and Disability Instrument; ***Driving related outcomes*** included driving performance (ability or inability), access to car, driving duration & frequency, driving distance, preference to be driver vs passenger; ***Mobility limitation*** defined as self-reported inability on all or any of the following: walking up and down a flight of stairs (10 steps) or several flights of stairs, walking a mile (1600meter) or half a mile (800meter) or a quarter mile or a block (400meter) or 100-300meter, or across the room and running/jogging for 20-30 minutes; ***Mobility assistive devices*** included scooter, powered and manual wheelchairs, walking aids (cane, walker, crutches).

Table 2: Physical factors from the included studies and their description (n = 433)

Factors	n (%)	Definition
Musculoskeletal system (n = 129)		
Muscle strength	84(19.4)	The amount of tension a muscle develops to move or lift object, for example. How strong or weak a muscle is.
Muscle power	18(4.2)	How fast the muscle can work, for example how fast can we stand up and sit down within a small timeframe.
Muscle endurance	9(2.1)	How long a muscle can work
Muscle coordination	3(0.7)	How the muscles work together to move
Range of motion	15(3.5)	The ability of a joint to move in all its directions
Nervous and sensory system (n = 69)		
Proprioception	3(0.7)	The ability to sense the body in space, where it is located, the movement of the body
Pain	32(7.4)	The uncomfortable feeling that tells you something is wrong
Hearing	6(1.4)	The ability to perceive and understand sound
Vision	25(5.8)	The ability to see
Dizziness	3(0.7)	Describe a range of sensations, for example, feeling faint.
Cardiovascular and respiratory system (n = 30)		
Respiratory system	19(4.4)	The lungs and tissues that help people breathe and how we breath.
Cardiovascular system	11(2.5)	The system that helps people deliver blood to the different regions of their body.
Other physical factors (n = 205)		
Frequency of exercise/physical activity	22(5.1)	The frequency of exercise or physical activity
Falls (number and history of falls)	44(10.2)	The number of times a person come to go down suddenly from a standing position
Chronic conditions (number and type)	45(10.4)	The number and type of chronic conditions (e.g high blood pressure, diabetes, arthritis)
Non-chronic conditions (e.g fracture and non-specific symptoms (e.g Fatigue)	8(1.8)	This includes other conditions, such as fracture and non-specific symptoms, such as fatigue
Body composition (e.g BMI, waist circumference)	83(19.2)	A description of how much of the body is muscle or fat
Frailty	3(0.7)	Medical condition of reduced function and health in older individuals. People who are frail usually have 3 out of the following five symptoms: muscle loss, weakness a feeling of fatigue, slow walking speed, and low levels of physical activity.

n = number of articles that explored the association between the physical factors and mobility outcomes.

Box 1: Inclusion and Exclusion Criteria for Study Selection

Articles were included if:

(a) The study population was older adults (mean age of study sample, at least 60 years).

(b) The exposures were (not exhaustive): muscle strength, muscle power, muscle coordination, muscle endurance, range of motion, number of chronic conditions, physical activity and exercise levels, body composition, respiratory system parameters, vision, hearing etc.

(c) The outcome was any mobility measure including, but not limited to:

- (i) a performance-based test such as the gait speed, Timed Up and Go Test, Short Physical Performance Battery Test, Stair Climb Test, Balance Test, and walking tests (e.g., 6-Minute Walk Test, 2.4 Meter Walk); or
- (ii) a self-reported measure of mobility, such as the Late-Life Function and Disability Instrument, the de Morton Mobility Index, Life-Space Mobility Assessment; or
- (iii) the use of assistive mobility devices (e.g., walkers, wheelchairs, scooters); or
- (iv) driving or transportation.

(d) The study setting was hospital (e.g., acute care, inpatient care), community, assisted living, or long-term care facilities.

(e) They were peer-reviewed, conducted in the quantitative, qualitative, or mixed-method paradigm, and published in English between Jan. 2000 to Jan. 2022.

Articles were excluded if:

(a) They were opinion papers with no data.

(b) The outcome or self-reported measure was related to functional decline in activities of daily living or instrumental activities of daily living without any specific measure of mobility.

(c) They described physical activity or exercise (except walking) as a form of mobility

(d) They were exercise intervention studies that showed the effect of exercise intervention on mobility outcomes listed above; for instance, older adults in the exercise improved in their gait speed but those in the non-exercise group did not improve.

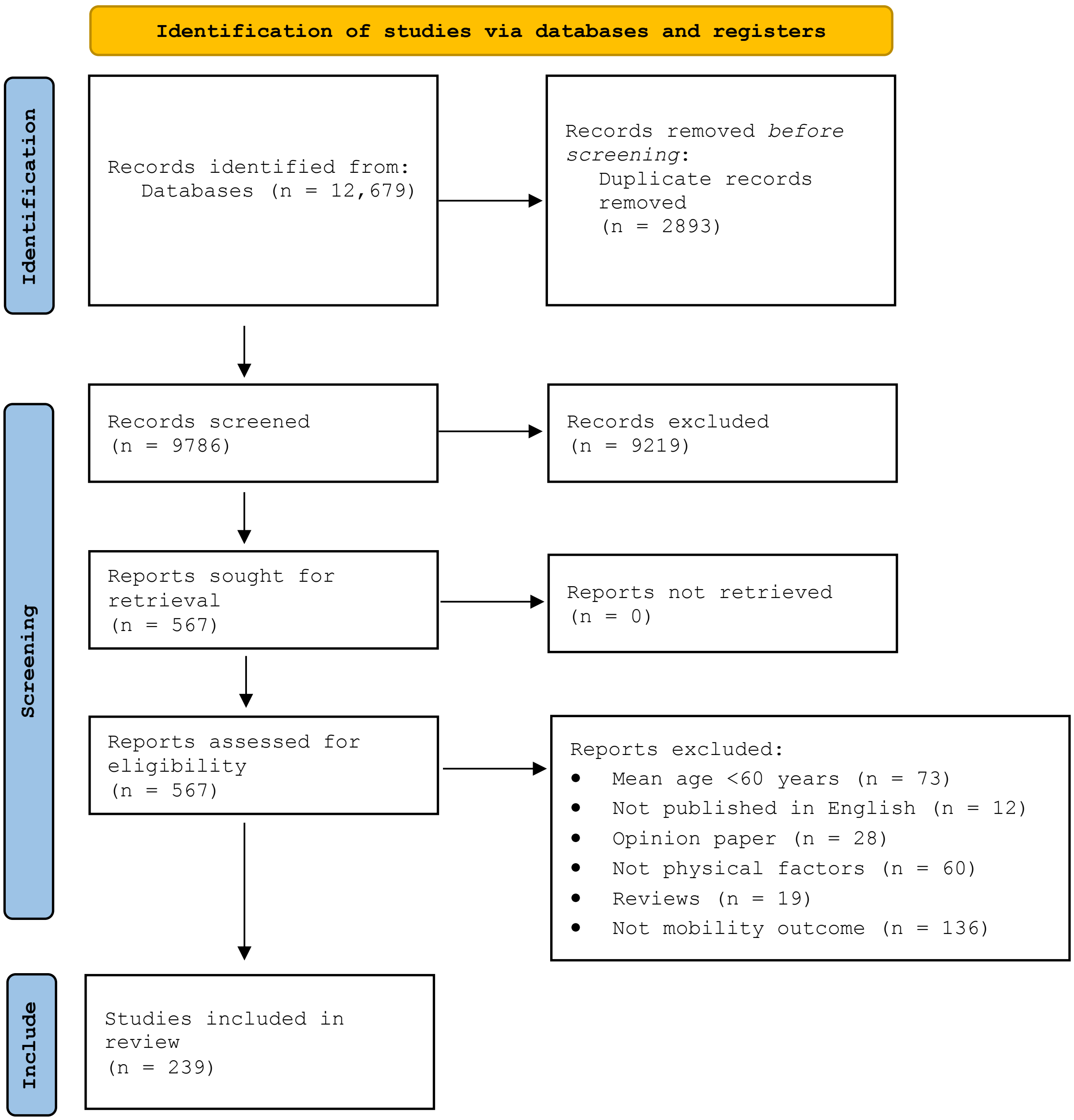

Figure 1- Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) flow chart of the scoping review

From: Page MJ, McKenzie JE, Bossuyt PM, Boutron I, Hoffmann TC, Mulrow CD, et al. The PRISMA 2020 statement: an updated guideline for reporting systematic reviews. BMJ 2021;372:n71. doi: 10.1136/bmj.n71

For more information, visit: http://www.prisma-statement.org/

CHAPTER 5: A comprehensive mobility discharge assessment framework for older adults transitioning from hospital-to-home in the community - What mobility factors are critical to include? Protocol for an international e-Delphi study.

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Preface

This chapter is a protocol manuscript of Phase 2 of the PhD thesis that focused on developing, through consensus, factors within mobility determinants that are critical to be part of a Comprehensive Mobility Discharge Assessment Framework for older adults transitioning from hospital-to-home. I, under the supervision of Dr Dal Bello-Haas, conceptualized the study purpose and research question for this study, designed the study protocol, wrote, revised and submitted the manuscripts. Dr. M Griffin, Dr. J Ploeg, and Dr. J Richardson reviewed and provided feedback on the e-Delphi study protocol. This chapter is a reprint of the manuscript as published in *PLoS ONE*. The conceptual thinking, design and writing of the protocol was completed between May 2020 to January 2021, and manuscript was submitted in February 2021

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A Comprehensive Mobility Discharge Assessment Framework for older adults transitioning from hospital-to-home in the community – what mobility factors are critical to include? Protocol for an international e-Delphi study

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PLOS ONE

STUDY PROTOCOL

A comprehensive mobility discharge assessment framework for older adults transitioning from hospital-to-home in the community—What mobility factors are critical to include? Protocol for an international e-Delphi study

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Abstract

Background

Mobility deficits have been identified as an independent risk factor for hospital readmission for adults ≥65 years. Despite evidence indicating how determinants additively influence and predict mobility, no hospital-to-home care transition models comprehensively assess all seven mobility determinants, cognitive, financial, environmental, personal, physical, psychological, and social. There is currently a lack of clarity regarding what factors clinicians and researchers should evaluate for each mobility determinant. The purpose of this e-Delphi study is to prioritize and reach consensus on the factors for each mobility determinant that are critical to assess as part of the Comprehensive Mobility Discharge Assessment Framework (CMDAF) when older adults are discharged from hospital-to-home.

Methods

This protocol paper is an international modified e-Delphi study following the Recommendations for the Conducting and Reporting of Delphi Studies. International researchers, clinicians, older adults and family caregivers residing in a country with universal or near-universal health coverage will be invited to participate as 'experts' in three e-Delphi rounds administered through *DelphiManager©*. The e-Delphi Round 1 questionnaire will be developed based on scoping review findings and will be pilot tested. For each round, experts will be asked to rate factors for each determinant that are critical to assess as part of the CMDAF using a 9-point scale: Not Important (1–3), Important but Not Critical (4–6), and

Competing interests: The authors have declared that no competing interests exist.

Critical (7–9). The scale will include a selection option of "unable to score" and experts will also be asked to provide a rationale for their scoring and suggest missing factors. Experts will receive feedback summaries in Rounds 2 and 3 to guide them in reflecting on their initial responses and re-rating of factors that have not reached consensus. The criteria for reaching consensus will be if ≥70% of experts rate a factor as "critical" (scores ≥7) and ≤ 15% of experts rate a factor as "not important" (scores≤ 3). Quantitative data will be analyzed using median values, frequencies, percentages, interquartile range, and bar graphs; Wilcoxon matched-pairs signed-rank test will be used to assess the stability of participants' responses. Rationale (qualitative data) provided in the open-ended comments section will be analyzed using content analysis.

Conclusion

This study is a first step in developing the CMDAF and will be used to guide a subsequent e-Delphi survey to decide on the tools that should be used to measure the examples of each factor included in our framework.

Introduction

Globally, about 250 million older adults (defined as ≥65 years) have at least one disability [1], with about one-third of older adults reporting a mobility-related disability such as difficulty walking 400-meters or climbing a flight of stairs without assistance [2–4]. The worldwide prevalence of mobility-related disability among older adults living in high-income countries ranged from 22.6 to 47.6% between 2005–2015 [5–8]. According to the 2012 Canadian Survey on Disability, 20.6% of Canadians ≥65 years and 27% of Canadians ≥75 years have disabilities related to mobility [9]. Mobility-related disabilities often precede the onset of difficulties with activities of daily living and participation restrictions, often leading to social isolation, anxiety, and depression in older adults [2–4]. Mobility preservation among older Canadians is crucial in maintaining function and preventing further disability.

Mobility is defined as the ability to move between a variety of environments such as room, home, outdoors, neighborhood, community and the world either independently, with the use of assistive devices, or via transportation [10]. Historically, mobility has been viewed from a biomechanical or physiological perspective, which in turn has focused interventions on improving mobility-related physical outcomes such as gait, and muscle strength and power [11]. Over the years, the role of cognitive, financial, environmental, personal, psychological and social factors on mobility has been explored [10, 12, 13].

Webber and colleagues [10] in their Conical Model of Theoretical Framework for Mobility in older adults conceptualizes cognitive, psychosocial, physical, environmental, financial and personal histories/stories as determinants of mobility across seven life space locations—the room where the older adult sleeps, home, outdoors, neighborhood, service community and the surrounding area, and the world. Physical determinants of mobility include the number of chronic conditions, physical activity levels and muscle strength [12, 13]; while cognitive determinants include memory, executive functioning and mental status [12, 13]. Psychological determinants of mobility include depression, fear, anxiety, whereas social determinants include social networks and loneliness [12, 13]. Environmental factors are physical characteristics such as distance, temporal characteristics, light and weather conditions [13], and/or social, environmental policies such as public attitudes, social policies, services and systems, that hinder mobility [10]. Financial determinants of mobility may include personal income or household income, while personal determinants include age, gender, sex, marital status, race, ethnicity and culture [10].

Several studies have tested [12, 13] or expanded [14] the Conical Model of Theoretical Framework for Mobility in older adults. While Meyer et al. [12] and Giannouli [13] 's studies highlighted the additive influence of cognitive, environmental, financial, personal, physical, psychological, and social factors on older adults' mobility, Franke and colleagues reframed the Conical Model of Theoretical framework for Mobility into a sliding scale that reveals the dynamic, fluid and experiential nature of Mobility by analyzing physiological, subjective and contextual factors within and between people and their environment, over time [14]. Although Franke et al. [14] provided examples of how older adults and their caregivers can identify and rate each physiological, subjective, and contextual factor influencing their mobility across the sliding scale in a continuum scale of high to low, its application in a clinical setting is limited. For instance, this rating can be challenging for older adults with cognitive impairment. In addition, the reframed framework did not provide, for example, the specific physical factors, such as muscle strength, muscle power, range of motion, or built environment, such as street, residential and sideway characteristics, that the older adults or family members can identify as factors that influence their mobility.

Older adults experiencing a hospital-to-home transition are at increased risk for poor health outcomes such as mobility decline and deterioration in cognitive and functioning [15–17]. Between 30% to 60% of older adults experience functional decline after hospitalization [15–17], and mobility difficulties have been identified as predictors of mortality and loss of independence among community-dwelling older adults [18]. Functional deficits have been identified as independent risk factors for hospital readmission for older adults [19]. Therefore, efforts to improve mobility for older adults transitioning from hospital-to-home in the community are important and may help reduce hospital readmission costs. For instance, in Canada, the total cost of hospital readmissions is considerable at $1.8 billion per annum [20]. Older adults (65+ years) account for the largest proportion (60%) of total costs of hospital readmission in Canada [21], resulting in a significant economic burden to the Canadian health care system. Older adults readmitted to the hospital are at risk for hospital-acquired infections, deconditioning, and poor quality of life [20, 22]. Additionally, family caregivers are negatively affected and experience a sense of powerlessness, often resulting in anxiety and depression, when an older adult is readmitted to the hospital [23].

To date, hospital-to-home transition models such as Naylor [24] and Coleman [25] have typically focused on interventions to: improve provider-to-provider or provider-to-patient/family caregiver communication; improve coordination of care; and educate patients to self-monitor and manage their medical conditions. However, there has been little or no emphasis on addressing mobility [26], even though readmission risk prediction models targeting functional status consistently out-perform models based on medical comorbidities [27, 28]. Currently, mobility is rarely assessed during hospital discharge. Polnaszek et al. [29] reported that mobility-related recommendations, including assessment, were omitted in 53% of discharge summaries of 163 high-risk patients when transferred from hospital to sub-acute care facilities. In addition, among 64 mobility measures included in a review, none incorporated or highlighted the role of all seven mobility determinants [30], even though the interrelationship of these seven mobility determinants explains the complexity associated with mobility and could highlight which factors clinicians should intervene when older adults are discharge from the hospital. Addressing older adults' mobility during hospital-to-home transitions is important because there is increasing recognition that a standardized, comprehensive functional assessment tool is necessary to improve the complex discharge process during the hospital-to-home transition [26, 31]. The World Health Organization's Integrated Care for Older People Report recommended that every older person undergo continuous comprehensive assessments at services or system levels, including hospital discharge, to optimize their functional ability [26, 31].

To advance the use of the Conical Model of Theoretical Framework for Mobility [10], there is a need to develop specific factors for each determinant that are critical to assess when older adults are being discharged from hospital-to-home. This research will close this knowledge gap by developing a **C**omprehensive **M**obility **D**ischarge **A**ssessment **F**ramework (CMDAF) that clinicians can use during the hospital-to-home transition. The CMDAF will consist of factors within each mobility determinant and their corresponding outcome measures. The first phase of creating the CMDAF is to determine through consensus which factors within each determinant are critical to be assessed. The second phase is to identify the outcome measures for each of the factors within each determinant that reached consensus in the first phase. This protocol focuses only on the first phase. This e-Delphi study aims to prioritize and reach consensus on the factors for each mobility determinant [cognitive, financial, environmental, personal, physical, psychological, social] that are critical to assess as part of the CMDAF when older adults are discharged from hospital-to-home.

Methods

Study design

We will use modified Delphi methods to develop the CMDAF [32], following the Recommendations for the Conducting and Reporting of Delphi Studies (CREDES) to conduct the study and report our findings [33]. The Delphi method is a systematic approach to combining opinions to achieve consensus among individuals with a range of knowledge, experience and expertise through iterative, multi-stage completion of survey questionnaires (referred to as rounds) [32, 34]. Delphi methods are appropriate for this study because of the complexity of mobility, the need for group involvement and inclusion of a diversified and broad representation of expert opinions, including older adults and caregivers, to achieve the study aim [32].

We will use an e-Delphi method, online web-based survey questionnaires, for consensus building [32]. Participants worldwide (henceforth referred to as experts or expert participants) will be anonymous to each other to ensure one or more individuals do not dominate the process [32]. They will effectively connect with other experts without the need to be physically present, to identify, clarify, and refine their opinions and apply their expertise regarding older adult mobility during the hospital-to-home transition to reach consensus feasibly and cost-effectively [35].

Sample–expert description and eligibility

Experts will include researchers, clinicians, older adults and family caregivers. Within the Delphi process, the definition of "experts" is fundamental to ensure the reliability of the Delphi findings. However, the definition of "experts" is highly debated in the Delphi research [36]. Baker and colleagues provided elements for defining "experts" for use within Delphi panel research, including specific qualifications, years of experience, and number of publications in the area of expertise [36]. We define each expert in our study following these elements. Researchers will be considered an "expert" if they have authored at least two peer-reviewed articles as either the first or senior author in at least one of the mobility determinants. Clinicians will be considered an "expert" if they have at least two years of clinical experience working with older adults with mobility difficulties in their field of professional expertise and hospital-to-home transitions. Older adults (65 years and older) will be considered an "expert" with lived experience if they self-identify as having at least one year of mobility difficulties and have experienced a hospital-to-home transition. Family caregivers will be considered an "expert" if they have at least one year experience providing informal care for older adults with mobility limitations, specifically during hospital-to-home transitions. This heterogeneous sample is needed to ensure that a spectrum of opinions from different stakeholders is included [32].

Experts are eligible to participate if they: a) conform eligibility based on the description above; b) can read and write in the English language; c) have knowledge of and ability to use computers and have reliable internet access; d) indicate interest, willingness and availability for participation in the timeframe of the three rounds of e-Delphi [34, 37]; e) reside, practice or research in a country with universal (or near-universal) health coverage such as Australia, Canada, United Kingdom [38]. Universal (near-universal) health coverage countries offer all their citizens affordable access to a comprehensive health service package [39]. This inclusion criterion ensures we recruit experts from countries with a healthcare system similar to Canada.

Sampling strategies and recruitment. The Delphi method employs criterion-based purposive and snowball sampling techniques to recruit experts [34]. Experts will be recruited from an international community of researchers, health and social care professionals, older adults and family caregivers based on the criteria described above.

We will use the following strategies for recruiting experts. First, we will send email invitations to the first and senior authors of the included articles in our scoping reviews. We will also employ snowball recruitment techniques by encouraging the pool of potential experts to send us the name and email contact of other potential participants who meet our expert description/criteria [32]. We will leverage the extensive networks of our Steering Committee members (described below) [40], with each Steering Committee member providing a list of additional potential experts that will receive an invitation to participate in the study. As needed, clinician and research experts will also be recruited through interdisciplinary professional associations such as Australian Association of Gerontology, British Society of Gerontology, Canadian Association of Gerontology, International Association of Gerontology and Geriatrics. Older adults will be recruited through HelpAge International [41], which comprises a pool of older adults residing in the countries with universal (near-universal) healthcare systems; and family caregivers will be recruited through family caregivers' organizations such as IMAGINE Citizen Collaborating for Health [42], Caregivers Alberta [43]. We will approach these organizations to explain our study and aims and request they nominate potential experts to be invited to participate in our study. To ensure the required sample representation of experts, recruitment will be monitored, and all interested individuals will conform eligibility prior to participating.

Sample size. There is no set standard or accepted guidelines for the sample size for e-Delphi [32]; instead decision-making is guided by the scope and aims of the study and practicality [32]. A 2011 systematic review found that the median number of individuals invited to participate in Delphi studies was 17, with a range of 3 to 418 (Q1 = 11, Q3 = 31) [44]. Based on this, we will aim to include at least 20 experts (five per stakeholder group—researchers, clinicians, older adults and family members).

Data regarding specific recruitment efforts such as number of invitations sent for Delphi and e-Delphi studies and response rates for these efforts are sparse in the literature [33, 45], in particular for specific stakeholder groups. Often, recruitment response rate is calculated as the number of participants who complete the Delphi rounds (participation rates), and these rates and reporting of rates vary greatly. For instance, recruitment response ranged 46% to 65% for participant groups not specified [46]; 96% for patients and caregivers and 81% for research experts [47]; and 100% for all participant groups [48]. Baldwin et al. [49] reported an overall response rate of 69.5% to expression of interest invitations across a broad range of experts, including patients, while Stewart et al. [50] reported a response rate of 67.9%. Using recruitment response rates of 65%, we will approach approximately 31 experts to achieve our sample size of 20, ensuring the equal number of experts across the four stakeholder groups: clinicians, researchers, older adults and family caregivers.

Steering committee

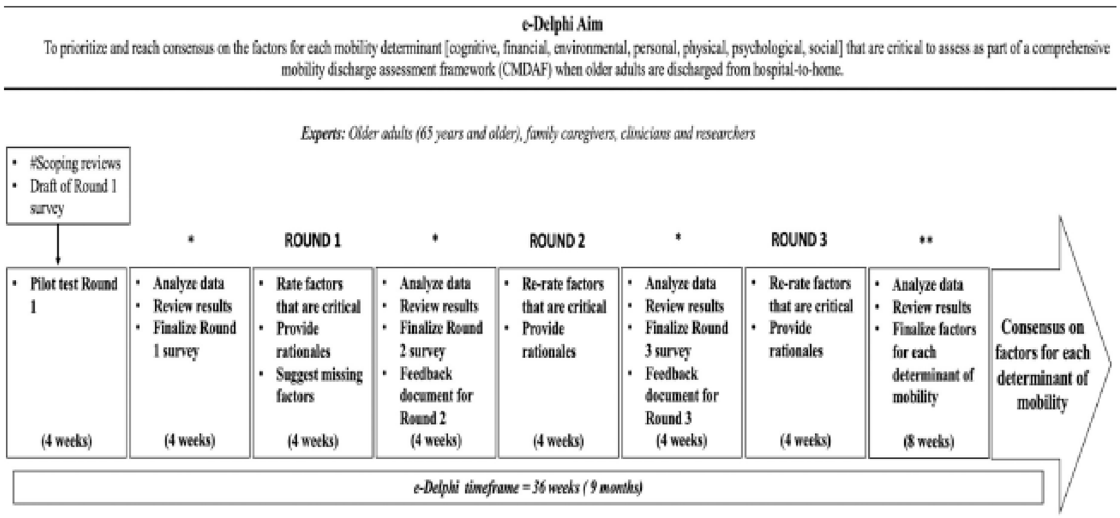
The Steering Committee, including team investigators, an older adult and a family caregiver, will provide overall study oversight. The Committee comprises members from various disciplines such as nursing, physiotherapy, gerontology, with clinical and research expertise related to older adults, mobility, hospital-to-home transitions, and qualitative, quantitative, and Delphi methods. The older adult will have lived experience with mobility limitation and transitioning from hospital-to-home, while the family caregiver will have lived experience providing care to an older adult with mobility limitation and hospital-to-home transition. The Steering Committee will meet at key stages throughout the study and will be responsible for identifying and responding to any issues arising, reviewing study conduct, and overseeing knowledge dissemination. The Steering Committee will conduct content and face validity of e-Delphi questionnaire to ensure accuracy, comprehensiveness, clarity of wording, and appropriateness of structure; review results at each round; and review feedback summaries to be provided to experts at subsequent rounds. The Steering Committee may also be required to decide on items should experts fail to reach consensus [40]. Any decisions made by the Steering Committee will be communicated to the expert participants throughout the study, and experts will be provided with opportunities to respond. This approach reduces the burden on the experts during the Delphi process [34].

General procedure

While the classical Delphi typically uses four rounds [34], two or three rounds have been used to achieve a consensus [33, 51]. Because of the topic's complexity, our experts' heterogeneity, and our aims, experts might not achieve consensus in two rounds. We anticipate that at least three rounds will be needed to achieve consensus, as prolonged Delphi process, for example four rounds, often leads to reduced response rate, which affects the Delphi process's validity (Fig 1).

The survey questionnaire for each e-Delphi round will include: background information containing study's purpose, aims, description of e-Delphi methods, and definitions of factors within each determinants; questions to collect demographic and participant information; and, the e-Delphi questionnaire consists of structured and open-ended questions. We will use a 9-point scale, divided into three categories, for importance rating: Not Important (1–3), Important but Not Critical (4–6), and Critical (7–9) [52]. As well, an "Unable to Score" response and instruction for its use will be provided should experts feel uncomfortable rating any particular question. A 9-point scale is preferred in a Delphi survey as it increases sensitivity and consensus can be achieved on more items compared to 3- or 5-point scale [53].

The survey will be administered through *DelphiManager* [54], a web-based system designed to facilitate the building of e-Delphi surveys that includes functionality that allows for easy and efficient data management. *DelphiManager* allows for secure data collection and integrity using multiple encryption layers, and "quasi anonymity". Quasi-anonymity refers to researchers knowing the experts' identity and their responses, but experts are anonymous to each other



*Steering committee meeting between rounds to review results and finalized survey for the subsequent round
**Steering committee to decide on any factors that have not reach consensus at the end of round 3.
#list of factors for each determinant developed from the scoping reviews

Fig 1. e-Delphi survey process and timeline.

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and provide responses that are anonymous to each other [55]. For each round, experts will receive a link to an e-Delphi questionnaire in *DelphiManager*. Only experts who provide informed consent will have access to the questionnaire.

All experts, including older adults and family caregivers, will be asked to complete questions regarding each mobility determinant. As experts, their opinions and perspectives across all determinant domains lend trustworthiness and relevance to our study [37]. Research has demonstrated that older adults and their family caregivers can actively participate in an e-Delphi consensus, especially when plain language explanations of items for consensus are provided [56]. A description of each factor will be provided in each round of the e-Delphi.

Although there is no specific recommended duration for each round of an e-Delphi process [35], Junger et al. [33] noted that Delphi round durations could range from 10 days to 10 weeks. Based on previous international e-Delphi studies with multi-stakeholders [35, 40, 57], we estimate that each round will be open for four weeks to ensure experts have enough time to participate effectively, without losing interest [35]. There will be a minimum four-week time interval between rounds to allow for data analysis, review of results by the Steering Committee, revision of the questionnaire and development of the feedback document for subsequent rounds (see Fig 1). The feedback document will include a summary document of preceding rounds, including bar graphs showing experts' group ratings, distribution of ratings, and individual ratings on factors that reached consensus and did not reach consensus and a qualitative summary of the rationale for each rating. Providing a feedback document to experts for subsequent rounds is an important component of the process because it allows experts to consider the group rating compared to their response enabling them to reflect, revise or change their opinions while avoiding the effects of dominant individuals that could influence their decision in direct communication (e.g. face-to-face communication) [32, 37]. We anticipate that the e-Delphi process will occur over approximately nine months, including the test round (see Fig 1).

Test round (pilot study). Prior to Round 1 of the e-Delphi, the survey questionnaire will be pilot tested (test round) to: ensure content and face validity [58]; receive feedback regarding format, comprehensiveness, clarity of instructions, descriptions/definitions and participation time [34]; and, test the online platform and its nuances [37]. We will recruit four experts (a clinician, a researcher, an older adult and a family caregiver) to pilot test the questionnaire. Experts involved in the test rounds will not participate in subsequent rounds.

e-Delphi round response rate. No agreed-upon guidelines exist for an acceptable response rate for each round of the e-Delphi process [32]. A 70% response rate has been suggested in the literature to maintain rigour in a Delphi technique [32].

Strategies to increase the response rate. We will incorporate Dillman's Tailored Design Method [59] suggestions and published recommendations [35, 45, 59], to encourage participation and engagement with each round, and to ensure the high retention of expert participants in the e-Delphi process to achieve our minimum 70% response rate [32]. Strategies we will employ to increase response rates and thus decrease potential attrition bias include: sending an initial personalized email to the potential experts requesting participation before sending the e-Delphi survey [35, 59]; emphasizing that each expert's perspective matters, and for the result to be meaningful, completing the whole e-Delphi process is important [59]; and sending thank you emails to experts who have participated [45]. For each round, we will send weekly personalized reminders for the first three weeks following the distribution of the survey [59].

Consensus level. Although there is no universally accepted threshold for defining consensus in an e-Delphi process, establishing an a priori consensus criteria is considered an indicator of a good quality Delphi process [33, 60]. Researchers have established consensus using a formal measure of agreement, a measure of central tendency, percentage agreement, a central tendency within a specific range (restricted or unrestricted), the proportion of range (restricted or unrestricted), decrease in variance, stability and rank [51]. While there is no agreement on the best approach, the percentage agreement and the proportion within a range are most often used in Delphi studies [51]. In this study, we define consensus as $\geq$70% of experts rated a factor as "critical" (scores $\geq$7) and $\leq$15% of experts rated a factor as "not important" (scores$\leq$ 3).

Questions regarding the e-Delphi process or rounds. Experts will be informed that they are welcome to contact the research team at any time with questions including clarification about the aims, instructions, e-Delphi process, descriptions or definitions, and technical support when completing the survey.

e-Delphi rounds. Evidence from scoping reviews will inform Round 1 of our e-Delphi study rather than using general, open-ended questions for idea generation as is typical of classical Delphi studies [32, 61]. Participants will be invited to rate 76 factors: cognitive (n = 5), environmental (n = 17), financial (n = 3), personal (n = 11), physical (n = 20), psychological (n = 15), and social factor (n = 5) identified through the scoping reviews. Experts will receive compiled lists and descriptions of factors for each determinant identified from the scoping reviews.

Round 1. e-Delphi Round 1 questionnaire will be developed based on the findings of the scoping reviews. Experts will be asked to: a) rate factors for each determinant that are critical to assess as a part of a CMDAF when older adults are discharged from hospital to home using a 9-point GRADE Scale of Not Important (1–3), Important but Not Critical (4–6), and Critical (7–9); with the option of selecting "unable to score" b) provide a rationale for their ratings in an open-ended comment section; and, c) suggest missing factors for each mobility determinant.

Round 2. We will provide a feedback summary based on the Round 1 responses, and the feedback summary will be included as part of Round 2's introductory message. The feedback document will contain a summary document of Round 1 including bar graphs showing experts' group ratings, distribution of ratings, and individual ratings on factors that reached consensus and did not reach consensus [48], suggested factors from Round 1 and any possible changes on factor descriptions based on experts' comments. In Round 2, experts will be asked to rate the factors suggested by experts in Round 1 and re-rate the factors that did not reach consensus while considering the feedback [32, 47, 50].

Round 3. Experts will receive a similar feedback document based on findings from Round 2. Experts will be asked to re-rate only items that did not reach consensus by reflecting on, verifying, or modifying their original choice, and provide rationale for their choices.

After Round 3, the Steering Committee group will review the results and make any decisions as necessary (e.g., whether to include or exclude any factor(s) that has not reached a consensus, but is close to reaching consensus) [40]. Any decision-making by the Steering Committee will be communicated back to the experts [34]. A final list of factors for each mobility determinant will be collated to form a part of the CMDAF.

Data analysis

While expert participants will be able to withdraw at any time, data will be included up to the point of round withdrawal. All quantitative analysis will be conducted using STATA,v16.1© [62]. Descriptive statistics will be used to analyze demographic data and quantitative items. Continuous data will be tested for normality before the use of parametric inferential statistics. The response rate for each round will be calculated by dividing the number of usable responses returned by the total number of invitations sent out multiplied by 100% at each round [57, 63]. Median values, frequencies and percentages will be used as indicators of agreement on the 9-point scale [32], and will be used to calculate consensus level. The interquartile range and bar graphs [49] will show the dispersion levels and individual ratings at each round for each factor [32]; this will enable experts to see where their responses stand in relation to the group's responses. Stability, defined as the consistency of responses between successive rounds [61], will be used to assess the shift in scores across rounds as a consequence of considering the anonymized feedback from other expert participants, and will be calculated using Wilcoxon matched-pairs signed-rank or interclass correlation coefficient, if the data is normally distributed [61]. The analysis will be completed for all experts as a group and separately for each expert [49].

Qualitative analyses will be managed using NVivo Software© [64]. Open-ended comments such as rationale for experts' choices or changes, will be analyzed using content analysis [65]. Two coders will read the responses independently to develop codes and themes for each round. Coders will meet to merge their themes. Any disagreement will be discussed during a Steering Committee meeting and resolved. A reflexive journal and audit trail will be kept to capture methodological decisions throughout the Delphi process [32].

Ethical considerations

This Research have been approved by Hamilton Integrated Research Ethics Board (HIREB Project no: 7212) on May-06-2021. Only invited experts who provide informed consent will be eligible to participate in the study. The privacy and identity of all experts will be protected during and after the study. We will de-identify any feedback or summary statements shared with the experts.

Discussion

Mobility deficits are often missed during the hospital-to-home transition for older adults [66]. Functional status is a better predictor of hospital readmission than medical comorbidities in a medically complex rehabilitation population [27, 28]. Empirical evidence has found that mobility-related recommendations were omitted entirely in 53% and partially omitted in 47% of discharge summaries of 163 high-risk patients transitioning from hospital to subacute care facilities [29]. No comprehensive assessment framework based on the Conical Model of Theoretical Framework for Mobility currently exists. Similarly, available assessment tools do not incorporate all seven determinants. For instance, the Activity Measure for Post-Acute Care Inpatient Mobility Short Form [67] was designed to assess three activity domains of post-acute care function: movement and physical such as body position and transfers, personal and instrumental such as personal care, home skills, and applied cognition such as speaking and understanding; but does not include domains related to social, psychological, financial, and environmental factors affecting mobility. With no comprehensive mobility discharge assessment framework consisting of the seven determinants of mobility, it is challenging for healthcare workers to implement an integrated, holistic approach to examination, decision-making and recommendations incorporating factors known to be associated with mobility decline in older adults after discharge. Therefore, the proposed CMDAF, which will be evidence and stakeholder informed, will address the complexity of mobility in older adults during the hospital-to-home transition. It will serve as a guide for an all-inclusive assessment of mobility-related issues at hospital discharge, thereby reducing the number of readmissions and their related economic and personal burden. This study is a first step in the development of the CMDAF and will be used to guide a subsequent e-Delphi survey to decide on the tools that should be used to measure the examples of each factor included in our framework.

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CHAPTER 6: What mobility factors are critical to include in a Comprehensive Mobility Discharge Assessment Framework for older adults transitioning from hospital-to-home in the community? An International e-Delphi study.

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Preface

This chapter is the quantitative manuscript of Phase 2 of the PhD thesis that focuses on developing, through consensus, factors within mobility determinants that are critical to be part of a Comprehensive Mobility Discharge Assessment Framework for older adults transitioning from hospital-to-home. I, under the supervision of Dr V Dal Bello-Haas, and following the published protocol in Chapter 5, developed the study materials, including recruitment fliers; applied and obtained ethical approvals; conducted the research ranging from the recruitment of participants to data collection, managing the data, organizing and leading Steering Committee Meetings at each round of the e-Delphi process; conducted data analysis; wrote, revised and submitted the manuscript for publication. Dr. M Griffin, Dr. S Boamah, Dr. J Harris and Dr. T Rantanen participated in the Steering Committee Meetings. They provided feedback on the e-Delphi questionnaire, feedback summaries sent to e-Delphi expert members after each round, and the manuscript. The project including recruitment, ethics submission and approval, e-Delphi data collection and writing of manuscript was completed between February 2021 to June 2022. The manuscript was submitted in July 2022.

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Discharge Assessment Framework for older adults transitioning from hospital-to-home in the community? An International e-Delphi study.

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Abstract

Objectives

To prioritize and achieve consensus on mobility determinant factors [cognitive, financial, environmental, personal, physical, psychological, social] considered critical to include in the Comprehensive Mobility Discharge Assessment Framework (CMDAF) for older adults transitioning from hospital-to-home.

Methods

We conducted a three-round modified e-Delphi process with 60 international experts (seven older adults, nine family caregivers, 24 clinicians, and 20 researchers) from nine countries with universal or near-universal health coverage. Expert members rated 91 factors identified from scoping reviews using a 9-point scale: not important (1-3), important (4-6), and critical (7-9).

Result

A total of 41 of 91 factors (45.1%) met the a-priori consensus criterion after three rounds: five cognitive, five environmental, two personal, 19 physical, six psychological, and six social factors. No financial factors reached a consensus. Factors that reached consensus among older adults were grouped as "safety, accessibility, and availability" and "government/institutional support" and added to the final list of factors. Forty-three final factors comprise the CMADF.

Conclusions

We advanced a comprehensive mobility framework by developing, through consensus, 43 mobility factors to be assessed as part of a CMDAF. Future research will determine which measurement instruments best measure these factors.

Keywords: Mobility, Ageing, Discharge, Hospital-to-home, e-Delphi process.

Introduction

Older adults' mobility has been described as the hallmark of ageing [1]. The inability to be mobile is associated with several adverse health outcomes, including mortality risk, social isolation, and poor quality of life [1]. Mobility decline is common during hospitalization [2]. About 30% to 60% of older adults experience functional decline during and after hospitalization, as most spend more time sitting or lying on their bed than performing mobility-related activity [3–5]. Mobility decline following discharge is associated with higher hospital costs in many countries, including Canada [6], the UK [7], Australia [8], and the USA [9]. Despite this, mobility decline is not yet widely recognized as an important hospital care outcome [10].

Mobility assessments are often not completed during the hospital-to-home transition for older adults [11], even though functional status is a better predictor of hospital readmission than medical comorbidities in a medically complex rehabilitation population [12,13]. Empirical evidence has found that mobility-related recommendations were omitted entirely in 53% and partially omitted in 47% of discharge summaries of high-risk patients transitioning from hospital-to-subacute care facilities [14]. Possible explanations for this omission or reduced attention to mobility during hospital discharge include the lack of active involvement of rehabilitation professionals during discharge processes [11,15], staffing constraints in some physiotherapy departments with well-established interdisciplinary mobility care [10], or the lack of a comprehensive mobility assessment framework for discharge planning [11,15].

Mobility is a complex phenomenon with related factors influencing it; hence the need for a comprehensive framework describing the interrelationships between these factors and how they affect older adults' mobility. Webber and colleagues [10], in their Conical Model of Theoretical Framework for Mobility in Older Adults, conceptualize cognitive, psychosocial, physical, environmental, financial and personal histories/stories as determinants of mobility across seven life space locations - the room where the older adult sleeps, their home, the outdoors, their neighbourhood, their service community and surrounding area, and the world. The authors highlighted the interrelationships between the determinants and how they work together or individually to influence older adults' mobility. For example, older adults with reduced muscle strength (physical determinant) and lack of access to transportation or driving (environmental determinant) would likely have limitations in community mobility, leading to a reduction in social networks causing loneliness (social determinant) and often social exclusion from participating in social activities meaningful to older adults, decreasing their quality of life.

Franke et al. [17] expanded the Conical Model of Theoretical Framework for Mobility in Older Adults by reframing the model into a sliding scale that reveals the dynamic, fluid and experiential nature of mobility by analyzing physiological, subjective and contextual factors within and between people and their environment over time. They suggested that older adults and caregivers can identify and rate each physiological, subjective, and contextual factor influencing their mobility across the sliding scale ranging from high to low. While the Conical Model of the Theoretical Framework for Mobility in Older Adults [16] and the expanded version [17] have provided practical conceptual ideas to enhance mobility for older adults, their use has been limited in clinical practice, especially in specific settings, such as hospital-to-home transition. Within the expanded model, it may be challenging for older adults with cognitive impairment to rate which factors they believe could influence their mobility, and the framework did not provide examples of physiological, subjective, and contextual factors.

In order to identify factors within each mobility determinant, our team conducted scoping reviews to describe the associations between different forms of mobility and factors within each determinant. The findings of these reviews are published [18] or are currently under review in peer-reviewed journals [19,20]. Together these reviews included 722 articles with 76 factors, including five cognitive factors, 17 environmental, three financial, 11 personal, 20 physical, 15 psychological, and five social factors associated with older adults' mobility.

Hospital discharge processes are fast; therefore, it would not be practical to include all the factors in a comprehensive mobility discharge assessment framework. There is a need to prioritize specific factors within each determinant that are critical to assess when older adults are being discharged from hospital-to-home, advancing the practical use of the Conical Model of Theoretical Framework for Mobility [16]. In addition, the Quality and Performance Measurement Committee of the American Geriatric Society, Recommendation #3 in their White Paper Executive Summary [10], suggested a need to develop a consensus on standard methods to assess mobility. Building on these, our team aimed to develop a **C**omprehensive **M**obility **D**ischarge **A**ssessment **F**ramework (CMDAF) that clinicians can use during hospital-to-home transitions. This e-Delphi study aimed to prioritize and reach consensus on the factors within each mobility determinant [cognitive, financial, environmental, personal, physical, psychological, social] to assess, as part of the CMDAF, when older adults are discharged from hospital-to-home.

Methods

Design

This modified e-Delphi survey was developed, implemented, and the findings were reported following the Conducting and Reporting of Delphi Studies (CREDES) framework [21]. The e-Delphi study protocol has been published elsewhere [22]. Briefly, the e-Delphi method, a systematic approach to combining opinions of individuals with knowledge and experience, was employed to achieve consensus regarding mobility factors critical to assess when older adults are being discharged from hospital-to-home. The e-Delphi method was appropriate for decision making because its flexible approach allowed us to administer three-rounds of an online web-based survey questionnaire to reach a consensus without requiring participants to be physically present to participate.

Steering Committee

A Steering Committee (SC), comprised of five team investigators with expertise in mobility and e-Delphi process – two physiotherapy researchers, one occupational therapist researcher, one nurse researcher and social gerontology researcher focusing on movement; an external consultant with expertise in mobility, public health and gerontology; an older adult with mobility limitations; and a family caregiver with lived experience of receiving and providing care during hospital-to-home transition, provided overall study oversight. They met at different key stages throughout the study to ensure accuracy, comprehensiveness, and clarity of e-Delphi materials and questionnaire, review results and feedback summaries after each round, and review and make decisions about factors that were close to reaching consensus in the last round, see figure 1.

Experts' eligibility, sampling strategies, recruitment and sample

We employed criterion-based purposive sampling to recruit a heterogeneous group including researchers, clinicians, older adults, and family caregivers, henceforth referred to as experts.

Experts' eligibility

As per the protocol, we defined: (a) expert researchers as those who have authored at least two peer-reviewed articles on at least one of the mobility determinants; (b) expert clinicians as those who have at least two years of clinical experience working with older adults with mobility difficulties; (c) expert older adults as individuals, 65 years and older, who have at least one year of mobility difficulty and have experienced hospital-to-home transition; and, (d) expert family caregivers as individuals who have at least one year of providing care to older adults with mobility difficulties and have experienced hospital-to-home transition. We included older adults and family caregivers as experts because their involvement could ensure that the Delphi process findings are relevant to patients' needs and preferences, facilitate implementation of the intended CMDAF, increase compliance and ultimately improve care quality [23,24]. In addition, research has demonstrated that older adults and their family caregivers can actively participate in an e-Delphi consensus, especially when plain language explanations of items for consensus are provided [25].

Experts, regardless of their group, were recruited from a country with universal or near-universal health coverage, for example, the United Kingdom, Canada, and Australia, which offer all their citizens affordable access to comprehensive health services [26].

Recruitment

Experts were recruited via several methods including: email invitations to researchers identified through scoping reviews; email invitations to clinicians, older adults, and family members through steering committee networks; sending emails with our recruitment materials to local, national and international interdisciplinary professional associations and patient or caregiver focused organizations e.g., the British Society of Gerontology, the Canadian Association of Gerontology, HelpAge International, HelpAge Canada, IMAGINE Citizen Collaborating for Health, Caregivers Alberta, McMaster Institute for Research in Aging, and the Hamilton Council on Aging for distribution and advertising in their newsletters.

Sample

There is no standard sample size for the e-Delphi process; rather the sample size is based on the study's aims, scope, and practical purposes [27]. Using recruitment response rates of 65% [27], we initially invited approximately 31 experts to achieve our minimum sample size of 20 (five per expert group - researchers, clinicians, older adults and family caregivers). All 31 experts indicated interest in participating and suggested an additional 47 experts.

Generating a list of factors within each mobility determinant to inform Round 1.

We modified the classical Delphi process that often starts with experts generating items in Round 1. Using evidence from scoping reviews [18–20], we identified factors within each mobility determinant to be rated in Round 1. The team investigators conducted seven scoping reviews of cognitive, environmental, financial, personal, physical, psychological and social mobility determinants to identify the initial list of factors. These scoping reviews aimed to synthesize the available evidence on factors within seven mobility determinants and their association with older adults' self-reported and performance-based mobility outcomes. The reviews were registered at the Open Science Framework https://doi.org/10.17605/OSF.IO/7Y5VG; and the findings of these reviews are published [18] or currently under review in peer-reviewed journals [19,20]. Summarily, we included 722 articles across these scoping reviews, and 76 factors, including five cognitive factors, 17 environmental, three financial, 11 personal, 20 physical, 15 psychological, and five social factors, were reported as factors associated with older adults' self-reported and performed-based mobility outcomes. The plain language descriptions for each factor within each determinant was developed through an iterative process with the SC, which includes an older adult and a family caregiver; and with feedback from 15 individuals with varying education levels and knowledge of medical terminology. Details of all factors and their descriptions used in this e-Delphi study are included as an Appendix 6B.

Pilot study

Pilot testing of e-Delphi round(s) has been recommended to ensure content and face validity, receive feedback regarding formatting and plain language descriptions, determine participation time, test-run the online platform, and resolve any issues before launch [28]. We invited 18 participants with similar characteristics of the expert members to participate in the e-Delphi pilot study, and 13 participated - 7/7 for researchers, 3/4 for clinicians, 2/6 for older adults and 1/1 for the caregiver group. e-Delphi pilot study participants were asked to provide feedback regarding the structure, determine participation time, and identify issues with online platform. The areas of strength included: the survey's ease of navigation; the amount of time to complete the survey was approximately 20 minutes; the plain language definitions of factors encouraged them to complete the survey; wording which was considered appropriate; and clear instructions. Areas requiring improvement included: the consent form was deemed too long, especially for the older adults; participants experienced difficulty finding the comments section to provide rationale(s) for rating each factor; and participants had difficulty with getting back to the survey after logging out of the system.

The pilot study participants suggested eight additional factors to be included in the survey. The SC met, discussed the areas requiring improvement, and resolved concerns. For instance, the informed consent was revised and shortened to remove redundancy. We specifically highlighted and bolded the instructions on identifying the open-ended section where experts would provide a rationale(s) for rating each factor. We reminded participants to check their email to retrieve their log-in details or send an email to the study coordinator if they could not return to the survey at any time. The SC added the eight suggested factors, resulting in 84 factors to be rated by expert members in Round 1 of the e-Delphi survey.

e-Delphi Procedure

Following the CREDES recommendation [21], the number of rounds to be completed was set *a priori* as three. We chose three rounds for two main reasons. Two rounds might not be adequate to reach a consensus on a complex subject, such as mobility, with a heterogeneous group of experts; and four rounds might lead to a decreased participation rates across the rounds, which affects the Delphi process validity [29]. Each factor within each determinant was rated using a 9-point scale divided into three categories for importance rating: Not Important (1-3), Important but Not Critical (4-6), and Critical (7-9) [30]. Additionally, an "unable to score" response and instruction for its use were provided in the case experts felt they could not rate a particular factor.

Consensus

Following the CREDES recommendation [21], consensus definition was set *a priori.* We defined consensus as ≥70% of experts rating a factor as "Critical" (scores ≥7) and ≤15% of experts rating a factor as "Not Important" (scores ≤3). This consensus definition has been used in previous e-Delphi studies to ensure that opinions of minority experts, such as older adults and family caregivers, are taken into account in reaching consensus [31–33].

Survey administration

Experts' demographic information was collected via LimeSurvey with a link to the e-Delphi questionnaire hosted in DelphiManager©, a web-based system designed to facilitate the building of e-Delphi surveys that allows easy and efficient data management while allowing anonymity of expert members to be maintained throughout the study [34]. The three-round e-Delphi survey commenced on January 17, 2022, and ended on April 17, 2022, with each round open for three weeks at a time. Experts who had not responded after one week of each round launch received three personalized email reminders two weeks, a week, and three days before the end of the survey. Throughout the survey, expert members were encouraged to contact the research team for clarification regarding instructions, technical support, or additional time to complete the survey. Experts who completed Round 1 were invited to complete all rounds, even if they did not complete subsequent rounds, to ensure better representation of the opinions of the invited panel and reduce false consensus [35]. Items that reached consensus were removed in subsequent rounds. At each round, expert members were reminded of the study aim, and plain language descriptions were provided for all factors to be rated.

Round 1

Round 1 started on January 17, 2022. The Round 1 survey asked expert members to rate factors and provide rationale for rating for each determinant that are critical to assess as a part of a CMDAF when older adults are discharged from hospital-to-home. The survey asked an open-ended question about other potential factors for each mobility determinant.

Round 2

Before Round 2, the SC met and discussed the Round 1 analyses and the factors suggested by expert members in Round 1. We provided a feedback summary based on Round 1 responses as the introductory message in Round 2, see Appendix 6A. The feedback summary described the factors that reached consensus, factors suggested by expert members in Round 1, and the rationale for not adding any factors expert members suggested. The DelphiManager© has an inbuilt functionality to calculate the distribution of ratings for each factor aggregated from all Round 1 participants and stratified by each expert group. The rating distribution (group and overall rating) automatically displayed to the experts in the next round, together with a reminder of their own rating [34]. Experts were asked to re-rate these factors, rate additional factors suggested in Round 1, and provide rationales for their ratings.

Round 3

Round 3 proceeded as per Round 2. Expert members were asked to provide any additional comments regarding the e-Delphi process at the end of the survey and were offered the option to indicate if they wanted to be acknowledged in the project or remain anonymous.

At the end of Round 3, the SC met and discussed factors close to reaching consensus, defined as factors that reached consensus by at least one expert group in Round 3 but did not reach consensus in the combined group rating [36].

Data analysis

As per the protocol [22], quantitative data were analyzed using STATA,v16.1© [37], with a p-value set at <0.05. Descriptive statistics, such as frequency counts and percentages, were used to analyze and report response rate and consensus level. Response rate was defined as the total number of participants that completed each round divided by the total number of participants that received the survey, and multiplied by 100 [21]. In addition, mean (standard deviation), median, and interquartile ranges, were calculated and used to report the consensus level. Analyses were completed for all expert groups combined, and separately for each expert group. Stability, defined as the consistency of responses between successive rounds, was calculated using the Wilcoxon matched-pairs signed-rank test.

Deviations from protocol and rationale

We did revise some methods from the original protocol. First, we collected e-Delphi demographics using LimeSurvey© instead of through the DelphiManager© to maintain anonymity, as the DelphiManager team manages data collected through DelphiManager©, introducing a third party and requiring additional ethics approval. As a result, we increased the sample size for the pilot study from four participants to 13 to comprehensively understand the issues that could arise in using both Limesurvey© and DelphiManager© to conduct the e-Delphi process. Third, we planned to use histograms to provide feedback to expert members. However, because of the large number of factors (84 in Round 1 and 75 factors in Round 2), providing 84 histograms for each expert group rating alongside individual experts' ratings, would be unwieldy and visually complex. Therefore, we provided feedback to the expert members using only the overall group, specific group, and individual percentages.

Ethical consideration

This research was approved by Hamilton Integrated Research Ethics Board (HIREB Project no: 7212). Only invited experts who provided informed consent online participated in the study. The privacy and identity of all experts were protected during and after the study. We de-identified any feedback or summary statements shared with the experts.

Results

We invited 74 expert members to participate, and 60 [researchers (n=20), clinicians (n=24), family caregivers (n=9) and older adults (n=7)] participants completed Round 1 (81% response rate).

Participants demographics

Expert members' characteristics are shown in Table 1. The researchers' mean (SD) years of experience was 9.1 (6.8), ranging from 2 to 31 years. Eight (40.0%) had at least five first-author publications or published at least two publications on mobility determinants as senior authors, and two-thirds (n=14, 70.0%) had co-authored at least two publications. Most clinicians (n=21, 87.5%) worked full time and included one (4.2%) general physician, two (8.3%) geriatricians, 12 (50.0%) physiotherapists, four (16.7%) occupational therapists, two (8.3%) nurses, two (8.3%) social workers and one (4.2%) exercise physiologist. Clinicians' mean (SD) years of experience was 12.8 (10.1), ranging from 2 to 43 years. The discharge practice setting of clinicians varied, with a little over half (54.2%) reporting working predominantly in a mixed setting, while the remaining reported working in critical care (n=2, 8.3%), emergency care (n=1, 4.2%), inpatient rehabilitation (n=2, 8.3%), and outpatient rehabilitation (n=6, 25.0%). More than half (58.3%) of clinicians reported that older adults (65 years and older) constitute more than 70% of the population of their clinical practice. While four (44.4%) family caregivers and five (71.4%) older adults had experienced hospital-to-home transition in the last six months, five (55%) family caregivers and one (28.5%) older adult had experienced hospital-to-home transition in the last one year at the time of this study.

Round results

Figure 1 shows the e-Delphi survey process, results, and timeline. **In Round 1**, 60 of 74 expert members (81%) responded; eight researchers, two clinicians, two older adults and two family/informal caregivers did not respond. Among the 84 factors to be rated, 16 (19%) factors met consensus criteria (See Table 2).

Details of the rating of all factors in **Round 1** are shown in Appendix 6B. Expert members suggested an additional 25 factors, and SC met and discussed them. The SC agreed that some factors were already captured in some of the factors rated. For instance, functional cognition, defined as “the ability to use and integrate thinking and performance skills to accomplish complete everyday activities" ([38] p. 1), was suggested. However, elements of functional cognition are captured within "executive function." Hence functional cognition was not added in Round 2. Following discussion of each of the suggested 25 factors, only an additional seven factors were added in Round 2. These seven factors were governmental/institutional support, discharge goals and expectations, history of recent readmission to hospital, ability to walk 400m or a city block, ability to dual-task, ability to climb stairs, and baseline physical function before admission. See Appendix 6A for other suggested factors alongside the rationale for not adding them in Round 2.

In Round 2, 52 out of 60 expert members participated (87% response rate); one researcher, five clinicians, and two caregivers did not respond. Among the 75 factors rated in Round 2, 20 factors met consensus criteria (See Table 2). All consensus factors, except memory and muscle coordination, were stable between rounds 1 and 2 (Wilcoxon matched signed-rank test, p>0.05, see Table 3). Details of the rating of all factors in Round 2 are shown in Appendix 6B. The SC met and reviewed the factors that reached consensus in Round 2 and developed a feedback summary for Round 3.

In Round 3, 52 out of 60 expert members participated (87%); three researchers, four clinicians, and one family caregiver did not respond. Among the 55 factors in Round 3, 5 factors met consensus criteria (See Table 2). All consensus factors were stable between Rounds 2 and 3 (Wilcoxon matched signed-rank test, p>0.05, see Table 3). Details of the rating of all factors in Round 3 are shown in Appendix 6B.

Steering committee decision making post Round 3

At the end of Round 3, 41 out of 91 factors met consensus criteria. Thirteen factors that reached consensus in at least one expert group were discussed by the SC. After robust discussions (see Appendix 6A for meeting notes), the SC agreed that **governmental and institutional support systems** should be included in the CMDAF. To give voice to the older adults, the SC suggested that crime-related safety, access to rest areas, and recreational facilities could be merged as one factor to describe **safety**, **accessibility**, **and availability** and included in the CMDAF. Therefore, 43 factors were included as part of CMDAF; see Table 4 for the description of each factor.

Discussion

We used a three-round modified e-Delphi consensus methodology with an international panel of 60 expert members to identify critical factors to include in a Comprehensive Mobility Discharge Assessment Framework for older adults transitioning from hospital-to-home in the community. Forty-three factors reached consensus within six broader determinants: cognition, environmental, personal, physical, psychological and social. No factor under the financial determinant reached consensus. These findings advanced the Webbers' comprehensive mobility framework [16] by providing specific factors within each mobility determinant that are critical to assess during older adults' hospital discharge. The American Geriatric Society recommended consensus regarding a standard method to assess mobility in the hospital care, specifically in acute care, is needed [10]. Our study findings provided the first step to achieving this recommendation. Subsequent studies will focus on identifying how these mobility factors will be assessed or identifying, through consensus, an existing assessment that is validated, appropriate for hospital-to-home transition, and clinically meaningful to providers and patients [10].

Expert members identified at least two critical factors within each mobility determinant. Notably, no factor within the financial determinant achieved consensus. Although economic resources may dictate activities that could enhance mobility, such as access to fitness centers or transportation following discharge [16], financial factors may not be critical to assess as part of CMDAF amid other competing factors. This finding supports evidence from Meyer et al.'s study that reported that financial determinants were not strong predictors for mobility in the presence of other determinants [39].

Nevertheless, the countries from which we recruited our participants may have influenced why financial factors were not considered critical to be included in the CMDAF. Our expert participants were from countries with universal or near-universal health coverage, which offers all their citizens affordable access to a comprehensive health service package [40]. Another possible reason could be the fact that some experts that participated in our study do not worry about finances and are not necessarily aware of those who are not able to use transportation services due to financial challenges (e.g., taking a taxi to a medical appointment), which is not covered by universal healthcare in Canada. This reason is based on the experts' demographics, specifically older adults and family caregivers, who were highly educated and may have high incomes. With the ageing population, some of these countries have expanded their public funding to include, for instance, free or subsidized transportation for seniors [41]. Therefore, it is plausible that financial factors would be critical to include in the CMDAF in countries where citizens have private insurance or pay out-of-pocket.

Contrary to expectations, gait, the "sixth vital sign" [42], did not reach consensus in our study. This finding is surprising because gait speed has been shown to predict hospital readmission [43,44]. In previous e-Delphi studies, expert members have consistently chosen gait speed as the core outcome for the motor function domain of the National Institutes of Health Toolbox [45] and for interventional studies aiming to maintain or improve motor-cognitive function [46]. Previous studies have reported that older adults are often discharged from the hospital "quicker and sicker," as a result, they may be weak or unable to complete the gait speed walk at discharge [47,48]. Kuspinar et al. [49] reported that social support (~10%) contributed more than gait speed (~6%) to the variation in life space index scores of community-dwelling older adults in a multivariable model [49]; this finding could explain why gait speed did not reach consensus in our study. We argue that some factors' relevance or importance in mobility assessment could change amid other competing factors.

All six social factors reached consensus in Round 2, highlighting that expert members place significant importance on the impact of social factors on older adults' mobility during discharge. The role of social factors on mobility is the least studied compared to physical, cognitive, psychological, and environmental factors [18]. Social issues, such as lack of social support, are a known risk factor for adverse health outcomes in older adults following discharge [50]. Studies have reported living alone and poor social network as independent risk factors for delayed discharge, defined as a patient being discharged more than 24 hours after his/her last recorded clinically fit date [51,52], and hospital readmission [53]. Using baseline data from a double-blinded randomized, placebo-controlled trial, Ullrich et al. [54] investigated potential determinants of life-space mobility among older adults with mild to moderate cognitive impairment discharged from geriatric rehabilitation; and found that social activities were independently associated with higher life-space mobility scores. Similarly, Greysen et al. [55] reported that patients with higher levels of social engagement following hospital discharge improved significantly in their mobility compared to those with lower levels of social engagement. These studies also highlight the importance of including social factors in the CMDAF.

Group stability is considered a necessary criterion for consensus [56]. In our study, stability was present for all factors that reached consensus, except for the memory and muscle coordination factors. Interestingly the older adults in our study initially considered memory not a critical factor in Round 1. Previous studies have demonstrated that memory was not associated with mobility [49,57,58], and that some older adults consider loss of memory as a natural occurring event [58]. The complexity in describing muscle coordination and its role in mobility-related activities, such as walking and balance in older adults, could have influenced how experts rated each round [59]. In addition, evidence has shown that controlled feedback provided as comments or in statistics could impact the group stability [60]. Therefore, experts reviewing the feedback provided in each round may have influenced how they subsequently rated factors. Content analysis of the rationale for rating is currently underway and may provide insight [61].

There are several strengths in this study design and conduct. We conducted this study according to a published protocol [22], following the CREDES reporting guideline, and all deviations from this protocol were disclosed. The factors used in the Round 1 survey were identified from a comprehensive series of systematic scoping review for each of the seven determinants of mobility, highlighting several mobility-related factors that have been studied in the literature. We engaged several strategies to improve the validity and reliability of the e-Delphi process, such as pilot testing, stating a priori criteria for consensus, use of plain language in defining each factor to be rated, and feedback summaries. We used a SC, including an older adult, a family caregiver and content and methodological experts, to independently oversee the study conduct and analysis. Historically, expert members in an e-Delphi are often researchers, sometimes clinicians, and rarely older adults and family caregivers [27]. We included older adults and family caregivers as SC and expert members in our study. Involving older adults and caregivers is encouraged in the e-Delphi process as they may prioritize factors of importance that may not otherwise be prioritized in the published literature or by clinicians [62]. The relative importance placed on various factors can differ between older adults, family caregivers, clinicians and researchers [63]. Therefore, we intentionally included different expert groups to maximize relevance to these groups, especially older adults and caregivers, increasing the usability of this study’s findings in clinical practice and future research.

This study is not without limitations. All experts are from countries with universal or near-universal health coverage. While attempting to ensure equal distribution of expert members across each group, experts were skewed towards researchers and clinicians, with all caregivers recruited from Canada and older adults recruited from Canada and the UK, despite multiple and a variety of recruitment attempts. Therefore, there might still be questions about the applicability of research findings in some countries with universal or near-universal health coverage and findings may also not be applicable in countries with private health insurance (e.g., United States of America) or out-of-pocket healthcare systems in most developing countries. Moreover, we removed factors that reached consensus in subsequent rounds to increase the response rate, as evidence shows that a lower number of items in e-Delphi increases the response rate [64], thereby improving the reliability of the e-Delphi result and process. Arguably, factors that reached consensus in Round 3 in our study might be different if expert members rated all 91 factors in all rounds. Therefore, future studies should explore the effect of retaining all items in all rounds versus only consensus or non-consensus items on response rate and consensus results in an e-Delphi study.

Conclusions and future directions

Our study has identified 43 factors across all mobility determinant that are critical to be assessed as part of a CMDAF. The feasibility of assessing 43 mobility factors during hospital-to-home transition is low and requires further evaluation. Further prioritizing the number of mobility factors that can be feasibly assessed within the hospital-to-home transition is required as next steps. Regardless, this study is timely as it partly provides findings to support the Quality and Performance Measurement Committee of the American Geriatric Society's recommendation to develop consensus on a standard method to assess mobility in the hospital care, specifically in hospital-to-home transition [10]. Several steps are needed for this CMDAF to be fully implemented during hospital discharge. First, an e-Delphi consensus method recommended by the Quality and Performance Measurement Committee of the American Geriatric Society would be ideal for identifying when and how these 43 factors included in this CMDAF should be assessed [10]. The complete CMDAF would consist of factors and their corresponding measures, providing healthcare workers with a guide to comprehensively assess the factors that influence mobility post-discharge using an integrative and holistic approach. Second, feasibility testing in a hospital setting is necessary to determine the practicality of the CMDAF, focusing on feasibility outcomes while tackling barriers and leveraging facilitators to implement CMDAF. These future directions are recommended in the context of hospital discharge for countries with universal or near-universal health coverage.

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Disclosure statement

The authors report there are no competing interest to declare

Data availability statement

Available data for this project are attached as Appendices.

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Appendices

Appendix 6A – Feedback Summaries for Rounds 2 and 3 and Steering Committee meeting notes and decisions

Appendix 6B – The 91 factors, their definitions and rating per round.

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Table 1: Participant characteristics *(n=60)

	Researchers (n=20)	Clinicians (n=24)	Older adults (n=7)	Caregivers (n=9)
Age, Mean (Standard Deviation)	37.5 (8.6)	37.2 (10.8)	71.7 (7.2)	40.9 (11.9)
Female, n (%)	15 (75.0%)	10 (41.7%)	4 (57.1%)	9 (100%)
Education level, n (%)				
• PhD	13 (65.0%)	5 (20.8%)	0 (0%)	2 (22.2%)
• MSc	6 (30.0%)	15 (62.5%)	0 (%)	3 (33.3%)
• Bachelor's	1 (5.0%)	4 (16.7%)	2 (28.6%)	3 (33.3%)
• Diploma	0 (0%)	0 (%)	5 (71.4%)	1 (11.1%)
Country, n (%)				
• United Kingdom	3 (15.0%)	6 (25.0%)	2 (28.6%)	0 (0%)
• Canada	8 (40.0%)	10 (41.7%)	5 (71.4%)	7 (77.8%)
• Australia	2 (10.0%)	3 (12.5%)	0 (0%)	0 (0%)
• Finland	2 (10.0%)	1 (4.2%)	0 (0%)	0 (0%)
• Ireland	1 (5.0%)	3 (12.5%)	0 (0%)	0 (0%)
• Sweden	2 (10.0%)	0 (0%)	0 (0%)	2 (22.2%)
• Switzerland	1 (5.0%)	0 (0%)	0 (0%)	0 (0%)
• Hong Kong	1 (5.0%)	0 (0%)	0 (0%)	0 (0%)
• Singapore	0 (0%)	1 (4.2%)	0 (0%)	0 (0%)
How many times have you experienced/participated in a hospital-to-home transition? n (%)				
• Once	N/A	1 (4.2%)	3 (42.8%)	2 (22.2%)
• Twice	N/A	0 (0%)	2 (28.6%)	0 (0%)
• Three times	N/A	4 (16.7%)	0 (0%)	1 (11.1%)
• More than three times	N/A	19 (79.1%)	2 (28.6%)	6 (66.7%)
Which determinant(s) do you have expertise in (check as many as applicable), n (%)				
• Cognition	9 (45.0%)	17 (70.8%)	N/A	N/A
• Environmental	9 (45.0%)	16 (66.7%)	N/A	N/A
• Financial	7 (35.0%)	3 (12.5%)	N/A	N/A
• Personal	6 (30.0%)	10 (41.7%)	N/A	N/A
• Physical	17 (85.0%)	22 (91.7%)	N/A	N/A
• Psychological	10 (50.0%)	16 (66.7%)	N/A	N/A
• Social	13 (65.0%)	12 (50.0%)	N/A	N/A

Notes:

*=the total number of participants who completed the Round 1 survey and were invited at every round. However, 52 completed Rounds 2 and 3, with different people missing Rounds 2 and 3.
n = number of; % = percentage of; N/A = not applicable - participants were not asked that questions.

Table 2 – Forty-one Factors that Reached Consensus across all experts

Factors	Round at which consensus was reached	All Experts				
		Mean (SD)	Median (IQR)	Not Important N (%)	Important N (%)	Critical N (%)
Cognitive determinants (n=5)						
Visuospatial function	1	7.1 (1.5)	7 (6-8)	3 (5.5%)	12 (21.8%)	40 (72.7%)
Attention	2	7.1 (1.9)	7(6.5-9)	4 (7.7%)	9 (17.3%)	39 (75.0%)
Executive function	2	6.9 (1.7)	7 (7-8)	2 (3.9%)	10 (19.6%)	39 (76.5%)
Memory	2	7.2 (1.5)	7 (7-8)	1 (1.9%)	9 (17.3%)	42 (80.8%)
Global cognition	3	6.9 (1.8)	7 (6-8)	4 (7.8%)	11 (21.6%)	36 (70.6%)
Environmental determinants (n=3)						
Discharge environment (living environment)	1	7.5 (1.7)	8 (7-9)	2 (3.6%)	8 (14.3%)	46 (82.1%)
Access to public transit	2	6.6 (1.5)	7 (6-7)	2 (3.9%)	13 (25.5%)	36 (70.6%)
Access to destinations	3	6.7 (1.3)	7 (6-7)	2 (3.9%)	13 (25.5%)	36 (70.6%)
Personal determinants (n=2)						
Age	2	7.1 (2.1)	7(6.5-9)	5 (9.6%)	8 (15.4%)	39 (75.0%)
History of recent re-admission to hospital	3	7.1 (1.5)	7 (6-8)	1 (2.0%)	13 (26.5%)	35 (71.4%)
Physical determinants (n=19)						
Muscle strength	1	7.4 (1.7)	8 (7-9)	3 (5.2%)	7 (12.1%)	48 (82.8%)
Pain	1	7.6 (1.5)	8 (7-9)	1 (1.7%)	12 (20.7%)	45 (77.6%)
History of falls	1	8.0 (1.3)	8.5(7-9)	0 (0%)	6 (10.3%)	52 (89.7%)
Balance	1	7.9 (1.3)	8 (7-9)	1 (1.7%)	6 (10.3%)	51 (87.9%)
Vision	1	7.6 (1.4)	8 (7-9)	1 (1.7%)	7 (12.1%)	50 (86.2%)
Dizziness	1	7.5 (1.4)	8 (7-9)	1 (1.7%)	11 (19.0%)	46 (79.3%)
Self-care activities of daily living	1	7.2 (1.7)	7 (7-9)	3 (5.3%)	11 (19.3%)	43 (75.4%)
Frailty	1	7.5 (1.4)	7.5(7-9)	1 (1.8%)	11 (19.6%)	44 (78.6%)
Use of mobility aid	1	7.7 (1.4)	8 (7-9)	0 (0%)	10 (17.2%)	48 (82.8%)
Muscle power	2	7.2 (1.6)	7 (6-9)	1 (1.9%)	13 (25.0%)	38 (73.1%)

Muscle endurance	2	6.8 (1.8)	7 (6-8)	5 (9.6%)	9 (17.3%)	38 (73.1%)
Muscle coordination	2	7.2 (1.5)	7(6.5-8.5)	1 (1.9%)	12 (23.1%)	39 (75.0%)
Fatigue	2	7.2 (1.2)	7 (7-8)	0 (0%)	7 (13.5%)	45 (86.5%)
Number and type of comorbidities	2	7.4 (1.4)	7 (7-9)	0 (0%)	11 (21.6%)	40 (78.4%)
Instrumental activities of daily living	2	7.5 (1.6)	8 (7-9)	1 (1.9%)	9 (17.3%)	42 (80.8%)
Ability to climb stairs / steps	2	7.3 (1.3)	7 (6-9)	0 (0%)	13 (25.5%)	38 (74.5%)
Baseline or habitual physical function/mobility	2	7.5 (1.4)	7.5 (6-9)	0 (0%)	13 (26.0%)	37 (74.0%)
Sensation	3	6.6 (1.2)	7 (6-7)	1 (1.9%)	14 (26.9%)	37 (71.2%)
Respiratory system	3	7.2 (1.3)	7 (6-8)	0 (0%)	14 (26.9%)	38 (73.1%)
Psychological determinants (n=6)						
Self-efficacy	1	7.0 (1.6)	7 (6-8)	2 (3.4%)	15 (25.9%)	41 (70.7%)
Fear of fall	1	7.9 (1.2)	8 (7-9)	0 (0%)	8 (13.8%)	50 (86.2%)
Depression	2	7.4 (1.5)	7 (7-9)	1 (1.9%)	8 (15.4%)	43 (82.7%)
Motivation	2	6.9 (1.0)	7 (7-7)	0 (0%)	10 (19.2%)	42 (80.8%)
Fear of reinjury	2	7.3 (1.6)	7 (6-9)	0 (0%)	15 (28.8%)	37 (71.2%)
Discharge goals and expectations	2	7.2 (1.5)	7 (6-9)	0 (0%)	15 (30.0%)	35 (70.0%)
Social determinants (n=6)						
Living situation	1	8.0 (1.3)	9 (7-9)	0 (0%)	9 (16.1%)	47 (83.9%)
Social participation	1	7.1 (1.6)	7 (6-8)	2 (3.6%)	14 (25.0%)	40 (71.4%)
Social support	1	7.7 (1.3)	8 (7-9)	1 (1.8%)	9 (16.1%)	46 (82.1%)
Loneliness (emotional and social loneliness)	2	7.1 (1.6)	7 (6-9)	1 (1.9%)	14 (26.9%)	37 (71.2%)
Social isolation	2	7.1 (1.3)	7 (7-8)	1 (1.9%)	11 (21.2%)	40 (76.9%)
Social network (quality and quantity)	2	6.9 (1.3)	7 (6-8)	1 (1.9%)	13 (25.0%)	38 (73.1%)

Notes: 1-3 = Not important; 4-6 = Important; 7-9 = Critical. Consensus is reached for each factor when ≥70% of experts rated a factor as "Critical" (scores ≥7) and ≤15% of experts rated a factor as "Not Important" (scores ≤3).
N = number of; % = percentages; SD = Standard Deviation; IQR = Interquartile Range

Table 3: Wilcoxon matched-pairs signed-rank test for factors reaching consensus per Round.

Factors	**Prob > |z|**	Exact Prob	Z Test Statistics	Interpretation
Stability testing between Rounds 1 and 2 for 16 factors* that reached consensus in Round 2				
Attention	0.0735	0.0796	-1.790	Stable
Executive function	0.2875	0.3059	-1.064	Stable
Memory	0.0114	0.0110	-2.531	Not stable
Access to public transit	0.5216	0.5651	0.641	Stable
Age	0.5472	0.5419	-0.602	Stable
Muscle power	0.0816	0.0933	-1.741	Stable
Muscle endurance	0.1719	0.1991	-1.366	Stable
Muscle coordination	0.037	0.0435	-2.086	Marginally stable
Fatigue	0.4287	0.5437	-0.791	Stable
Number and type of comorbidities	0.4673	0.5710	-0.727	Stable
Instrumental activities of daily living	0.0728	0.0728	-1.794	Stable
Depression	0.0450	0.0536	-2.004	Stable
Motivation	0.3690	0.3767	-0.898	Stable
Loneliness (emotional and social loneliness)	0.9168	0.9018	0.105	Stable
Social isolation	0.4581	0.4874	0.742	Stable
Social network (quality and quantity)	0.9700	0.9487	-0.038	Stable
Stability testing between Rounds 2 and 3 for 5 factors that reached consensus in Round 3				
Global cognition	0.9381	0.7969	-0.078	Stable
Access to destinations	0.0484	0.0566	1.974	Stable
History of recent admissions	0.6700	0.7800	-0.134	Stable
Sensation	0.1781	0.1980	1.347	Stable
Respiratory system	0.1744	0.1955	1.358	Stable

Notes: prob > |z| = normal approximation p value, while exact p value = the exact p value. Our interpretation is based on the exact p value.
Null hypothesis: There will be no statistically significant difference between the ratings for each factor between rounds. We reject the null hypothesis if the $p < 0.05$. However, if the $p > 0.05$, we assume that there is no significant difference in the rating, indicating the rating of the factor was stable between rounds.

Table 4: Final list of factors that reached consensus and included in the Comprehensive Mobility Discharge Assessment Framework and their descriptions

Factors	*Descriptions
Cognitive determinants	
Visuospatial function	How people understand what they see and how it relates to where they are, for example, using a map to get from one place to another, walking through doorways rather than bumping into the door frames, judging how far away a car is and how fast it is moving
Attention	The ability to focus on something while ignoring other things
Executive function	A set of mental skills that allows people to plan, decide, find solutions to problems, and control themselves from acting without thinking
Memory	The ability to remember things about past events or knowledge.
Global cognition	Refers to the way people think, judge, learn, understand, remember, and see things
Environmental determinants	
Discharge environment (living environment)	What kind of house is the person discharged to, and could be home, apartment, retirement home?
Access to public transit	How easy it is to take public transit, including how many routes, how far away bus stops are and the cost of a ticket
Access to destinations	How many shops, services, senior centers are close by, how much does it cost to attend the senior centers, how easy it is to get there, and how far it is to walk, take public transit, or drive
Safety, accessibility and availability	How safe is the community based and how many community fitness or recreation centers or rest areas are close by, how much does it cost to attend, and how easy it is to get there, for example how far it is to walk, take public transit, or drive
Governmental and institutional support system	Entails services that provide benefits, structured programs and operations with systems at local, regional or national, or international levels governed and regulated by policies ensuring older adults' mobility in the community
Personal determinants	
Age	The number of years from birth
History of recent readmission to hospital	The reasons for being admitted to the hospital not long ago
Physical determinants	
Muscle strength	The amount of tension a muscle develops to move or lift an object, for example. How strong or weak a muscle is.
Pain	The uncomfortable feeling that something is wrong, and it is usually caused by tissue damage

History of falls	Includes number and history of falls, defined as any event that result in a person coming to rest on the floor or ground or other lower level.
Balance	The ability to move or to remain in a position without losing control or falling
Vision	The ability to see with the eyes
Dizziness	The feeling of faint, weak or unsteady
Self-care activities of daily living	Refers to bathing, dressing and undressing, feeding self, using the toilet, and taking medication
Frailty	People who are frail usually have 3 out of the following five symptoms: muscle loss, weakness a feeling of fatigue, slow walking speed, and low levels of physical activity.
Use of mobility aid	Using devices, such as wheelchair, walker, cane, crutch, that will help you walk or move from place to place on your own.
Muscle power	How fast the muscle can work, for example how fast can we stand up and sit down within a small timeframe
Muscle endurance	How long a muscle can work
Muscle coordination	How the muscles work together to move
Fatigue	Always feeling tired
Number and type of comorbidities	Having more than one illness or disease occurring in one person at the same time.
Instrumental activities of daily living	Things you do every day to take care of yourself and your home, and they include managing finances (paying bills), driving or planning other means of transport or do grocery shopping and prepare food
Ability to climb stairs/steps	The ability to climb stairs
Baseline or habitual physical function/mobility	Physical ability, such as getting in and out of a chair, and bathing oneself before admission
Sensation	The ability to feel touch, pain, temperature, vibration
Respiratory system	The lungs and tissues that help people breathe, and how we breath
Psychological determinants	
Self-efficacy	The belief someone have in the abilities to carry out and complete a task.
Fear of fall	Worrying about falling so much that the person do not take part in activities
Depression	A feeling of sadness and loss of interest, which stops someone from doing normal activities
Motivation	The reasons people act or behave in a specific way
Fear of reinjury	Worrying about getting hurt again
Discharge goals and expectations	Things someone hopes to achieve or desire to happen following discharge
Social determinants	
Living situation	Describes with whom you live with, such as family members, roommates, as well as how many live with you.

Social participation	Activities that allow people to connect with others in the community.
Social support	The help, comfort, concern and care people receive from family and friends to handle problems better
Loneliness (emotional and social loneliness)	An unpleasant feeling associated with having few or no friends or having lost connections with people, places, or things or when
Social isolation	The feeling people have when they do not have contact with others
Social network (quality and quantity)	The type and number of social relationships that people have

Notes:

*= plain language description for each factor was developed via iterative process with members of the Steering Committee Members comprised of five team investigators with expertise in mobility and e-Delphi process – two physiotherapy researchers, one occupational therapist researcher, one nurse researcher and one kinesiology and social gerontology researcher; an external consultant with expertise in mobility, public health & gerontology; an older adult with mobility limitations and a family caregiver with lived experience of receiving and providing care during hospital-to-home transition; and 15 individuals with varying education levels and knowledge of medical terminology.

These descriptions were included in the DelphiManager© system, with an inbuilt functionality with a HelpText column that allows a more detailed explanation of each factor. Experts viewed the HelpText column by holding the mouse over the factor they sought for description, and a statement was displayed on the screen with the description of the factor.

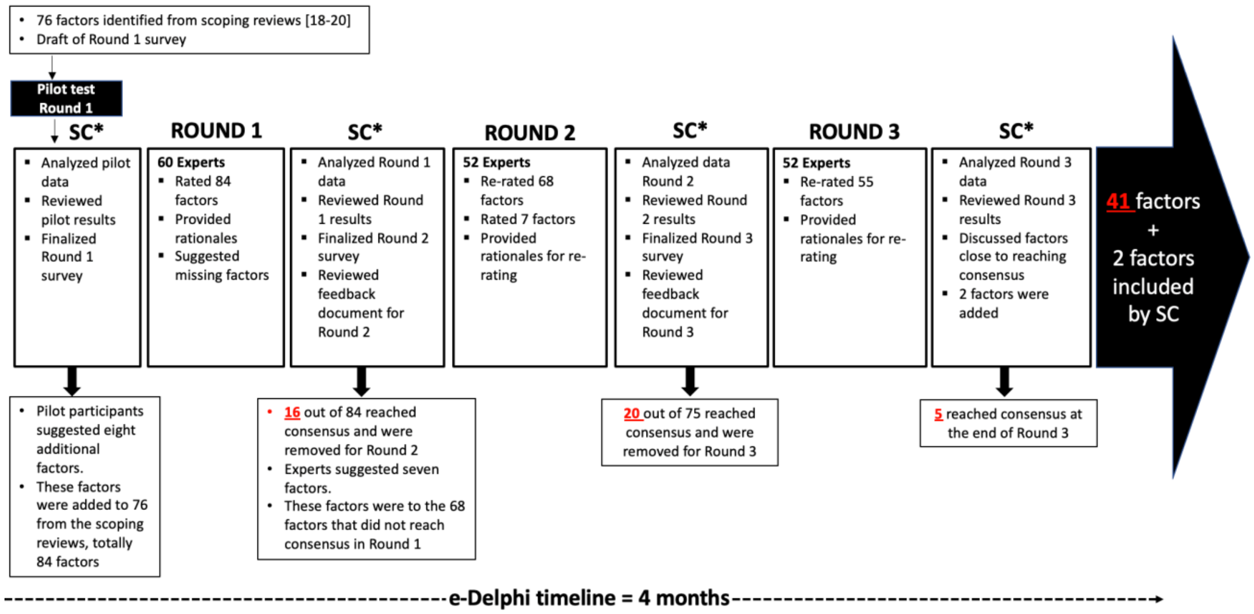

Figure 1: **e-Delphi timeline, process and results**

*SC = Steering committee

CHAPTER 7: Qualitative analysis of experts’ rationales for rating mobility factors deemed critical to assess as part of a Comprehensive Mobility Discharge Assessment Framework for older adults transitioning from hospital-to-home.

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Preface

This chapter is a qualitative content analysis of experts' rationales for rating factors within mobility determinants that are critical to be part of a Comprehensive Mobility Discharge Assessment Framework for older adults transitioning from hospital-to-home. I, under the supervision of Dr Dal Bello-Haas, developed the research questions and managed and transferred the qualitative data from the online platform into an excel sheet for data analysis. I conducted data analysis with D Rayner and Dr V. Dal Bello-Haas reviewed the data analysis process and emerging themes. D Rayner assisted in the content analysis and provided feedback on the preliminary draft of the manuscripts. I revised and submitted the manuscript. Dr. M Griffin, Dr. S Boamah, Dr. J Harris and Dr. T Rantanen provided feedback the manuscript.

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Abstract

Research question

What reasons did experts participating in a modified e-Delphi provide for rating factors to be included in a Comprehensive Mobility Discharge Assessment Framework (CMDAF) for older adults transitioning from hospital-to-home?

Method

This qualitative descriptive study was conducted as part of a three-round modified international e-Delphi study to prioritize factors critical to be included in a CMDAF. Experts were asked to provide their rationale(s) for their ratings at each round using an open-ended question. Qualitative comments were analyzed using inductive content analysis.

Result

Thirty-one experts (three older adults, six family caregivers, 12 clinicians, 10 researchers) from seven countries provided comments for their ratings. Experts conditionally placed importance on certain factors based on: the uniqueness of each older adult; health care roles and practice-based reasons; service availability and regional (context) meaning of mobility factors; the varying degrees of relevancy of mobility factors amidst competing older adult's needs; and the positive and negative role of the factor influencing mobility when older adults were discharged from hospital-to-home.

Conclusion

Findings highlight the importance of context when considering the application of mobility factors in practice.

Relevance

These findings highlight rationales for decision-making when considering mobility factors to assess when older adults are discharged from hospital-to-home

Key words: Content analysis, Mobility and Mobility factor, hospital-to-home transition

Introduction

Mobility limitation has been identified as an independent predictor of hospital readmission among adults aged 65 and older [1–3]. Hospital readmission costs account for about half of all healthcare expenses in most high-income countries [4,5]. Despite the negative consequences of mobility deficits following discharge, older adults' mobility is rarely assessed during hospital-to-home transition [6]. The lack of mobility assessment among older adults during the hospital-to-home transition could be because of the lack of involvement of rehabilitation professionals, such as physiotherapists, as active members of an interdisciplinary discharge team [7]. Further, comprehensive mobility assessment tools or frameworks that capture the seven determinants of mobility: cognitive, environmental, financial, personal, physical, psychological and social factors [8] do not currently exist. With no comprehensive mobility discharge assessment framework, it is challenging for healthcare workers to implement an integrated, holistic approach to examination, decision-making and recommendations incorporating factors known to be associated with mobility decline in older adults when discharged from the hospital. Through an e-Delphi process, our research team has developed an evidence-based and stakeholder informed comprehensive mobility discharge assessment framework that will serve as a guide for a more fulsome assessment of mobility at hospital discharge [9].

The Delphi technique, developed by the Research and Development Corporation [10], is a systematic multi-stage survey approach for achieving consensus among panel members on an important issue [11]. The original Delphi method has been used to address various topics, such as forecasting weather and the potential use of technology in military [10]. Several amended approaches from the original Delphi method have been documented and used, such as modified Delphi, decision Delphi, policy Delphi, real-time Delphi, and e-Delphi to tailor the method to specific contexts [11]. The amended approaches have been commonly used for several primary purposes including setting research, practice, and policy priorities, developing clinical practice guidelines, or gaining consensus on a particular subject matter, such as core outcome domains to be included in an effectiveness trial [11]. For instance, research groups and networks such as the Outcome Measures in Rheumatology (OMERACT) group [12], the Core Outcome Measures in Effectiveness Trials (COMET) Initiative [13], and the Core Outcome Measures in Tinnitus (COMiT) Initiative [14] primarily use the Delphi methods in developing core outcome domains and measures.

Delphi processes often involve diverse groups of "experts" who have clinical, research, or lived experience in the subject area [15]. Experts may include clinicians, researchers, patients and clients, family caregivers, and the public. Due to the heterogeneous nature of the expert panel, decisions to reach a consensus are often challenging as each group may have different perspectives. For example, evidence has found items reaching consensus among patients often differ from those reaching consensus among clinicians [16] and that patients are more likely to change their responses in a mixed panel with clinicians and researchers than in a homogenous panel (i.e., a panel with only patients) [17]. This highlights the potential for clinicians' and researchers' to implicitly influence patients’ responses and the need to garner an understanding of the rationales for rating items during an e-Delphi process.

Across e-Delphi studies, researchers are often invested in the outcome of the e-Delphi process, specifically the final rating of items that reach consensus, rather than the process, namely the reasons why participants rate as they do. Few studies report on experts members’ explanation for their ratings [18]. Rather, Delphi studies typically collate explanations and use the information as part of the feedback summary between rounds [18]. No previous studies have comprehensively explored experts’ rationales for rating items in an e-Delphi process. Understanding why experts rate items during an e-Delphi process will provide information that would enable the users of the e-Delphi outcomes, specifically the factors that have reached consensus, an understanding of behaviours, actions, and perspectives guiding experts' rating, ultimately enhancing the practical use of such Delphi outcome.

Our research team conducted an e-Delphi process, in which experts (researchers, clinicians, older adults and family caregivers) rated mobility factors to be included as part of a Comprehensive Mobility Discharge Assessment Framework (CMDAF) to be used in assessing older adults' mobility during hospital-to-home transition [19]. In addition, we were also interested in understanding the process of the ratings (e.g., why experts rated the way they did). Therefore, the e-Delphi process was structured to capture both experts' ratings on mobility factors and their rationales for rating mobility factors, providing the opportunity to garner reasons informing their rating. This qualitative study aimed to answer the following research question: What reasons did international experts in a modified e-Delphi process provide for rating mobility factors that they considered to be critical to include in a Comprehensive Mobility Discharge Assessment Framework for older adults transitioning from hospital to home?

Methods

This study was conducted as part of a three-round modified international e-Delphi study [9,19]. The current study is a descriptive qualitative study [20] involving content analysis [21] of open-ended comments provided by experts highlighting their rationales for rating factors within each determinant in Round 1. Qualitative description design facilitates the description and exploration of phenomena that captured naturalistic perspective of the participants [20].

Brief overview of the three-round modified international e-Delphi study

A detailed description of experts' eligibility, sampling strategies, and recruitment are described and published elsewhere [9]. Researchers, clinicians, older adults, and family members who met the definition of experts as shown in Box 1 and reside or practice in countries with universal or near-universal health coverage, were invited via email or through local, national, or international organizations to participate in the study. We invited 74 experts and 60 participated in the e-Delphi survey. Experts completed three rounds of the e-Delphi survey hosted in DelphiManager© - a web-based system designed to facilitate consensus-building while allowing experts to remain anonymous [22]. Experts rated factors within each of the seven determinants that are critical to be included in a CMDAF in a three-round survey using a 9-point Likert Scale of 1-3 (not important), 4-5 (important), and 7-9 (critical) [9].

Data collection

For this study, we asked experts the following question in Round 1 for each factor they rated: *what is the rationale(s) for your rating*? For subsequent rounds, experts were asked to provide rationales for re-rating factors if their rating of such factors changed from previous rounds. We only used the rationales provided in Round 1 to answer the research question in this study. Because the rating of factors that reached consensus between rounds was stable [19], as a result experts provided limited comments. Also, rationales for re-rating in subsequent rounds did not align with the research aim. Out of the 60 experts (seven older adults, nine family caregivers, 24 clinicians and 20 researchers) that participated in the e-Delphi study, only 31 experts (three older adults, six caregivers, 12 clinicians and 10 researchers) provided reasons for rating factors in Round 1, as it was optional.

Data analysis

Data were analyzed using qualitative inductive content analysis as described by Kyngas et al. [21]. Qualitative content analysis is a method that entails subjective interpretation of content or contextual meaning of text data through a systematic classification process of coding and identifying themes or patterns [21]. Content analysis is an approach for the researcher to understand the intentions, attitudes, and motives of what happened through reviewing the content of texts [21]. As no previous studies have comprehensively explored experts' rationales for rating items in an e-Delphi process, we chose inductive content analysis because such an approach allows data to emerge from the comments provided by the experts rather than using a set of predetermined codes to guide the themes that emerged from experts' comments.

Prior to the inductive content analysis, the principal researcher copied the experts' comments verbatim into seven excel sheets for each determinant (i.e., cognitive, environmental, financial, personal, physical, psychological, and social). Comments in the excel sheet for each determinant were further categorized by expert group (researchers, clinicians, older adults, and family caregivers). Following Kyngas et al.'s [21] unit of analysis definition - a chunk of text that answered researchers' questions - we focused on only statements that responded to our research question (i.e. why experts rated factors to be included in CMDAF). The inductive content analysis was conducted by two coders independently, following Kyngas et al.'s approach [21] which is comprised of data reduction, data grouping, and formation of themes. Data reduction is an open coding process in which coders read through the comments to determine which of the comments answer the research question, and codes are applied to these comments. First, two researchers (MK and DR) independently coded the transcripts containing reasons for rating environmental factors because there were more comments for the environmental factors than any other determinant. Second, the two coders met and triangulated their codes by comparing the similarities and differences between the open codes they had applied to each comment and determined which codes could be grouped to form categories (data grouping) and themes (formation of themes), creating a code book for subsequent analysis. This process was instrumental in ensuring trustworthiness of the coding process [21]. Using the codebook, each researcher independently coded the remaining transcripts containing reasons for rating the remaining mobility determinant factors (cognitive, financial, personal, physical, psychological, and social) for each expert group. The two researchers met at least four times and iteratively developed the codes for each mobility determinant to create a final coding book. The two coders examined the data individually by expert group, as a whole within each mobility factor category. Any disagreement at each meeting was resolved through discussion, and the final code book was reviewed by the senior author (VDBH). The codes, categories, subthemes, and themes generated at the end of the coding process were reviewed several times by other research team members and two external qualitative researchers familiar with the research topic to ensure themes accurately represented the rationales the participants provided. This process enhanced credibility and conformability of the study findings [21]. See Table 1 for an example of the coding process.

Strategies to ensure rigor and trustworthiness

Strategies were employed to ensure rigor, as described by Lincoln and Guba [23]. The credibility of this study was maintained by involving two coders at each stage of the analysis, keeping reflective notes of their "Subjective I’s” that would influence data analysis. Before data analysis, the two coders (MK and DR) identified their “Subjective I” – the values, assumptions, and beliefs that a qualitative researcher brings to the research [24]. For instance, the two coders independently wrote their assumptions based on mobility determinants and their knowledge of the hospital-to-home transition literature. This approach allowed the coders to reflectively ensure that the codes, categories, and themes identified from the experts' comments were not influenced entirely by their values and assumptions. Peer-member checking, where several researchers familiar with the research topic read the themes and provided feedback to ensure that the themes represented the participants' perspectives, was also applied to ensure rigor. To ensure transferability of our findings, experts in our study were from countries with universal or near-universal healthcare system. Furthermore, a detailed description of the experts' characteristics is provided, including the number of peer-reviewed articles as either the first or senior author involving at least one of the mobility determinants, and the years of clinical experience working with older adults with mobility difficulties in their professional expertise. Detailed descriptions of the older adults' number of years living with mobility limitations, how often they have actively participated in hospital-to-home discharge processes, and family caregivers' experience providing informal care for older adults with mobility limitations, specifically during hospital-to-home transitions, were provided.

Ethical consideration

This research was approved by the Hamilton Integrated Research Ethics Board (HIREB Project no: 7212). Only invited experts who provided informed consent participated in the study. The privacy and identity of all experts were protected during and after the study. We de-identified all comments provided by the experts prior to analysis.

Results

The 31 experts (three older adults, six family caregivers, 12 clinicians and 10 researchers) provided 235 comments describing their rationale(s) for rating 84 mobility determinants factors (see Appendix 7A for mobility factors, plain language definition of mobility factors, and the mean (SD) and median (IQR) rating for each factor).

Participants description

The length of time that the older adults had mobility limitations ranged from 4 to 10 years. All older adults (n=3, 100%) had experienced hospital-to-home transition in the last six months. Among family caregivers, four (66.7%) and two (33.3%) had experienced hospital-to-home transition in the last six months and one year at the time of this study, respectively. All clinicians were full-time staff, including five physiotherapists, three occupational therapists, two geriatricians, one nurse, and one social worker. Clinicians' years of experience ranged from 2 to 43 years, with a mean (SD) of 9.6 (6.5) years. Eight (66.6%) clinicians worked in a mixed discharge practice setting, while the remaining worked in outpatient (n=2, 16.7%) or inpatient (n=2, 16.7%) rehabilitation settings. Most clinicians (n=10, 83.3%) reported that older adults (65 years and older) constituted more than 70% of the population in their practice. The years of research experience among researchers ranged from 2 to 31 years, with a mean (SD) of 7.7 (6.7) years. Almost three-quarters (n=7) of researchers had at least five first or senior author publications, with the remaining (n=3, 30%) having co-authored at least two publications on mobility determinants. See further demographic information in Table 2.

Reasons for rating factors to be included in a CMDAF

Two major themes emerged from the rationales for rating factors within each mobility determinant to be included in a CMDAF: The first theme was *conditional importance and the role of factors on mobility.* As conceptualized by expert members, the conditional importance theme emphasizes placing value on some mobility factors over others based on contextual circumstances, such as the uniqueness of an older adult circumstances and practice experiences. The second theme, the *role of factors on mobility,* highlights factors as enablers or barriers that positively or negatively, and directly or indirectly, influence mobility when older adults are discharged from hospital-to-home. Based on experts' varied experiences of engaging in a wide range of older adults' mobility assessments in their research or during their professional role or lived experiences with the hospital-to-home transition, the reasons for rating mobility factors differed across expert groups (researchers (R), clinicians (C), older adults (OA), and family caregivers (CA)), as described below.

Theme 1: Conditional importance

This theme portrayed how experts conditionally placed importance on some factors over others, based on four reasons: the uniqueness of each older adult; health care roles and practice-based reasons; service availability and regional (context) meaning of mobility factors; and the varying degrees of relevancy of mobility factors amidst competing older adult's needs.

The uniqueness of each older adult

Older adults are a heterogeneous population and have variable health states embodied in different levels of health, wellness, functioning and chronic conditions and these elements may or may not affect their mobility in the same manner or to the same extent. The older adult's health and functional status uniqueness was one of the reasons that researcher and clinician experts, but not older adults and caregivers, provided as reasons for their ratings. For example, researcher and clinician experts rated the factor of ‘access to rest areas and street characteristics’ based on the potential specific circumstances and the interaction of these circumstances with the individual older adult’s health conditions and ability or need to mobilize out of the home.

> *“Assessing access to rest areas will be patient-dependent. Do they mobilize outdoors? Do they have to mobilize longer distances? Do they have a respiratory or heart condition that may cause shortness of breath?”* [R8, Canada]

> *“Street characteristics are applicable if outdoor mobility is feasible for this individual.”* [C24, Physiotherapist, Canada]

Further, researcher and clinician experts’ ratings of some physical factors, such as respiratory status, muscle coordination, and sensation, were based on older adults' pre-existing chronic conditions before hospital admission. Experts noted that some physical factors, such as sensation, should only be assessed as part of the CMDAF at discharge if there was a clinical indication to do so based on the older adult's medical or surgical history or reasons for being in the hospital.

> "Muscle coordination is only important for patients with extremely poor coordination like ataxia. The average person with below-average coordination can probably still walk and take care of themselves." [C33, Nurse Finland]

> "Sensation should only be assessed at discharge if it is clinically indicated, especially among older adults who have undergone surgery or have underlying neuropathy because of diabetes." [R26, Canada]

Researcher and clinician experts stated that understanding the older adult's mobility-related discharge goals and expectations would guide them in selecting which factors to include in CMDAF. Mobility-related discharge goals and expectations were conceptualized as mobility-related activities that someone hopes to achieve or desires to happen after discharge. Clinician experts highlighted that older adults are rarely asked about their mobility discharge goals in clinical practice, which often leads to an assessment of factors that would not promote an older adult's mobility upon discharge. Understanding what an older adult hopes to achieve as a mobility goal would help identify factors that could influence their mobility.

> "Does the patient want to access recreational facilities for physical activity upon discharge, or is there another avenue to ensure that older adults maintain physical activity upon discharge?" [R8, Canada]

> "Access to public transit is only critical if the individual do not desire to drive [upon discharge], and may not desire to walk to places, such as grocery stores." [C58, Social Worker, Canada]

Further analysis of researcher experts' rationales for including mobility factors alluded to the idea that personal determinants are better understood by exploring older adults' discharge goals and expectations, which aligns with the ideal patient-centered approach to assessment of mobility at discharge. An understanding of older adults' mobility discharge goals and expectations by clinicians and researchers would limit the risk of generalizing the impact of personal factors on mobility:

> "I would be more inclined to focus on the patient's stated [mobility-related] discharge goals and preferences, rather than any of these specific personal determinant factors – otherwise [you] risk generalizing the impact of these personal factors on mobility." [R26, Canada].

This subtheme highlights that researcher and clinician experts' ratings were based on the uniqueness of each older adults based on their health status, and mobility-related discharge goals and expectations.

Health care roles and practice-based reasons

Researcher and clinician experts, but not older adults and family caregivers experts, broadly stated that before rating mobility factors, they reflected on the logistics and the feasibility of assessing some mobility factors in practice. In the context of this study, healthcare role and practice-based reasons were described by experts as reasons related to three questions: Who can assess these factors? How can these mobility factors be assessed? Is there time to assess these factors – especially when weighing other factors critical to assess? The underlying assumption for these healthcare role and practice-based questions was built on current discharge team members. Current interdisciplinary discharge coaches determine what is assessed in alignment with their professional scope.

The selection of mobility factors by researcher and clinician experts was guided by who could assess some mobility factors, such as land mass use, when older adults are discharged from hospital to home. The quotes below highlight the questions raised by experts regarding who will assess environmental factors for example:

> "It won't be easy to see who will assess all these factors [environmental factors]; therefore, I often place the factors that can easily be assessed in the current clinical practice higher than others." [C39, Physiotherapist, Canada].

> "I should have included factors like landmass use, but who can assess those?" [R17, Ireland]

> "I thought of the professional who will assess each factor [environmental factors] before choosing them." [C15, Occupational Therapist, Canada]

How mobility factors, primarily psychological factors, could be assessed during discharge appeared to underpin how experts rated factors in the CMDAF. Experts believed that foreseeing how to evaluate each factor was foundational in deciding which factors to include in the CMDAF.

> "Some of these psychological factors, such as openness, agreeableness may provide insight, but I'm not sure how they can be assessed; hence I rated them lower." [R26, Canada]

> "While most of these factors [psychological factors] are great and sound good on paper, I am not sure how we can assess some of the factors." [C15, Occupational Therapist, Canada]

For clinicians who ultimately identify how these factors can be assessed during the discharge process, many referenced that current discharge teams lack professionals with targeted or specific expertise to assess certain factors, such as psychological factors (e.g., openness, extraversion) and environmental factors (e.g., street characteristics and sidewalk characteristics). Historically, hospital discharge processes are coordinated by nurses or physicians; occupational therapists and physical therapists, in some countries, are typically involved in discharge processes on a consultation basis. Other professionals, such as psychologists, with the professional competencies to assess psychological factors relating to mobility, are rarely involved in discharge processes [7], which makes the selection of psychological factors difficult for experts.

> "Our current clinical practice discharge coaches are primarily nurses, sometimes occupational therapists or social workers, and rarely physical therapists, and these professionals are often not in an interdisciplinary team of discharge coaches. Therefore, depending on the discharge coaches' professional scope, some factors [environmental and psychological factors] may not be assessed" [C21, Occupational Therapist, Australia].

> "I often place the factors [psychological, such as depression or delirium] that can easily be assessed in the current clinical practice higher than others" [C39, Physiotherapist, Canada]

The discharge process is complex and fraught with challenges, such as a lack of time to conduct comprehensive and accurate assessments of older adults' mobility problems, which underpinned clinician experts rationale for choosing the mobility factors to be included in the CMDAF. Clinician experts revealed that navigating what factors that were possible to assess within the limited time during discharge influenced their ratings. While some physical factors, such as muscle strength, endurance and power, are specific and critical, navigating what to assess within the limited time during discharge and the need to complete several assessments before finishing their shift influenced how clinician experts rated the mobility factors. For instance, an occupational therapist stated that " a lot of this page [physical factors] is very specific, but in the context of hospital assessment, time is generally limited" [C59, Singapore]. Another reason was that although some factors, such as gait speed, can provide insight into older adult's independence upon discharge, the assessment of these physical factors may require more time. A physiotherapist practicing in Canada stated:

> "Some factors such as the ability to walk 400m, dual-task, or even gait speed may not be possible while the patient is on admission, even though these parameters can provide insight into the patient's independence and the support they need upon discharge, but with limited time, it becomes challenging to assess gait speed upon discharge; therefore, I rated gait speed low to save time." [C39, Physiotherapist, Canada]

Appropriate health care practice is a function of clinicians' understanding of how the mobility factors should be assessed and by whom and determining if there is sufficient *time* to evaluate those mobility factors. These three reasons, taken together, offer guidelines for assessing mobility factors while considering the current interdisciplinary mobility discharge team members.

Service availability and regional (context) meaning of mobility factors

Clinician experts captured service availability as accessibility, and the quality and affordability of transport and recreational activities options available to older adults' following hospital-to-home transition. Clinician experts in some countries, such as the United Kingdom, Ireland, and Finland, stated that several government-funded services or programs increase accessibility and the availability of certain factors that could influence mobility upon discharge, such as access to public transit and recreational facilities. For this reason, they rated some of these factors as not critical, which allowed them to prioritize other factors as essential to be assessed as part of CMDAF. However, clinician experts emphasized that prioritizing other factors over environmental factors related to accessibility, such as access to public transport, was based on the premise that older adults reside in the area without accessibility issues.

> "The [Finnish] government has taken care of some factors like transportation; therefore, I rated those low, and others like social networks as critical." [C33, Nurse, Finland]

> "Organizations like AgeUK have specialized services such as accessible transportation, although this depends on where you live. So, I would prefer the clinician to ask my mother or me where she lives rather than transport access, which would help them know if we can access other services." [C54, Physiotherapist, UK]

Even though experts received a plain language description of each of the factors as part of the e-Delphi survey, clinician and family caregiver experts narrated how their knowledge or understanding of the mobility factors influenced their ratings. The clinicians and family caregiver experts further expressed how different country-specific meanings of mobility factors underpinned their thought processes influencing how they rated mobility factors. The differences in the regional meaning of mobility factors were primarily evident in environmental factors, such as land mass use and rest areas, and could explain why these factors were rated low.

> "Rest area probably means something in other places, for example, the US. In Ireland, rest areas relate to areas you can pull in when driving, and this is not a problem; hence I rated low." [C4, Geriatrician, Ireland]

> "Some of these environmental factors, take for instance land mass use is not a typical term we use in this region [Sweden], and it may mean something else culturally here." [CA2, Sweden]

The varying degrees of relevancy of mobility factors amidst competing older adult's needs

The idea of 'trade-offs' was the underlying principle for considering the varying degrees of relevance of mobility factors amidst older adults' needs. This assertion guided how experts rated each factor. Older adult experts highlighted that some factors were essential but became less important when they considered other factors that should comprise a mobility assessment for older adults transitioning from hospital-to-home. Although two mobility factors may be critical to enhancing mobility, older adults tend to more highly rate the factors that cannot be modified or amended. For instance, a 72-year-old Canadian described that "she could still walk indoors, even if the weather were terrible (i.e., snowing or raining), but she could not do anything to improve her sight or hearing" [OA45]. For this reason, she rated vision and hearing as critical factors over the weather.

Family caregiver and clinician experts further described how they 'gave up' other factors such as personal and environmental factors to be part of CMDAF to include more social and physical factors. Social factors (e.g., social support) and physical factors (e.g., muscle strength) were consistently prioritized over personal factors (e.g., culture, ethnicity, and sex) and environmental factors (e.g., weather). As described by the experts, the underlying reasons for this prioritization were anchored on the explicit roles of social and physical factors in mobility enhancement. Family caregiver experts reiterated that when social and personal factor-related questions are asked, social factors questions are more informative and can better guide the understanding of factors influencing older adults' mobility than personal factors. For example, family caregiver experts described how asking questions about culture were less important than questions related to living arrangement, which could allow them to gather further information about whether their living arrangement fostered communal social support (culture). Ultimately, experts rated social factors as critical, over personal factors. For instance, a family caregiver rated "living arrangements over culture because when relatives [living with an older adult] are around, they can help the older adults with daily chores and could motivate the [older adults] to walk after discharge" [CA11, Canada].

Similarly, another clinician expert shared the same rationale in rating physical factors (chronic conditions) higher than personal factors (sex). Experts recognized that "sex" is an important factor, probably building on the assertion that females are at a greater risk for fall related problems. Despite knowing this link, clinician experts rated medical conditions higher than sex building on the indirect relationship (risk factors) between sex and mobility.

> "Sex will determine many risk factors (e.g., fracture after a fall); therefore, I would prioritize assessing medical conditions rather than personal factors." [C58, Social Worker, Canada]

Clinician and researcher experts highlighted some factors within physical, environmental, social, and psychological mobility determinants would be considered more critical than others because rating one (e.g., muscle strength) could achieve a more desired, universal or comparable outcome versus rating another (e.g., muscle endurance). They alluded that considering factors within each determinant against each other influenced their thought process and allowed them to critically reflect on their clinical practice or research to perceive rate mobility factors that would be very important to older adults during hospital discharge. For example, within the determinant of physical factors, muscle strength was rated over muscle power because experts believed muscle strength is more sensitive to change following intervention than muscle power and endurance.

> "Even though muscle strength and endurance go hand in hand and are very vital to mobility during discharge, I rated muscle strength 9 [critical] and muscle endurance 6 [important but not critical] because I thought that when both are placed side by side, I will choose muscle strength, because it [can] provide valuable information and can help identify improvement." [R14, UK]

> "Muscle power is essential but not as crucial as strength. You don't need a lot of power to transfer and mobilize independently, and you can use a mobility aid to supplement." [C33, Nurse, Finland]

Similarly, across the social determinants, social support was rated over social networks as researcher and clinician experts were of the opinion that having a social network does not automatically equate to receiving support. Hence, the asking of a question about social support (as compared to the social network) would be more helpful in mobility assessment after discharge.

> “Social network is important but when compared to social support; social support is probably more important for mobility because having social network does not mean you will get support.” [R41, Australia]
>
> “Knowing many people (large network) does not always mean someone has support from these individuals; hence social support is more important.” [C58, Social Worker, Canada]

An 83-year-old British older adult rated depression higher than other psychological factors because he believed that depression ultimately influenced the desire to walk even when other factors, such as the walkway, are free of obstacles. He noted, “depression should be rated 9 (very critical) over other psychological factors because if you are depressed, you may not even want to take a walk when you are discharged, even if the walking route is safe and free of obstacles” [OA28, UK]. Similar reasons were noted among clinician experts for environmental factors:

> “I chose the discharge home environment over the residential characteristic because, as an occupational therapist, an older adult would want me to ask him questions regarding his home rather than the area he lives.” [C21, Occupational Therapist, Australia]

Theme 2: The role of factors on mobility

All experts, including older adults, family caregivers, researchers and clinicians, highlighted the positive and negative roles of factors and the pathway (directly or indirectly) influence older adults' mobility as the reasons guiding how they rated factors within each mobility determinant.

The positive influence of factors on older adults' mobility

Experts rated factors within each determinant based on the role of the factor in positively influencing mobility of older adults. Factors were considered to positively influence mobility if they facilitated or enabled safe and independent indoor and outdoor mobility, improved motivation to mobilize and participate in mobility-related activities (e.g., physical activities), improved mental wellbeing, or prevented falls. In other words, some mobility factors were rated as critical because they were deemed to be "protective" in terms of enhancing safety or guarding against mobility-related adverse events. All seven determinants were considered to influence mobility positively somehow, but to varying degrees. Experts agreed that social, physical, or environmental factors often directly influenced mobility, implying that, for example, increased social support, improved muscle strength or good street interconnectivity in an area would lead to increased mobility in older adults. The role of physical factors in preventing falls, facilitating older adults' mobility independence, and motivating physical activity participation following discharge were also identified as reasons experts rated physical factors as high importance and to be included in the CMDAF.

> "Proprioception is critical in preventing falls; the history of falls predicts the tendency for falls to occur; muscle strength, balance, and vision are crucial to mobility." [R51, UK]

> "Good balance and muscle coordination reduces the likelihood of frequent falls." [CA11, Canada]

> "Proprioception, and sensation affect movement quality and safety; History of falls, balance, fatigue, vision, dizziness, and use of mobility aid are considerations for safety, confidence, fear of falling, and motivation to mobilize" [C15, Occupational Therapist, Canada]

Although most environmental factors were not rated highly in the e-Delphi process, their role in enabling safe and independent outdoor and indoor mobility, and physical activity participation guided the rating of environmental factors. Of note, discharge home environment was rated highly among all other environmental factors, building on its role in maintaining and facilitating home independence.

> "Street, residential, and sidewalk characteristics directly dictate how safe (e.g., even sidewalks) the area is for me to walk or not walk." [OA28, UK]

> "Access to rest areas, recreational facilities, sidewalk characteristics, and traffic-related safety facilitate community ambulation and outdoor activities." [R36, Sweden]

> "Discharge home environment facilitates independence at home, and street characteristics enable safety for community ambulation." [C39, Physiotherapist, Canada]

Personal factors (e.g., race) indirectly influence older adults' mobility, implying that they provide insight into other factors, such as social and physical factors, that could influence mobility [25]. For example, older Black adults (personal factor) have a high prevalence of diabetes (physical factor), and because of this condition, older Black adults are more predisposed to mobility limitations than their white counterparts [25]. Older adult, clinician and researcher experts highlighted the role of marital status (personal factor) in providing insight into the potential social support (social factor) from the older adult's spouses, family members and community. The experts assumed that this social support could be a catalyst for improving mobility-related activities. Regardless, experts rated social factors higher than personal factors but emphasized the importance of understanding the personal factors, not necessarily including them as a critical factor to be assessed as part of CMDAF.

> "Having someone at home (e.g., a spouse) to help each other plays a significant role to discharge. But I am not sure if they will surely help the older adults. Discharging a patient who lives alone is more challenging, especially with ADLs and IADLs." [C33, Nurse Finland]

> "I had a partner at home who could take care of me; for instance, he could walk with me in our area upon discharge." [OA46, Canada]

> "Marital status helps understand support at home following discharge." [R26, Canada]

Although the positive influence of psychological and cognitive factors on older adults' mobility was not cited as the reason for rating mobility factors, there were instances where experts considered these influences. Clinician experts considered some psychological factors, such as self-efficacy and emotional wellbeing, to be vital to mobility because they facilitated an older adult's motivation to mobilize following discharge. The most common reason for highly rating cognitive factors, such as memory and attention, was their role in enhancing effective communication of mobility-related information and their importance in recalling instructions that could help improve ambulation.

> "Self-efficacy [defined as the belief someone has in the ability to carry out and complete a task] affects motivation to attempt to mobilize." [C15, Occupational Therapist, Canada]

> " Good memory and attention are needed to ensure that older adults or their relatives understand and recall instructions regarding ambulation following discharge." [C63, Geriatrician, UK]

In addition to maintaining mobility and participation in physical activity, experts emphasized the role of social factors in maintaining the psychological wellbeing of older adults after discharge as their reason for rating social factors as high. Older adults with good mental health are more likely to seek connections in the community, which by extension, can help to improve their mobility.

> "Social support, reduced loneliness, living situation, and social participation are critical for improving older adults' psychosocial wellbeing following discharge." [R51, UK]

> "It is crucial to interact with people and continue your social connection; after discharge, older adults often want to go into the community to connect, promoting mobility." [CA11, Canada]

Generally, experts highlighted the role of mobility factors, such as social, physical, and environmental, as enablers that directly and positively influence older adults' mobility. Experts mentioned the indirect influence of personal factors on older adults' mobility and the significant role of cognitive factors in enhancing effective communication of mobility-related information during discharge. Overall, the interrelatedness of these mobility factors further highlights the complexity of the role of factors as enablers of mobility-related outcomes.

The negative influence of factors on older adults' mobility

All experts also described the negative influence of factors on older adults' mobility as their reasons for rating factors within each determinant. Factors were considered to negatively influence mobility if they hindered safety and independence or increased the risk of developing mobility issues. All factors, except personal and financial factors, were deemed to negatively influence older adults' mobility.

> "A very poor memory would create many challenges with discharge. It would also potentially cause a safety concern for the patient being home." [C33, Nurse Finland]

> "Snow hinders mobility and has affected how I provide mobility-related care to my dad. During snow, we rarely work as we fear that he may fall." [CA49, Canada]

All experts considered psychological factors (as compared to physical, social, and environmental factors) as barriers to enhancing outdoor or indoor mobility and decreased physical activity. Across all physical, environmental, cognitive, and psychological factors, fear of falling, fear of re-injury, and depression were predominantly mentioned as barriers to older adults' physical activity participation, which can cause mobility decline. Experts described how older adults who fear falling will limit movement even in a familiar zone and they may further limit their mobility in an unfamiliar zone away from home, which could ultimately lead to activity restriction and further cause functional disability. As older adults are already confined in the hospital, their social activity participation may be affected by their hospital admission. Therefore, transition coaches should prioritize the assessment of factors such as fear of falling and depression that could further limit mobility. This line of reasoning guided how experts rated some of these psychological factors.

> "Fear of falling can cause older adults to become inactive or decrease physical activity, which is a risk factor for various health conditions and declining mobility for that age group." [R52, Australia]

> "Fear of falling can limit a person's functional ability indoors and outdoors - it can impact their participation in the activity of daily

> life, community ambulation, and integration into their community." [C59, Occupational Therapist, Singapore]
>
> "Depression can make you lazy when they discharge you at home, and because you also have mobility issues, it worsens." [CA49, Canada]
>
> "Depression limits my ability/motivation to continue exercising or maintain activity levels." [OA46, Canada]

Discussion

Although Delphi management systems for e-Delphi studies, especially those using a web-based system, have built-in open-ended sections for expert members to provide comments or to answer questions posed, e-Delphi studies rarely report on the findings of these open-ended questions or comments. In this study, we purposely collected data about the reasons and rationales older adult, family caregiver, clinician, researcher experts who participated in an international e-Delphi provided for rating factors that are critical to be included in a CMDAF for older adults transitioning from hospital to home. The comments and answers provided offer researchers a rich and unique opportunity to garner an understanding of perspectives and what is valued – in other words a 'window' into thought processes and decision-making about what is deemed important and why.

We identified six patterns within the reasons experts provided for rating factors to be included in the CMDAF. However, the reasons differ across expert groups, highlighting the differences of opinion influencing the rating of items in the e-Delphi process. Older adult and caregiver experts highlighted that their reflections on the protective role and the negative influence of these factors on older adults' mobility guided their thought process in rating each factor. In addition, researcher and clinician experts reported that they conditionally placed importance on some mobility factors over others based on contextual circumstances including: the uniqueness of each older adults; healthcare and practice-based reasons; service availability, and regional (context) meaning of mobility factors. Previous e-Delphi studies have reported differences in perception across stakeholders group quantitatively and not qualitatively [26,27]. Owens et al. [27] reported that clinicians prioritize research that focuses on providing physical healthcare, whereas care partners or service users prioritize research that promotes independence, self-esteem and recovery. The differences of opinion have value because collaborative planning that allows similarities and differences in opinion encourages different ways of thinking and creates innovation that tends to have greater impact when implemented [28].

Our study highlighted the notion of "trading off" as an important concept in an e-Delphi process. However, the rationale for the trade-off differs across experts. Older adult experts' ideas of "trade-offs" were based on rating factors with no alternatives (those they cannot control) higher than those with alternatives (those they can control). For instance, an older adult expert rated vision and hearing higher than the weather since she can work indoors even if the weather is terrible. Clinician and researcher experts' "trade-offs" of factors were based on rating factors with a universal comparable outcome in practice higher than those with a less universal comparable outcome. For instance, they rated muscle strength higher than muscle endurance because they believed that muscle strength assessment could be more universally compared across studies than muscle endurance assessment. These differences in opinion among experts in our study have been noted in a previous study that asked clinicians, individuals with atraumatic brain injury (ABI) and their caregivers to describe factors that influence mobility among individuals with ABI [29]. Overall, the differences in opinion among experts in our study provided insight into the thought processes of why experts rated the way they do in an e-Delphi process, emphasizing the need to specifically ask experts to provide the rationales for a rating in a study that aimed to reach consensus on items. Difference in rationale among experts gives credence to the assertion that older adults, family caregivers, researchers and clinicians might want different things regarding mobility assessment of older adults during hospital-to-home transition.

The ratings of the family caregiver, clinician and researcher experts were based on the explicit roles of social and physical factors in mobility enhancement. They traded other factors to include social and physical factors because they believed that social and physical factors are foundational to the interrelatedness of mobility factors. High-quality evidence with a large effect size for the association between older adults' mobility decline has been found for several social factors, including poor social networks and engagement [30], and could explain why experts traded other factors to include social factors. Similarly, social factors, such as social participation, have been identified as protective against cognitive decline that often accompany mobility decline in older adults [31,32]. Generally, evidence has shown that most physical and social factors influencing mobility are modifiable determinants, readily amenable and sensitive to change with intervention [33]. However, this "trade-off" notion of other factors, including social and physical factors, seem to be based on mobility as walking versus mobility achieved via transport, or driving that are often linked to other determinants such as environmental and cognition [34,35].

The questions of "who" should assess particular mobility factors and "how" mobility factors should be assessed that were raised as elements in reasons for researcher and clinician expert participants' ratings align with the discussion points raised in the Quality and Performance Measurement Committee of the American Geriatrics Society's White Paper Executive Summary [36]. The White Paper discussed the who, what, when, where, and how to assess and prevent mobility loss in the hospital [36]. The researcher and clinician experts in our study also reflected on the logistics and feasibility of assessing various/particular mobility factors during hospital-to-home. Specifically, the White Paper noted nurses, nurses' aides, and therapists (*'who'*) are likely to assess older adults' mobility in the acute care setting. Researcher and clinician experts in our study indicated the importance of a comprehensive, interdisciplinary team inclusive of team members beyond the more 'typical' HCPs e.g., psychologists. Current hospital-to-home transition models, e.g., Naylor [37] and Coleman [38]) are nurses or physician-led and focus on, but are not limited to, self-management of medical conditions and medications, with no mobility assessment component, even though functional status is a better predictor of hospital readmission than medical comorbidities. Rehabilitation professionals, such as physiotherapists' and occupational therapists' main scope of practice centers on mobility, as it is defined – moving via self, use of assistive devices and transportation/driving **[8]**, but they are often consulted when and as deemed necessary. This consultation model limits their role in the identification of older adults who might be readmitted because of mobility limitations during hospital discharge. Therefore, and as suggested by researcher and clinician experts in our study, creating a comprehensive, interdisciplinary team, such as physiotherapists, occupational therapists, and psychologists, could be promising to improve health outcomes, such as functional status, which is a known independent predictor of readmission, possibly reducing the economic cost associated with hospital readmission.

Study limitations and strengths

The strength of this study lies in two areas: the expert population and employing strategies to ensure rigour and trustworthiness throughout the data collection and analysis approach. e-Delphi studies rarely include multiple expert groups, and we included older adults, family caregivers, researchers, and clinicians from nine countries. The inclusion of different expert groups allowed us to assess comprehensively the reasons for rating factors, which we noted differs between experts group. For instance, clinician and researcher experts' rationale for rating factors conceptually focused on the heterogeneous nature of the older adults, i.e., focusing on the uniqueness of each older adult. Older adults and family caregivers stated that they rated each factor based on their role in promoting or limiting older adults' mobility.

We followed Lincoln and Guba's [23] processes as described above. Summarily, we used two coders; the two coders completed an initial content analysis of environmental factors and then meet to ensure both are coding comments that aligns with the research question. Before the start of the analysis, the two coders, reflectively identified their Subjective I's – the assumptions that they brought regarding the mobility and hospital-to-home transition. The two coders often refer back to the Subjective I statement to ensure integration of their knowledge while allowing the themes to emerge from the data. To increase the credibility of data analysis, the two coders actively searched for diverging themes to enable us to understand opposing views regarding why experts rated the way they did. For instance, researcher and clinician experts stated that muscle coordination is only important if the patient has extremely poor coordination; whereas family caregivers thought that regardless of the state of coordination of the older adult, good muscle coordination will likely reduce falls, hence should be considered critical. These discrepancies could explain why muscle coordination was moderately rated in Round 1 of the e-Delphi process [19]. We provided detailed descriptions of the experts' demographics, including their years of clinical, research, or experiences in participating during the hospital-to-home transition. The detailed experts' description allows readers to understand the significant and complex contextual meaning underpinning the themes that emerged from this study. Being one of the few qualitative studies to analyze experts' comments is a strength and have provided foundational knowledge to application of the CMDAF.

This study also has limitations. The original e-Delphi sample was 60, but only 31 experts provided comments. It is possible that the remaining 29 experts did not provide rationales for rating mobility factors because of the burden of filling out a lengthy e-Delphi survey. Experts were asked to rate 84 factors in Round 1 of our e-Delphi survey. In addition, they were also asked to provide rationales for rating each. Because of this, it is plausible that experts may have experienced a burden in providing rationales for rating each factor in the comment section. Therefore, since it was not compulsory to provide reasons for rating factors in Round 1, most experts may have skipped providing rationales. It is, therefore, plausible that themes or subthemes would have changed if we had more experts provide comments for rating, highlighting the need to interpret the results with caution.

While we ensured that the voice of older adults and family caregivers were captured in the analysis, researchers and clinicians had a larger sample size and inherently provided more comments for rating factors. For instance, the 235 comments were distributed as follows: older adults (12), family caregivers (18), clinicians (100) and researchers (105). The make-up of comments across different experts group explains why there were differences in the reasons for rating factors. The differences in the reasons may not have been noted if older adults and family caregivers had provided more comments.

Qualitative comments in an open-ended section provided reasons for the rating. However, exit interviews or focus groups could provide additional insight into why the experts rated the way they did. Therefore, future research should consider integrating exit interviews with open-ended questions to explore in detail the rationale for a rating in an e-Delphi process and to understand the decision-making process influencing how items are rated in an e-Delphi process.

Conclusion

Experts' rationale for rating factors included in the CMDAF was based on two concepts: selective importance of mobility factors, and the role of mobility factors in influencing mobility-related outcomes after hospital discharge. All experts reflected on factors as mobility enablers or barriers, guiding how they rated each factor. In addition, clinician and researcher experts conditionally placed importance on mobility factors based on: uniqueness of each older adult; health care and practice-based reasons; service availability and regional meaning of mobility factors; and the varying degree of relevancy of mobility factors amidst competing older adults' needs. This finding has offered a rich and unique opportunity to garner an understanding of perspectives and thought processes, and decision-making in an e-Delphi process. Furthermore, the reasons provided by experts in this study can inform guide the application of CMDAF in clinical practice to guide patient care, discharge planning and improve clinical outcomes.

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Disclosure statement

The authors report there are no competing interest to declare

Data availability statement

Available data for this project are attached as Appendices, at the end of the thesis.

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Appendices

Appendix 7A – Mobility factors, plain language definition of mobility factors, and the mean (SD) and median (IQR) rating for each factor)

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Table 1 – Example of the coding process for two themes

Sample unit of analysis (participant quote)	Codes (open coding)	Categories	Subthemes	Themes
Muscle coordination is only important for patients with extremely poor coordination like ataxia. The average person with below-average coordination can probably still walk and take care of themselves. (C33, Nurse, Finland)	Only important if the older adult has poor proprioception	It depends on the older adult health conditions	The uniqueness of each older adult	
Sidewalk characteristics will depend on the activities essential to the particular patient's discharge (R8, Canada)	Activities an older adult wants to do after discharge	It depends on the older adult discharge activity goals		
I would be more inclined to focus on the patient's stated [mobility-related] discharge goals and preferences, rather than any of these specific personal determinant factors – otherwise [you] risk generalizing the impact of these personal factors on mobility (R26, Canada)	The older adult mobility discharge goals	It depends on the older adult mobility discharge goals		
I should have included some factors like landmass use, but who can assess those (R17, Female, Ireland)	Who can assess some of the environmental factors	The who, how, and time needed to assess some of the mobility factors	Health care roles and practice-based reasons	
Some of these psychological factors, such as openness, agreeableness may provide insight, but I'm not sure how it can be assessed, hence I rated them lower (R26, Canada)	How can you assess some of the psychological factors			
Some factors such as the ability to walk 400m, dual-task, or even gait speed may not be possible while the patient is on admission, even though these parameters can provide insight into the patient's independence and the support they need upon discharge, but with limited time, it becomes challenging to assess gait speed upon discharge; therefore, I rated gait speed low to save time (C39, Physiotherapist, Canada)	Can be assessed and provide insight, but no time to assess			
Our current clinical practice discharge coaches are primarily nurses, sometimes occupational therapists or	Current interdisciplinary	Current clinical		

social workers, and rarely physical therapists, and these professionals are often not in an interdisciplinary team of discharge coaches. Therefore, depending on the discharge coaches' professional scope, some factors [environmental and psychological factors] may not be assessed (C21, Occupational Therapist, Australia)	discharge coaches determine what is assessed in alignment with their professional scope	practice determines what is assessed?		Conditional importance
The [Finnish] government has taken care of some factors like transportation; therefore, I rated those low, and others like social networks as critical (C33, Nurse, Finland)	Government takes care of some factors, such as transport.	Some factors are less important to assess if subsidized or covered by the government	Service availability and regional (context) meaning of mobility factors	
Organizations like AgeUK have specialized services such as accessible transportation, although this depends on where you live. So, I would prefer the clinician to ask my mother or me where she lives rather than transport access, which would help them know if we can access other services (C54, Physiotherapist, UK)	Transportation has been subsidized by the government			
Rest area probably means something in other places, for example, the US. In Ireland, rest areas relate to areas you can pull in when driving, and this is not a problem; hence I rated low." (C4, Geriatrician, Ireland) Some of these environmental factors, take for instance land mass use is not a typical term we use in this region [Sweden], and it may mean something else culturally here." (CA2, Sweden)	Environmental factors might mean different things in countries	Regional meaning of mobility factors		
The culture or ethnicity of the person matters; because in some cultures, for example, the Asian or African cultures, older adults live with relatives, and they are taken care of by relatives or loved ones; so, I rated living arrangement over culture because when relatives are around, they can help the older adults with daily chores while they recover. They can even help them walk sometimes (CA11, Canada)	Prioritizing living arrangements over culture and ethnicity	Prioritizing social factors over other factors, such as personal and psychological factors	The varying degrees of	
I (social worker) think the older adults may want me to ask about someone who will help them move around when they				

are discharged. This is one of the reasons I choose social-related factors over other factors like psychological factors (CA11, Canada)	Prioritizing social factors higher than psychological factors		relevancy of mobility factors amidst competing older adult's needs	
Sex will determine many risk factors (e.g., fracture after a fall); therefore, I would prioritize assessing medical conditions rather than personal factors (C58, Social Worker, Canada)	Prioritizing medical conditions over sex	Prioritizing physical factors over environmental and personal factors		
Weather is important, but I cannot rate this critical because my ability to see and hear is critical because I can walk indoors when the weather is bad, raining or snow (OA45, Canada)	Prioritizing vision and hearing over weather			
Even though muscle strength and endurance go hand in hand and are very vital to mobility during discharge, I rated muscle strength 9 (critical) and muscle endurance 6 (important but not critical) because I thought that when both are placed side by side, I will choose muscle strength (R14, UK)	Prioritizing muscle strength over muscle endurance	Prioritizing factors within mobility determinants		
Depression should be rated 9 (very critical) over other psychological factors because if you are depressed, you may not even want to take a walk when you are discharged, even if the walking route is safe and free of obstacles. (OA28, UK)	Prioritizing depression over other psychological factors			
I chose the discharge home environment over the residential characteristic because, as an occupational therapist, an older adult would want me to ask him questions regarding his home rather than the area he lives (C21, Occupational Therapist, Australia)	Prioritizing discharge home over residential characteristics			
Having someone at home (e.g., a spouse) to help each other plays a significant role to discharge. But I am not sure if they will surely help the older adults. Discharging a patient who lives alone is more challenging, especially with ADLs and IADLs (C33, Nurse, Finland)	Marital status provides insight into support at home enabling ADL and IADL	Personal factors (marital status) indirectly and positively influence	Positive influence of factors on older adults' mobility	The role of factors on mobility
I had a partner at home who could take care of me; for instance, he could walk with me in our area upon discharge (OA46, Canada)	Marital status provides insight into support at			

If I did not have my wife as a caregiver at home; I could not have gone home (OA45, Canada)	home enabling care at home	older adults' mobility		
Proprioception is critical in preventing falls; the history of falls predicts the tendency for falls to occur; muscle strength, balance, and vision are crucial to mobility (R51, UK)	Proprioception and history of falls help prevent adverse mobility-related outcomes (falls)	Physical factors directly and positively influence older adults' mobility		
Balance, muscle strength, power, endurance, coordination, range of motion, proprioception, sensation, pain, history of falls, balance vision, self-care activities of daily living, and instrumental activities of daily living are needed for safe independence in mobility (R36, Sweden)	Physical factors are needed for safe and independent mobility			
The discharge environment is critical to ensure that older adults can independently perform ADLs at home (R51, UK)	Discharge environment promotes independence at home	Environmental factors directly and positively influence older adults' mobility and PA participation		
Street, residential, and sidewalk characteristics directly dictate how safe (e.g., even sidewalks) the area is for me to walk or not walk (OA28, UK)	Environmental factors facilitate walking			
Street characteristics, traffic-related safety, access to recreational facilities, destinations, rest areas, public transit, and weather may affect motivation for outdoor mobility among the elderly in the community (C15, Occupational Therapist, Canada)	Environmental factors motivate older adults to mobilize outdoors			
Street characteristics, access to the destination, and public transit could facilitate PA participation (R51, UK)	Environmental factors facilitate PA participation			
I rated openness as important because it is good to know if the patient is aware that she may need more assistance, such as a change in their environment that can promote mobility after discharge (C59, Occupational Therapist, Singapore)	Openness may make an older adult more willing to mobilize and accept assistance	Psychological factors directly and positively influence older adults' mobility and		
Self-efficacy [defined as the belief someone has in the ability to carry out and complete a task] affects	Self-efficacy affects			

motivation to attempt to mobilize (C15, Occupational Therapist, Canada)	motivation to mobilize	motivation to mobilize		
Attention is needed to focus on ambulating properly and to recall precautions, and visuospatial function is required to enable older adults to be aware of their body in space to walk safely (C63, Geriatrician, UK)	Attention facilitates proper ambulation	Cognitive factors directly and positively influence older adults' ability to follow instructions, influencing ambulation		
Having good memory will enable me to follow instructions regarding mobility when discharged (OA45, 72 years, Canada)	Memory assesses one's ability to follow instructions			
Social support, reduced loneliness, living situation, and social participation are critical for improving older adults' psychosocial wellbeing following discharge (R51, UK)	Social factors influence mental wellbeing	Social factors influence mental wellbeing and motivation to mobilize		
Loneliness may affect patient's motivation to mobilize; a patient's social participation status before mobility decline is likely to determine their desire to mobilize (C15, Occupational Therapist, Canada)	Social factors influence motivation to mobilize			
Poor balance and dizziness can lead to falls; higher frailty puts patients at risk of injury and readmission (C33, Nurse, Finland)	Increase risk of adverse mobility-related outcomes (readmission, falls, reinjury)	Physical factors as barriers to mobility and mobility-related outcomes	Negative influence of factors on older adults' mobility	
Sedentary living and high BMI are often associated with musculoskeletal disorders and mobility decline (C15, Occupational Therapist, Canada)	High BMI and sedentary living are barriers to mobility			
Language barriers affect the way we gather and dispense information relating to mobility. Also, language barriers may delay discharge due to the need to involve translators (C33, Nurse, Finland)	Language barriers can affect receiving and gathering information related to mobility	Reduced cognitive ability as barriers to communication and safety		

A very poor memory would create many challenges with discharge. It would also potentially cause a safety concern for the patient being home (C33, Nurse, Finland)	Poor memory can lead to safety concerns			
Fear of falling, emotional well-being, self-perceived fatigue, anxiety, apathy, affect, and depression could be barriers to physical activity/mobility (R51, UK)	Psychological factors can act as barriers to PA and mobility	Physical factors as barriers to mobility and PA		
Fear of falling can limit a person's functional ability indoors and outdoors - it can impact their participation in the activity of daily life, community ambulation, and integration into their community (C59, Occupational Therapist, Singapore)	Psychological factors can limit indoor and outdoor mobility			
Snow hinders mobility and has affected how I provide mobility-related care to my dad. During snow, we rarely work as we fear that he may fall (CA49, Canada)	Weather can influence the provision of mobility-related care	Environmental factors as barriers to mobility-related care and mobility		
If it is raining; I cannot go outside, and I like to walk out (OA46, Canada)	Weather can influence the ability to walk outdoors			

ADL – Activities of daily living; BMI – Body mass index; C – Clinician; CA – Caregiver, IADL – Instrumental activities of daily living; OA – Older adults; PA – Physical activity participation; R – Researcher

Table 2: Participant characteristics (n=31)

	Older Adults (n=3)	Caregivers (n=6)	Clinicians (n=12)	Researchers (n=10)
Age, Mean (Standard Deviation)	77.7 (5.6)	38.7 (10.5)	37.2 (10.8)	35.5 (8.4)
Female, n (%)	1 (33.3%)	6 (100%)	5 (41.7%)	7 (70.0%)
Education level, n (%)				
• PhD	0 (0%)	2 (33.3%)	2 (16.7%)	7 (70.0%)
• MSc	0 (0%)	3 (50.0%)	8 (66.7%)	2 (20.0%)
• Bachelor’s	1 (33.3%)	1 (16.7%)	2 (16.7%)	1 (10.0%)
• Diploma	2 (66.7%)	0 (0%)	0 (0%)	0 (0%)
Country, n (%)				
• United Kingdom	1 (33.3%)	0 (0%)	2 (16.7%)	2 (10.0%)
• Canada	2 (66.7%)	5 (83.3%)	5 (41.7%)	3 (30.0%)
• Australia	0 (0%)	0 (0%)	2 (16.7%)	2 (20.0%)
• Finland	0 (0%)	0 (0%)	1 (8.3%)	1 (10.0%)
• Ireland	0 (0%)	0 (0%)	1 (8.3%)	1 (10.0%)
• Sweden	0 (0%)	1 (16.7%)	0 (0%)	1 (10.0%)
• Singapore	0 (0%)	0 (0%)	1 (8.3%)	0 (0%)
How many times have you experienced/participated in a hospital-to-home transition? n (%)				
• Once	1 (33.3%)	0 (0%)	0 (0%)	N/A
• Twice	1 (33.3%)	0 (0%)	0 (0%)	N/A
• Three times	0 (0%)	0 (0%)	1 (8.3%)	N/A
• More than three times	1 (33.3%)	6 (100%)	11 (91.7%)	N/A
Which determinant(s) do you have expertise in (check as many as applicable), n (%)				
• Cognition	N/A	N/A	9 (70.8%)	6 (60.0%)
• Environmental	N/A	N/A	8 (66.7%)	2 (20.0%)
• Financial	N/A	N/A	1 (12.5%)	5 (50.0%)
• Personal	N/A	N/A	5 (41.7%)	6 (60.0%)
• Physical	N/A	N/A	15 (91.7%)	12 (85.0%)
• Psychological	N/A	N/A	8 (66.7%)	6 (50.0%)
• Social	N/A	N/A	6 (50.0%)	8 (65.0%)

- n = number of; % = percentage of; N/A = not applicable - participants were not asked that questions.

Box 1: Definition of experts

- **Researchers** were considered an "expert" if they have authored at least two peer-reviewed articles as either the first or senior author in at least one of the mobility determinants.
- **Clinicians** were considered an "expert" if they have at least two years of clinical experience working with older adults with mobility difficulties in their field of professional expertise and hospital-to-home transitions.
- **Older adults** (65 years and older) were considered an "expert" with lived experience if they self-identify as having at least one year of mobility difficulties and have experienced a hospital-to-home transition.
- **Family caregivers** were considered an "expert" if they have at least one year experience providing informal care for older adults with mobility limitations, specifically during hospital-to-home transitions.

CHAPTER 8: INTEGRATED DISCUSSION AND CONCLUSION

This PhD thesis consists of two Phases. Phase 1 aimed to synthesize the available evidence for factors within each mobility determinant (cognitive, financial, environmental, personal, physical, psychological, and social) and their association with self-reported and performance-based mobility outcomes; and generated three manuscripts. Phase 2 aimed to develop, through consensus, a Comprehensive Mobility Discharge Assessment Framework (CMDAF) for older adults transitioning from hospital-to-home in the community. Phase 2 generated a protocol paper and two manuscripts. This thesis advanced Webber's mobility comprehensive framework by summarizing factors within each mobility determinant, allowing other researchers to use these factors in clinical and research contexts. Further, this thesis project through an e-Delphi process, building on synthesized literature on mobility factors, developed a stakeholder- and evidence-informed integrated mobility comprehensive discharge assessment framework for older adults during hospital-to-home transition. This discussion chapter will focus on 1) the basis and rationale for the work; 2) the key findings and their implications; and, 3) limitations, strengths, and suggestions for future research.

The basis for studying older adults' mobility during hospital-to-home transition

Mobility is complex, as it depends on multiple factors that may change over time and requires the involvement of multidisciplinary teams for assessment and effective intervention. Webber et al. [1][p.444] defined *mobility* as the "ability to move oneself (either independently or by using assistive devices or transportation) within environments that expand from one's home to neighborhood and to regions beyond." The multiple factors that influence mobility discussed as mobility determinants in Webber's framework include cognitive, environmental, financial, personal, physical, psychological, and social [1]. Webber's framework describes the interactions of mobility determinants and how these interactions change as older adults move from their familiar environment (e.g., home) to an unfamiliar environment (e.g., outside the neighborhood) [1]. Webber et al. [1] recommended developing a tool (or a set of inter-related tools) capable of measuring factors influencing mobility in different contexts, for example, in the community or hospital settings. The initial plan for this Ph.D. was to develop a comprehensive mobility tool for assessing older adults' mobility during their hospital-to-home transition. However, during a preliminary literature review, there was great variability in the literature with regard to the selection of factors within each mobility determinants. For instance, Kuspinar et al. [2] measured environmental factors using residential location [2], while Dunlap et al. [3] used neighborhood walkability - a composite of the land-use mix, traffic-related safety, and sidewalk characteristics to measure environmental factors. The selection of different factors within the same mobility determinant in these studies made it challenging to determine which factors might be ideal for a comprehensive mobility discharge assessment tool [4,5]. More so, Webber et al.'s [1] mobility framework did not provide a comprehensive list of factors within each determinant, and how each factor was associated with self-reported and performance-based mobility of older adults. As a result, researchers pick and choose factors within each determinant. A solution to this problem was to comprehensively identify factors within each mobility determinant, enabling researchers and clinicians to advance Webber's framework and develop an integrated mobility assessment tool for different contexts. A series of scoping reviews to comprehensively identify a list of factors with each determinant and their associations with self-reported and performance-based mobility outcomes among older adults were conducted, constituting Phase 1 of this thesis.

Mobility-related issues have been identified as an independent risk factor for hospital readmission [6]. However, mobility is rarely assessed during the hospital-to-home transition. Possible reasons include the lack of rehabilitation professionals as members of care transition and the lack of a comprehensive mobility assessment tool comprising the factors within the seven mobility determinants [7]. It is logistically impossible to assess all the factors within all the determinants identified from the literature due to the limited time that surrounds discharging older adults from the hospital [8], highlighting the need to prioritize factors within the determinants that could influence mobility after hospital discharge and that should be assessed. Phase 2 of this thesis aimed to prioritize factors within each determinant to be included in the Comprehensive Mobility Discharge Assessment Framework for older adults transitioning from hospital-to-home.

Phase 1 Main findings and Discussion

Phase 1 consists of three manuscripts (Chapters 2, 3, and 4). Using the five-stage scoping review process by Arksey and O'Malley [9], the available evidence for factors within cognitive, psychological, and social (Chapter 2); personal, environmental, and financial (Chapter 3); and physical determinants (Chapter 4) and their associations with self-reported and performance-based mobility outcomes in older adults (60 years and older) were synthesized.

These reviews were conducted to advance Webber's framework by exploring factors within each mobility determinant and their associations with older adults' mobility, including those achieved independently or using assistive devices, transportation, or driving. Notably, Webber's framework described the psychosocial determinant as one, whereas in the scoping reviews, the psychosocial determinant was separated into two: psychological and social determinants, for two reasons. First, psychological factors are mostly individual-level factors that influence behaviors that promote or hinder mobility, while social factors are factors at the societal level guided by structures and processes influencing mobility [10]. Second, social factors, such as social networks, social support, and social participation, may be more amenable to intervention than psychological factors, such as depression and fall-related concerns [11]. Separating the psychosocial determinant into psychological and social determinants enabled the detailed and comprehensive report of how each factor influences older adults' mobility.

While previous reviews have explored the association between mobility and cognitive [12–14], psychological [15], social [16], environmental [17–20], and physical determinants [21,22], each review focused on a specific factor within each determinant without considering other factors. As well, most of the reviews on mobility focused on self-reported and performance-based walking outcomes, with very few attempts to include mobility as transportation and with assistive devices, such as walker and scooter. Further, no reviews have been completed describing the association between financial and personal factors and older adults' mobility outcomes. The reviews in this thesis are the only ones that have comprehensively synthesized the associations between different forms of mobility, including those achieved independently or using assistive devices, transportation, or driving, and capture different factors within each mobility determinant. Across the reviews, there are 772 articles published in 51 countries, of which most were cross-sectional studies. Eighty-four factors [cognitive (n=7), psychological (n=18), social (n=9); personal (n=11), environmental (n=17), financial (n=3), and physical (n=18)] and their associations with older adults' mobility were identified. The factors within each determinant were significantly associated with both self-reported and performance-based mobility outcomes in the expected direction. Compared to older adults with cognitive impairment, older adults with better cognitive functioning, such as better executive functioning, had better mobility outcomes (e.g., faster gait speed). Likewise, those with depressive symptoms or a reduced social network had poorer mobility outcomes (e.g., slower gait speed) compared to those with no psychological impairment or social issues. Similar trends were noted in the association between older adults' mobility and personal, environmental, financial, and physical factors.

The scoping reviews identified two major gaps. First, regardless of the mobility determinants evaluated, most studies exploring the association of mobility determinants and self-reported and performance-based mobility outcomes, focused primarily on walking-related outcomes, such as: gait speed, balance, inability to walk a quarter, half, or a mile, or climb stairs, with very few attempts to explore driving, transportation and use of assistive devices. While some studies explored the role of cognitive factors on driving outcomes, e.g., braking reaction time during driving, most studies focused on walking-related concepts [7,23,24]. Together, this finding highlights the continued neglect of other forms of mobility, including transportation, driving, and the use of assistive devices. There is reputable evidence on the effect of driving cessation on several health outcomes among older adults [25,26]. A systematic review of 16 studies reported that driving cessation is associated with a decline in general health, physical, social, and cognitive function and greater risks of admission to long-term care and mortality [27]. Similarly, being able to drive can reduce social isolation and increase social participation in the community [25]. In a qualitative interview, non-driving older adults reported feeling hopeless when they could not access transportation because of their inability to drive [26]. To keep the rapidly increasing heterogeneous population of older adults actively involved in their daily activities, it is vital that public transportation is affordable, available, accessible, and acceptable to meet the mobility demands of older adults [28]. Therefore, further studies are needed to explore the association between mobility factors, transportation, and driving.

Second, across the articles included in the reviews, studies exploring simultaneous effects of two or more mobility factors and/or mobility factors in more than one determinant on mobility outcomes were limited. There is considerable interest in studying interactions between mobility factors and their effects on mobility because it is anticipated that interactions can shed light on several mechanisms underlying the complexity of mobility. Furthermore, the interaction effect of these factors influencing mobility will allow researchers to identify which factors significantly interact with other variables to predict mobility outcomes, providing more explicit information on which factor to intervene with when there are competing demand for healthcare resources. The lack of power in most studies due to small sample sizes could explain why researchers did not test and include interacting variables in their regression models. Researchers are encouraged to use an extensive data set, such as the Canadian Longitudinal Study in Aging, with a large sample size that would allow for robust analysis of multiple interacting variables.

Phase 2 Main findings and Discussion

Phase 2 of this PhD thesis consists of one protocol paper (Chapter 5) and two manuscripts (Chapters 6 and 7). Building on the factors within each mobility determinant identified in the scoping reviews in Phase 1, 60 international experts (seven older adults, nine family caregivers, 24 clinicians, and 20 researchers) from nine countries participated in a three-round modified e-Delphi process to create a Comprehensive Mobility Discharge Assessment Framework (CMDAF) comprised of factors clinicians can assess to determine if they influence older adults' mobility during hospital-to-home transition. In addition to prioritising factors included in the CMDAF, experts were asked open-ended questions to provide rationales for rating factors during each round.

The findings of the three-round e-Delphi process was described in Chapter 6. The 60 international experts included 43 out of 91 mobility factors as part of the CMDAF. Chapter 7 is a qualitative content analysis describing why experts rated the factors in Round 1 the way they did. The content analysis yielded two major themes with six patterns highlighting reasons for rating factors to be included in CMDAF. All experts, including older adults, family caregivers, clinicians and researchers stated that a) the positive and b) the negative role of the factor influencing mobility guided how they rated factors to be included in the CMDAF. Researcher and clinician experts conditionally placed importance on certain mobility factors based on: a) the uniqueness of each older adult, b) health care roles and practice-based reasons, c) service availability and meaning of mobility factors in different countries; and (d) the varying degrees of relevancy of mobility factors amidst competing older adults' needs.

Selecting critical factors influencing mobility is essential to planning assessment and intervention and monitoring mobility changes after discharge. Experts provided reasons why they rated the way they did, elucidating experts' thought processes and decision making regarding what is important and why. These studies are the first to identify mobility factors specific to hospital-to-home transition based on the consensus of international experts, and to identify experts' perspectives and the contextual and other reasons guiding their ratings.

Chapter 6 described the critical factors within each determinant to be included in CMDAF to assess older adults' mobility during hospital-to-home transitions. Current mobility assessment tools, such as Activity Measure for Post-Acute Care [29], do not capture all mobility determinants and are often designed to measure activity rather than mobility e.g., walking, transportation, driving, or with use of an assistive device following discharge. The Quality and Performance Measurement Committee of the American Geriatrics Society developed a research-based report supporting the greater focus on mobility as an outcome for hospitalized older adults [8]. The report recommended the need for consensus on developing a standard method to assess mobility during discharge [8]. Findings in Chapter 6 provided factors within each mobility determinant to be included in a CMDAF, further advancing Webber's framework and moving towards achieving an integrated assessment of mobility.

Similar to a study that developed a mobility assessment related to transportation [30], financial factors were not included in the CMDAF. A plausible explanation could be the context of the experts participating in our study. Experts were from countries with universal or near-universal health coverage, defined as countries that offer all citizens affordable access to comprehensive health services [31]. Some of these countries provide free social services, such as free access to recreational services, and transportation to their older adult population [32]. As a result, citizens are not expected to pay for healthcare services and may have sufficient and reliable secondary insurance for additional services related to mobility improvement after discharge, such as physiotherapy services or the purchase of mobility aids. This expectation may have influenced why financial factors were not included in the CMDAF. However, financial factors could be considered when evaluating mobility in older adults residing in countries with no universal health coverage; or in countries with universal or near-universal coverage where the coverage [despite the term "universal'] is not all inclusive for all aspects of health and social care. For example, evidence suggests the protective effects of financial factors on older adults' mobility in Iran, a country with limited universal health coverage [5]. Furthermore, income has been noted as a significant factor influencing older adults' choices in transportation [33] and was significant in determining walking as the mode choice in a situation where over 70% of older people lacked access to public transport [34]. Researchers residing in countries with no universal health coverage could use the comprehensive list of mobility factors provided in this thesis to explore which mobility factors could be considered when evaluating the mobility of older adults during the hospital-to-home transition in their particular context; as it could elucidate the influence of financial factors on mobility as noted in previous studies [5,33,33].

Chapter 7 of this thesis was the qualitative content analysis of the rationales that experts provided for rating factors to be included in the CMDAF. No previous studies have explored experts' rationale for rating items in an e-Delphi process. Most e-Delphi studies are more interested in the outcome of the e-Delphi process, specifically the final rating of items that have reached consensus rather than the process, e.g., why experts rated the way they did. The findings reported in Chapter 7 provided an understanding of behaviours, actions and perspectives guiding an expert's rating as well as information into the thought processes driving decision-making across a group of experts in an e-Delphi process, highlighting differences in reasons for rating different factors.

Stakeholders have unique ways of seeing things, as differences in personal and professional roles, experiences, or backgrounds lead to divergence in what is considered important and what individuals pay attention to regarding particular issues, which in turn could influence how they approach problems. The reasons for rating factors within each determinant differed across expert groups, as described in Chapter 7. Stated reasons highlighted what each expert participant viewed as important regarding mobility assessment of older adults during hospital-to-home. While researcher and clinician experts' reasons for rating mobility factors centrally focused on the uniqueness of each older adult, differences in healthcare roles and practice-based reasons, older adult and family caregiver experts rated factors were more grounded in the positive or negative influences of the factors on older adults' mobility. These findings align with existing quantitative evidence that items reaching consensus can differ across multiple stakeholders [35,36]. For instance, in prioritizing supports and services to help older adults age in place, Campbell et al. [37] reported that compared to healthcare stakeholders, care partners felt that more diverse community-based factors, such as access to affordable housing and having mental health programs are more important for ageing in place. Previous research

[37] and the findings in this thesis (Chapter 7) highlight the need to include expert groups that represent a variety of stakeholders in research; and for expert groups to consider each other's perspectives in developing consensus. Shared understanding of the subject matter or issue, for instance mobility factors of importance to each expert group, enables the identification and resolution of any "blind spots" surrounding the issue, and leads to more robust, well-rounded innovations with greater impact when implemented [38]. These findings support the need for co-development of interventions with other experts, including older adults and family caregivers, as their opinions provide a different perspective clinicians and researchers would not have considered. Furthermore, expert groups should learn to appreciate the limits of their perspectives and seek to adopt other lenses when developing solutions for complex problems such as older adult mobility.

Rehabilitation professionals, such as physiotherapists or occupational therapists, are not always part of a regular discharge team, but are typically invited on a consultation basis [8,39]. Our study findings highlighted the need to expand the hospital care transition team to include rehabilitation professionals, such as occupational therapists and physiotherapists. This would entail changing hospital culture. However modifying organizational and hospital culture can be challenging, as changes are influenced by multiple factors, including but not limited to the clinicians' workload, the management structure, and the organizational practice pattern [8,40]. As functional status is a stronger predictor of hospital readmission than medical comorbidities in the older adult population [41,42], physical and occupational therapists who are trained to be competent managers could lead the care transition team. Therefore, the success and sustainability of a mobility assessment completed at hospital discharge could depend on a practice culture that includes physiotherapist and occupational therapist as typical members of the hospital care transition team and emphasizes the importance of mobility assessment at admission [8].

Hospital discharges occur very quickly [8]; therefore, there might not be enough time to assess all the mobility factors included in the CMDAF. As experts in our study described, focusing on the older adults' mobility needed to live at home and engage in social activities and events that foster recovery would allow clinicians to assess mobility factors most relevant to the older adults within a limited timeframe. A previous study has recommended that asking older adults how they prefer to be mobilized when admitted could guide the assessment of mobility factors during the hospital-to-home transition [42]. Another solution to the limited time to assess factors influencing older adults' mobility during hospital-to-home transition is to use the CMDAF on admission and monitor if the factors influencing older adults’ mobility identified on admission change. During hospital-to-home transition clinicians could then only assess the factors that negatively impacted older adults' mobility during the hospital stay, enabling them to focus on the most relevant factors within the limited hospital discharge time.

Although we recruited experts from countries with universal or near-universal healthcare systems and provided plain language definitions of mobility factors, researcher and clinician experts highlighted that there are regional meanings to various terms, such as access to transit stops or land use mass. Additionally, the relevance of some of environmental factors as described by our experts varies across countries. For instance, experts from Finland and the United Kingdom reported that the government pays for most of the social environmental factors, such as access to transport and access to recreational activities. As a result, they did not consider those relevant in their context. This may be why some of the environmental factors were rated low. Therefore, a universal, comprehensive mobility assessment framework that could be used across similar healthcare systems may not be feasible, and the CDMAF may need to be modified before use in different contexts.

Thesis Strengths

This thesis has several strengths, in particular the incorporation of various methodologies to advance Webber et al.'s framework. Extensive details of strengths have been reported in the individual studies in the thesis. This section will summarize the overall strengths of this thesis. Phase 1 was comprised of several scoping reviews to identify factors that influenced different forms of mobility, and these findings guided Phase 2, which was an international e-Delphi study to prioritize factors to be included in CMDAF to guide mobility assessment during older adults' hospital-to-home discharge. Each study was planned, executed, analyzed, and reported rigorously. The *a priori* publication of study protocols for Phases 1 and 2 reduced publication bias, helped solicit early feedback from peer-reviewers, as well as improved the reproducibility of study findings.

The Arksey and O'Malley five-step scoping review approach [9] guided the studies in Phase 1. The comprehensive search strategy developed in consultations with subject-specific librarians enabled the inclusion of many articles conducted in 51 countries. For example, I consulted more than one librarian with expertise in health sciences and social sciences. Based on the consultation with the librarians, I searched sociological abstract databases that I would have missed. Title, abstract and full-text screening and data extraction were pilot-tested and completed by pairs of researchers for each determinant to ensure consistency between reviewers regarding the inclusion and exclusion of articles. Another strength of the reviews is their scope, i.e., the range, extent and breath; the reviews comprehensively included many mobility factors and their association with self-reported and performance-based mobility outcomes. In addition, mobility achieved by self, with the use of assistive devices, transportation, and driving were included.

Phase 2 of this thesis is an e-Delphi study whose strength lies in the involvement of older adults and family caregivers as expert members and Steering Committee members overseeing the e-Delphi process. Through several cycles of reviews and revisions, members of the Steering Committee provided feedback on the plain language definitions for each mobility factor and feedback summaries; and advised on issues identified raised during the pilot study. Older adults and family caregivers were also recruited as expert participants in the e-Delphi process, allowing their voices to be heard regarding prioritization of factors of importance to them. For instance, crime-related safety, access to rest areas, and recreational facilities reached consensus among older adults and family caregivers but not among researchers and clinicians in the final round. To give voice to the older adults, the Steering Committee members merged these factors to create a factor called safety, accessibility and availability, which was included in the CMDAF. While e-Delphi studies have been criticized in the literature due to the lack of standardized approaches [43], we employed several strategies to improve the validity and reliability of the e-Delphi study. These strategies included: following CREDES reporting guidelines [44]; pilot-testing of the Round 1 e-Delphi; setting a priori consensus and number of rounds; calculating the stability of the ratings; providing summary feedback to experts at each round; and providing transparency in reporting during the Steering Committee meetings. Another strength of this e-Delphi study was the qualitative analysis of experts' comments to describe why they rated mobility factors to be included in the CMDAF, which provides context for assessing these factors in clinical practice.

Thesis Limitations

While each manuscript has a description of limitations, it is pertinent to acknowledge the broader limitations of this thesis. First, the year limit for the search from 2000 to 2021 and only articles published in English were included in the scoping reviews. In addition, we may have missed some articles on transportation and driving because we did not explode the MESH term and keywords for driving, and transportation. Approximately two-thirds of the articles in our reviews were cross-sectional studies, and thus their results did not explain the cause-and-effect relationships between mobility factors and mobility outcomes among older adults. For our e-Delphi study, all experts were from countries with universal or near-universal health coverage, and the results may not apply to countries with limited health coverage. The findings also may not be applicable to countries with private health insurance (e.g., United States of America) or out-of-pocket payment healthcare systems that are typical of most developing countries. While attempting to ensure equal distribution of participants across each expert group, experts were skewed towards researchers and clinicians. As well, all caregivers were recruited from Canada and older adults recruited from Canada and the UK, despite multiple and various recruitment attempts through country specific organizations, such as HelpAge Australia. As a result, comments provided by caregivers and older adults are limited and might reflect practice and experience unique mainly to the Canadian and UK contexts.

Contributions and Implications of the Thesis Work

Collectively the studies comprising this thesis have made important contributions to older adult mobility research. Webber's framework was used as a foundation for the thesis work; and since its publication others have used the framework as a guide. As noted previously, a limitation of Webber's framework and other studies (e.g., Franke et al. [45]) specific examples of various factors were not provided. The comprehensive list of mobility factors developed through the process of conducting the scoping reviews advances Webber's framework and the utilization of the studies guided by Webber's framework and forms the basis for future research. For example, currently there is no core outcome set for mobility factors in the older adult population. The comprehensive list of mobility factors represents an essential first step towards greater standardization of mobility assessment and measurement. A *core outcome set* is a recommended minimum set of outcomes or outcome measures for a particular health construct, condition, or population, which should be reported in all research trials exploring or examining that construct in that population [46]. Indeed, a core outcome set of mobility factors that can be widely used across a range of contexts and settings would facilitate critical comparisons of study findings and interpretations, better informing clinical practice and research.

The comprehensive list of mobility factors could be used to guide clinical practice. For example, clinicians could use the list to identify factors they typically would not consider to promote or hinder older adults' mobility, allowing them to further focus interventions on specific factors to maximize therapeutic benefits. Previous research has determined older adults and their family caregivers can correctly rate physiological, subjective and contextual factors influencing their mobility from high to low [45]. However, the authors did not provide a detailed factors list. The comprehensive mobility list from our scoping reviews has provided the details of physiological (e.g., muscle strength and muscle power), contextual (e.g., street, residential and sidewalk characteristics) and other factors, which would allow older adults and family caregivers to identify the factors which they believe most influence their mobility, allowing for more targeted mobility-related goal setting and interventions.

Another significant contribution of this PhD thesis was the development of plain language definitions for all mobility factors identified from the scoping reviews. Through a process comprised of several cycles of review and revisions, older adults, caregivers, researchers, and clinicians provided feedback on the plain language definitions of all mobility factors developed from the included studies in the reviews. Plain language descriptions can increase the understanding of scientific information by making complex information more accessible to a broader audience, including researchers and healthcare professionals from other fields, patients, caregivers, organizations, policy-makers and the public [47]. Mobility is a complex phenomenon that requires interdisciplinary and intersectoral perspectives and partnerships to address effectively [1]. Lack of shared comprehension and divergent characterizations can hinder effective collaboration. The plain language definitions of mobility factors in this thesis helps create a 'common language' that can be used to foster an integrated understanding of the complexity of mobility across different disciplines and sectors, providing opportunities to foster and enhance collaborations with other professionals, such as engineers and transportation officers, who are not typically involved in older adult mobility and ageing research.

Future Directions

Findings within this thesis highlight additional gaps that could be explored in future studies. Additional longitudinal studies are needed to explain the cause-and-effect relationships between mobility factors and mobility outcomes among older adults. Future studies should use large data sets with longitudinal data collection and comparable national longitudinal data sets to more fully understand the cause-and-effect relationship between mobility factors and mobility outcomes among older adults. For instance, the English Longitudinal Study of Aging, Health and Retirement Study, Mexican Health and Aging Study, Study on Global Ageing and Adult Health, Japanese Study on Aging and Retirement, and Longitudinal Aging Study in India are considered comparable [48].

As described previously, studies testing Webber's framework in its entirety, that is, exploring the possible interaction effects across different mobility factors and their relationship with mobility outcomes, is lacking in the literature. An interaction occurs when an independent variable, for example, (muscle strength), has a different effect on the outcome (mobility outcome) depending on the values of another independent variable, such as depression [49]. The 'checking' of interaction effects would provide detailed interactions between mobility factors and their effect on mobility outcomes and provide more insight into the complexity of mobility. However, the general practical problem with all interactions is that they can be hard to detect in small or moderately sized data sets. Therefore, using large data sets like the Canadian Longitudinal data set (n=12,646) or combining the comparable national longitudinal data sets described above is recommended.

Webber [50] stated that one limitation associated with the development of the theoretical framework was the lack of empirical evidence to support the interrelatedness of mobility factors described. The reports of myriad factors and their association with mobility outcomes in older adults provided in the scoping reviews have provided empirical evidence to support Webber's framework. The scoping reviews provided details of how factors individually or collectively influence different performance or self-reported mobility outcomes. For example, physical determinants, such as leg strength and grip strength, were the most important predictors of performance-based reported life-space mobility in Giannouli et al. [51], while driving and social supports explain the most variation in self-reported life-space mobility in Kuspinar et al.'s study [2]. This finding is a typical example of information in the scoping review that researchers should use to revise Webber's framework to focus on specific self-reported and performance-based mobility outcomes. Research could also focus on expanding Webber's framework to specific types of mobility, e.g., mobility using assistive mobility devices, an area often ignored in older adults' mobility research. An expanded Webber framework could use evidence from our scoping reviews to describe the interrelatedness of cognitive, environmental, financial, personal, physical, psychological, and social factors in older adults' use of assistive mobility devices to move across the life-space.

Comprehensive measures to evaluate a myriad of factors influencing mobility have been recommended in the literature [1,8,45,52], and no study has addressed this recommendation. Our study is the first study to identify 43 factors across all mobility determinants that are critical to be assessed as part of a CMDAF, which is the first step. The next step is to identify which measures to use to assess each factor providing a CMDAF that would guide healthcare workers in assessing mobility in older adults transitioning from hospital-to-home. This evidence- and consensus-informed CMDAF would promote mobility assessment during the hospital-to-home transition, as it would comprise multiple factors influencing mobility. Further, the CMDAF could stimulate interest in developing interdisciplinary and intersectoral mobility discharge teams comprised of health and social care professionals best able to assess the included factors.

Another next step is the consideration of how to implement the CMDAF in the context of hospital discharge for countries with universal or near-universal health coverage. This step could include feasibility testing among an interdisciplinary mobility discharge team to determine the practicality of the CMDAF, focusing on feasibility outcomes while addressing barriers and leveraging facilitators to implement the CMDAF.

Conclusion

Mobility loss is common among hospitalized older adults, which persists after discharge [42], warranting the need to include mobility assessment as a core component of the hospital-to-home transition [8]. However, mobility is rarely assessed during hospital-to-home because rehabilitation professionals who are experts in mobility assessment are not actively involved [42]. In addition, mobility assessments are currently not comprehensive and do not evaluate the myriad of factors that can influence mobility after discharge [8,42]. This thesis first identified 91 factors across each mobility determinant and their associations with mobility outcomes through scoping reviews. Subsequently, experts (i.e., researchers, clinicians, older adults, and family caregivers) prioritized 43 of these 91 factors to be included in a CMDAF and provided their rationales. Collectively, this thesis advanced Webber et al.'s framework [1] with the development of a comprehensive list of factors for each mobility determinant and their associations with mobility outcomes and identified factors within each determinant to be included in a CMDAF to assess older adults' mobility during hospital-to-home transition.

Mobility related assessment and interventions are typically conducted by rehabilitation professionals such as physiotherapists and occupational therapists. Current mobility assessments, for example, Activity Measure for Post-Acute Care 6-Clicks [29] used by physiotherapists or other rehabilitation professionals, are heavily focused on body positions, transfers, personal care, home skills, and applied cognition, such as speaking and understanding, with no components focused on other factors that may influence mobility e.g., social, and financial factors. A comprehensive set of mobility assessments comprising physical, environmental, personal, economic, cognition, psychological and social factors could create an opportunity for other professionals, such as nurses or psychologists, who typically are not involved in mobility assessment to understand factors influencing older adults' mobility, and possibly conduct some mobility assessment when rehabilitation professionals are not available. This proposed comprehensive mobility tool can guide as a screening to determine which healthcare professionals should be actively engaged as the transdisciplinary mobility assessment team enhancing interdisciplinary approach to older adults' mobility care.

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Appendix 3A: Details of included quantitative studies details for personal factors and mobility

Author, year, country	**Total Sample size included in analysis** **% Female**	**Mean Age (SD)**	**Personal Factors**	**Mobility Outcome**	**Findings (Analysis type)** Note: All variables in each study were analyzed using the same type of analysis unless otherwise stated.
Performance based and mobility outcomes and personal factors (n = 50)					
*Akima et al., 2020, Japan	132 53.0%	69.3 (2.7), pre-old 79.0 (2.9), old	Age	Physical functioning (Sit to Stand Test) Walking time (5-Meter Maximal Walk) Walking distance (6-Minute Walk)	Age was not corelated with Sit to Stand Test performance ($p > 0.05$). Those considered "old" took more time during the 5-m maximal walk [Mean (95%CI) = 2.5s (1.6; 3.3)] than those considered "pre-old" [2.3s (1.7; 3.1)] ($p < 0.01$). Those considered "old" walked a short distance in 6 minutes [586.8m (456; 720)] than "pre-old" individuals [624.6m (462; 774)] ($p < 0.01$). (*Unpaired samples Student's t-test*)
Alexandre et al. 2014, Brazil	1413 61.7%	68.9 (0.6), male 70.1 (0.2), female	Education Age Marital status	Walking time (3- Meter Walk Test)	Men with higher education were less likely to walk slower [OR (95%CI) = 0.88 (0.82; 0.95), $p < 0.05$] compared to men with lower education. Women with higher education were less likely to walk slower [0.94 (0.88; 0.99), $p < 0.05$] compared to women with lower education. Age was associated with slowness (walking) among women [0.94 (0.88; 0.99), $p < 0.05$] and [0.89 (0.82; 0.95), $p < 0.05$] Marital status was not associated with slowness (walking)

					(Multiple logistic regression)
Al Snih et al. 2008, USA 4456	4456 56.0%	69.2 (0.3)	Education Age Gender Marital Status Race/ethnicity	Physical functioning (SPPB)	Education (≥8 years) [β (SE) = 0.50 (0.11), $p < 0.0001$], age [-0.10 (0.006), $p < 0.0001$], gender (female) [-0.42 (0.07), $p < 0.0001$], Marital status (married) [0.25 (0.07), $p < 0.05$] and non-Hispanic black [-0.80 (0.08), $p < 0.0001$] and Mexican Americans [-0.44 (0.10), $p < 0.0001$] were significantly associated with SPPB score among the study participants *(Regression analysis)*
Anson et al., 2018, USA	57 72.0%	79.0 (NR)	Age	Physical functioning (TUG, BBS, Balance Evaluation Systems Test)	Age predicted Balance Evaluation Systems Test [β (SE) = -0.54 (0.16), $p = 0.01$], BBS [-0.29 (0.07), $p < 0.001$], and TUG [0.23 (0.06), $p < 0.001$] scores. *(Regression analysis)*

Aoyagi et al., 2001, Japan and USA	10247 100.0%	70.6 (4.9), Native Japanese 74.6 (4.6), Japanese Americans 71.6 (5.3), Caucasians	Race Age	Gait speed Physical functioning (Chair Stand Time)	Walking speed was about 10% slower among Caucasians than native Japanese, whereas Japanese Americans walked about 11% faster than native Japanese. Rapid walking speed was about 13% slower among native Japanese, and 17% slower among Caucasians than Japanese Americans. No significant difference of rapid walking speed between native Japanese and Caucasians was found. Mean unadjusted usual walking speed was 1.01 m/s for Native Japanese women, 1.07 m/s for Japanese American women and 0.9 m/s for Caucasian women. Mean unadjusted rapid walking speed was 1.32 m/s for Native Japanese women, 1.43 m/s for Japanese American women and 1.28 for Caucasian women. In each population, with age, both usual and rapid walking speed were lower for those >80 years of age compared to those who were 65-69 years of age (15.6 to 26.3% difference). For usual walking speed the percent difference was 20.4% in Japanese women, 26.3% in Japanese American women and 23.7% in Caucasian women. For rapid walking speed the percent difference was 15.6% in Japanese women, 23.3% in Japanese American women and 21.3% in Caucasian women. These differences should be interpreted with caution, as there were very few Japanese women in the oldest age groups. The Caucasian women required about 40% more time to complete 5 chair stands than either group of Japanese. The chair stand performance of native Japanese was similar to that of Japanese American women. *(General linear models and Analysis of variance)*

Barbosa et al., 2016, Canada, Brazil, and Albania	1995 51.0%	69.1 (2.9), male 69.1 (2.6), female	Sex Nationality Age	Gait speed	Tirana's men had slower gait [mean (SD) = 0.87 m/s (0.24)] than men from the two Canadian cities [Kingston, 1.03 m/s (0.19); Saint-Hyacinthe, 1.07 m/ s (0.22)] and were similar in gait speed to those from the Latin American cities [Manizales, 0.88 m/s (0.19); Natal, 0.85 m/s (0.19)]. Women living in the Canadian cities had a faster gait speed than those living in Manizales, Natal, or Tirana. Prevalence of slowness (gait speed < 0.8m/s) was higher among older adults 70-74 years compared to those 65-69 across the three cities. *(t-test)*
Barrera et al. 2017, Chile	86 100.0%	73.0 (7.0)	Education	Walking time (3- Meter Walk Test) Walking distance (Distance Walked in 12 minutes)	Individuals with illiterate/primary level of education took the longer time (median score = 7.8) to complete a 3-meter walk test compared to the time individuals with secondary (6.4) and technical/higher education (6.1) took to complete 3-meter walk test ($p < 0.05$). Individuals with secondary education walked longer distances (median score = 968.0), compared to those with technical/higher school (878.3) or primary education/illiterate (855.7), but did not reach statistical difference. *(Kruskal Wallis)*
Bergland et al., 2008, Norway	307 100.0%	80.8 (NR)	Age	Physical functioning (TUG, One Leg Stance, Walking Speed Tandem Stance and Stair Climbing)	There was a statistically significant negative relationship between age and step height ($r = -0.29$, $p < 0.01$). 85.6% of 75-79-year-olds were able to climb steps greater than 30 cm in height without support, compared to 77.8% of 80-84-year-olds and 52.2% of 85+ year-olds. Increase in age was associated low performance in all the physical functioning.

					(Correlation)
Bernard et al., 2020, France	1471 67.0%	72.5 (5.1)	Sex	Physical functioning (TUG & 4-Meter Walk Test of SPPB test)	There was no difference in TUG performance between men [mean (SD) = 11.45s (3.29)] and women [11.81 (3.48)] (p = 0.07). Men took shorter amounts of time to complete the SPPB 4m walking [4.56 (1.40)] than women [4.87 (1.76)] (p = 0.0008). *(Student's t-test)*
Bimali and Maharjan, 2017, Nepal	100 59.0%	17.6 (4.4)	Occupation Sex	Physical functioning (SPPB)	Occupation and sex were not associated with SPPB scores (p = 0.139). *(t-test)*
Birnie et al. 2011, United Kingdom	1601 55.5%, cohort 1 0.0%, cohort 2	70.7 (4.3), cohort 1 75.3 (4.3), cohort 2	Education Occupation	Walking time (3-Meter Walk Test)	For both cohorts, increased educational attainment and duration were associated with 2-4% faster walk times per extra year at school (p = 0.003). Slower walk times were observed for those in more "deprived" adult occupational categories (4-5% slower per occupational categories) (p = 0.004). *(Linear regression models)*
*Björkman et al., 2020, Finland	428 67.0%	83.5 (4.3), male 83.4 (4.7), female	Sex	Physical functioning (SPPB) Walking distance (2-Mintue Walk Test)	There was no difference between men and women for both SPPB and 2MWT. *(Student's t test)*
*Borgmann et al., 2020, Switzerland	85 40.0%	66.0 (10.0)	Age Sex Education	Walking distance (6-Mintue Walk Test)	Age, sex and education were not correlated with 6MWT distance.

					(*Linear regression*)
*Cancela, et al., 2020, Bulgaria, Hungary, Portugal, Italy, and Spain	418 59.3%	68.6 (7.3), Eastern European 69.6 (9.0), Southern European	Ethnicity/ sex	Walking distance (6-Mintue Walk Test) Physical functioning (30-S Chair Stand, and 8-Foot Up and Go)	In both male and female subgroups, there was no difference in the 6MWT between eastern and southern Europeans, and in 30-s chair stand for men. In both male and female, there was a significant difference in 8-foot up and go test between Southern European and Eastern European, and only in women for 30-s chair stand. Southern European performed better than Eastern European. (*Chi-square test*)
*Chang et al., 2020, Iceland	205 57.0%	73.5 (5.7)	Sex	Walking distance (6-Minute Walk Test)	Men performed significantly better on the 6MWT [mean (SD) = 499.18s (82.41)] compared to women [494.58s (66.89)] ($p < 0.05$). (*Generalized linear model*)
*Chen et al., 2020, Canada	64 29.7%	80.0 (5.4)	Education Age Sex	Observed driving ability	There were no significant associations between education level ($p = 0.53$), gender, age (0.12) and driving ability ($p = 0.53$) (*ANOVA*)
*Coelho-Junior et al., 2020, Brazil, and Italy	128 100.0%	75.2 (7.5), Brazilians 77.6 (5.5), Italians	Age Ethnicity	Physical functioning (Sit to Stand Test)	Age was not correlated with time taken to complete the Sit to Stand test among Italians and Brazilians. (*Pearson correlation*) Brazilian performed the Sit to Stand test in a shorter time [mean (SD) = 11.9s (3.3)] than Italians [16.7s (6.0)] ($p < 0.05$). (*Student t-test*)
Coppin et al. 2006, Italy	1025 56.2%	75.5 (7.3)	Education	Gait speed Physical functioning	Individuals with ≥5years of education walk faster (mean = 1.26m/s) than individuals with ≤5years of education (1.16m/s) ($p < 0.0001$).

				(SPPB)	Individuals with ≥5years of education higher SPPB score (mean = 10.11) compared to those with ≤5years of education (9.55) (p = 0.006). *(General linear models)*
de Melo et al., 2010, Canada	60 75.0%	77.0 (7.3)	Age Sex Marital status	Daily steps Physical functioning (Chair Stand Test)	The mean number of steps per day for those aged 65–74 years [mean (SD) = 7,169 (4,898)] was significantly different (*F* = 5.147) from those aged 75–84 [4,339 (2,762)] and 85 years and above [3,560 (2,766)] (p < 0.01). Physical function also varied significantly between the three age groups (F = 11.14, p < 0.001). The 65- to 74-year group had an average of 13.5 ± 4.4 chair stands, the 75- to 84-year group had an average of 9.7 ± 4.4, and the 85 years and above group had an average of 5.6 ± 5.5 chair stands. Tukey's test (a post hoc test) indicated that the number of chair stands for the 65- to 74-year group was significantly different from the 75- to 84- (p < 0.05) and the 85 years and above groups (p < 0.001). The number of chair stands for the 75- to 84-year group was also significantly different from the 85 years and above group (p < 0.05). Sex was not associated with steps walked. Marital status (being married) was not associated with steps walked. *(Analysis of variance)*

Demura et al., 2008, Japan	271 60.5%	71.2 (7.1), males 71.5 (6.0), females	Age Sex	Number of steps and double or single support times (Back and forth & Up and Down Stepping Tests)	Older adults >85 years had longer double support times [mean (SD) = 0.27 (0.11)] in the back/forth stepping test compared to older adults aged 75- 79 [0.24 (0.09)], 70-74 [0.23 (0.10)], 65-69 [0.20 (0.07)], and 60-64 [0.20 (0.08)] ($p < 0.05$). In the up/down stepping test, older adults >85 years had longer double support times [0.31 (0.19)] than older adults aged 70-74 [0.24 (0.09)], 65-69 [0.18 (0.06)], and 60-64 [0.18 (0.09)] ($p < 0.05$). In terms of steps taken, older adults >85 years took less steps [31.19 (6.50)] in the back/forth stepping test compared to older adults aged 65-69 [36.11 (6.58)], 60-64 [35.67 (5.70)], 75-79 [34.46 (5.76)], and 70-74 [33.17 (6.51)] ($p < 0.05$). This was also seen in the up/down stepping test, with older adults >85 years taking less steps [31.98 (7.30)] than older adults aged 65-69 [38.40 (8.12)], 60-64 [37.92 (6.44)], and 70-74 [35.33 (6.55)] ($p < 0.05$). No sex difference was found in evaluation parameters of all stepping tests. *(Two-way analysis of variance)*
Duff et al., 2007, USA	675 57.3%	73.2 (5.8)	Age Sex Education	Walking time (50-Foot Walk)	Participants were grouped by the time (in seconds) it took to complete the 50 ft walk. The groups were: <14s group, 14-17 s group and >17 s group. There were significant differences between the walking speed tertile groups on age [$F (2, 674) = 19.8$, $p < 0.001$], gender [$\chi2(2) = 44.0$, $p < 0.001$], and education [$\chi2(12) = 32.0$, $p < 0.01$]. *(Chi-square test / Analysis of covariance)*

Dumurgier et al., 2012, France	1623 60.5%	73.3 (4.1)	Age Sex Education	Walking speed	Participants who walked slower were older than those who walked faster (p < 0.001). The mean age decreased in faster walking speed tertiles (<1.50m/s = 73.7, 1.50-1.70m/s = 72.5, >1.70m/s = 70.9). Participants who walked slower were more often women than those who walked faster (p < 0.001). The percentage of female participants decreased in faster walking speed tertiles (<1.50m/s = 82.4%, 1.50-1.70m/s = 65.0%, >1.70m/s = 36.1%). Participants who walked slower had lower education than those who walked faster (p < 0.001). The percentage of those with low education decreased in faster walking speed tertiles (<1.50m/s = 45.4%, 1.50-1.70m/s = 23.3%, >1.70m/s = 22.3%). *(Analysis of covariance)*
Enright et al., 2003, USA	2281 48.0%	77.0 (4.0), completed 6MWT 78.0 (5.0), partial 6MWT completers	Age Race Education	Walking distance (6-Mintue Walk Test)	For men, age at year 9 visit [Coefficient (SE) = -2.0 (0.72), p = 0.006], black race [-25.4 (9.7), p= 0.009] predicted 6MWT, while education did not. For women, Age at year 9 visit [-3.4 (0.59), p < 0.001], while race and education did not *(Linear regression model)*
Fiser et al., 2010, USA	49 49.0%	72.5 (1.2)	Age Sex	Gait speed Physical functioning (SPPB)	Compared with the fastest walkers, the slowest walkers were older (79.0 vs 68.4 years) (p < 0.001). Women had slower habitual walking speeds [mean (SD) = 1.04 (0.04)] than men [1.21 (0.04)] (p = 0.006). Although women had lower SPPB scores [mean (SD) = 10.0 (0.3)] than men [10.8 (0.3)], the difference was not significant (p = 0.056). *(Independent t-tests)*

Gladin et al., 2021, USA	101 59.0%	69.7 (5.7)	Age Sex Race Education	Physical functioning (SPPB)	Those who scored ≥ 11 on the SPPB were younger [mean (SD) = 68.8 (5.2)] than those who scored < 10 [72.4 (6.6)] (p = 0.005). Sex, race, and education was not associated with SPPB performance. *(t-tests)*
Gonzales et al., 2020, USA	370 59.0%	69.3 (3.3)	Ethnicity	Gait speed	Mexican Americans had slower gait speeds [mean (SD) = 0.88 (0.20)] compared to European Americans [0.95 (40.19)] (p < 0.001). (*Independent t-tests*)
Gouveia et al., 2019, Portugal	802 50.0%	69.8 (5.6)	Age Sex	Balance (Fullerton Advanced Balance) Gait velocity Stride length Cadence Gait stability	Age was negatively associated with balance (β = -0.17, p < 0.001), gait velocity (0.11, p < 0.001), stride length (-0.07, p < 0.05), cadence (-0.10, p < 0.05), but positively associated with gait stability ratio (0.07, p < 0.05). Being female was negatively associated with balance (-0.08, p < 0.05), and stride length (-0.15, p < 0.001), but was positively associated with cadence (0.24, p < 0.001) and gait stability ratio (0.12, p < 0.001). Sex was not associated with gait velocity (p > 0.05). *(Multiple regression)*
*Ha et al.,2020, USA	35 3.0%	68.6 (7.3)	Sex	Walking distance (6-Mintue Walk test)	Sex was associated with distance walked during 6MWT [β (95%CI) = 143.5 (101.1;185.9), p < 0.001]. (*Paired sample t-tests and multivariable generalized estimating equations*)

Herman et al., 2009, Israel	278 60.0%	76.3 (4.6)	Sex Age	Physical functioning (TUG) Balance (BBT) Dynamic Gait Index (DGI)	Mean TUG test scores were similar amongst men [mean (SD) = 9.3 (1.8)] and women [9.7 (1.7)] ($p = 0.28$). Mean test BBT scores were similar amongst men [54.3 (2.3)] and women [54.0 (2.8)] ($p = 0.74$). Scores on the DGI were near perfect in men [mean (SD) = 23.3 (1.2)], but among women, there was a small, but significant decrease [22.5 (1.6)] ($p < 0.001$). *(Student's t-test)* The DGI was also modestly correlated with age ($r = -0.21$, $p < 0.001$). *(Pearson correlation)*
*Ignasiak et al., 2020, Poland	5367 78.0%	69.6 (7.1)	Age Sex	Walking distance (6-Mintue Walk test)	An increase in age is associated with worse performance on the 6MWT ($p < 0.0001$). Males perform better on the 6MWT compared to females ($p < 0.0001$). *(Two-factor ANOVA)*
*James et al., 2020, USA	133 63.0%	80.0 (4.7)	Age Sex Education	Physical functioning (SPPB)	Those with mobility limitations (SPPB ≤ 9) were significantly older [mean (SD) = 81.16 (4.12)] than individuals without mobility limitations (SPPB > 9) [79.44 (4.66)] ($p = 0.041$). Sex and education were not correlated with having mobility limitations (SPPB ≤ 9). *(Student's t-test)*
*Lau et al., 2020, Singapore	507 56.0%	64.0 (NR), males 60.5 (NR), females	Sex Age	Gait speed Height-adjusted gait speed Step & stride length	There was no difference in gait speed, stance time, height adjusted cadence between men and women. Compared to women, men had a lower height-adjusted gait speed [mean (95%CI) = 0.05 (-0.07; -0.03), $p < 0.01$], height adjusted step length [-0.01 (-0.01, <0.01), $p = 0.01$], height adjusted step width [-0.01 (-0.02; -0.010), $p = 0.02$], cadence [-5 (-6; -30), $p < 0.01$]

				Step & stride width Height adjusted step length Cadence Height adjusted gait speed Single & double support time	Compared to women, men had higher step length [2.21 (0.73; 3.70), p < 0.01], step width [2.77 (1.42; 4.12). P < 0.01], stride width [1.37 (0.86; 1.87), p < 0.01], single [0.01 (0.01; 0.02), p < 0.01] and double [0.02 (0.01; 0.03), p < 0.010], support time. There was a significant difference in all the parameters excluding cadence, height adjusted cadence and stride width. *(Independent t-test)*
*Lee et al., 2020, Taiwan	299 59.0%	73.3 (6.3), males 73.3 (7.0), females	Age Sex	Walking speed Slowness (walking speed <0.8m/s)	Those aged < 75 [mean (SD) = 0.9 (0.3)] had a faster walking speed compared to those aged ≥ 75 [0.8 (0.3)] (p < 0.001). There was no difference in walking speed between males and females (p = 0.514) *(Student t-test)* There was a significant difference in slowness between those aged < 75 (n = 54 (29.4%)) and those aged ≥ 75 (n = 61 (53.0%)) (p < 0.001). There was no difference in slowness between males and females (p = 0.985) *(chi-square)*
Manini et al., 2009, USA	248 48.0%	74.9 (3.5)	Sex Race Education	Gait speed	Among women, age [β (SE) = -0.036 (0.005), p < 0.001], high school education (vs no high school education) [0.158 (0.5050), p = 0.002] were predictors of longitudinal changes in gait speed.

					Among men, age was a predictor of longitudinal changes in gait speed [-0.033 (0.006), p < 0.001] Race was not associated with gait speed in both men and women while education was not associated with gait speed in men. *(Linear mixed models)*
Orr et al., 2020, Ireland	6122 53.8%	62.7 (9.0)	Age Religion Gender	Physical functioning (TUG)	TUG scores increased by an average of 0.1 seconds with each year of age, which increased to 0.3 seconds by age 72 years. Holding all other covariates constant, Catholic low-attendance women had TUG scores about one-third of a second slower than scores for high-attendance Catholic women with the same characteristics otherwise at age 62 (8.63 vs 8.29, a difference of .34 seconds). Religious affiliations were not a predictor of TUG scores. In TUG model- low-attendance Catholic women were slower, but this did not reach significance, although they did have a significantly faster rate of change. Other religion men had a slightly slower TUG rate of change. (*Linear mixed effects regression models*)
Otsuka et al., 2020, Japan	388 78.0%	73.0 (NR)	Age	Physical functioning (TUG)	Age was correlated (r = 0.468, p < 0.001) with TUG time. (*Spearman's rank correlations*)
Párraga-Montilla et al., 2021, Spain	61 66.0%	73.9 (9.6)	Age Sex	Gait speed Step length	Those aged 60-69 years had a faster gait speed [mean (SD) = 1.23 (0.53)] than those aged >79 years [0.70 (0.22)] (p < 0.05). Those aged 70-79 years had a faster gait speed [1.30 (0.52)] than those aged > 79 years [0.70 (0.22)] (p< 0.01). Those aged 60-69 years had longer step length [mean (SD) = 67.61 (8.8)] than those aged > 79 years [50.15

					(7.95)] (p< 0.001). Those aged 70-79 years had a faster gait speed [64.30 (8.67)] than those aged >79 years [50.15 (7.95)] (p < 0.001). There was no significant difference in gait speed and step length between those 60-69 and 70-79 years. There was no difference in gait speed and step length between men and women *(ANCOVA)*
Rodacki et al., 2020, Brazil	199 100.0%	70.3 (5.3)	Age	Physical functioning (Sit to Stand Test) Walking time (6-Meter Walk Test) Physical functioning (TUG)	There was no difference in Sit to Stand test results between the OLD (aged 60-70 years) and VOD (aged 71-86 years) groups (p = 0.47). There was no difference in time taken to complete 6m results between the OLD and VOD groups (p = 0.08). Those in the VOD group [mean (95%CI) = 9.97s (9.33; 10.65)] took longer in their TUG tests compared to those in the OLD group [8.63s (8.35; 8.89)] (p = 0.02). *(Unpaired t-tests)*
Rosenberg et al., 2020, USA	1135 56.0%	77.0 (NR)	Age Sex Ethnicity Education	Stepping time (mins/day) Steps (steps/day) Sit-to-stand transition (number/day)	Increase in age was negatively associated with more stepping time, steps taken a day (p < 0.001), but was not associated with the number of sit-to-stand transitions per day (p = 0.138). Sex was not associated with stepping time (p = 0.889), steps taken per day (p = 0.766). Females had more sit-to-stand transitions [mean (95%CI) = 44 (43; 46)] than males [41 (40; 43)] (p = 0.002). Non-Hispanic white individuals had more stepping time (p = 0.017) and steps per day (p = 0.007) than people of colour. Race was not associated with number of sit-to-stand transitions (p = 0.579).

					Education was not associated with stepping time, steps/day and sit-to-stand transitions. (*Linear regression*)
Santos et al. 2017, Brazil	120 63.3%	83.3 (3.0)	Age, Gender Education Marital status Race	Physical functioning (SPPB)	Uneducated individuals were more likely [OR (95%CI) = 2.48 (1.04; 5.90), p = 0.040] to have a low SPPB score compared to educated individuals. Age was a predictor of SPPB scores [3.39 (1.18; 9.76), p = 0.023]. Gender, marital status, race were not predictors of SPPB scores *(Binary logistic regression analysis)*
Serrano-Checa et al., 2020, Spain	271 100.0%	69.2 (5.7)	Age	Walking time (3-Meter Timed Tandem Walk Test) Physical functioning (TUG) Gait speed	Age was associated with TUG time ($\beta = 0.29$, $p < 0.001$) and 3MTW time (0.21, $p < 0.001$). Age was not associated with gait speed. (*Multivariate linear regression*)
Shubert et al., 2006, USA	195 70.0%	80.9 (5.9)	Age Sex	Walking speed Physical functioning (Timed Chair Rise)	Age was a significant predictor of walking speed (> 1.0m/s) [OR (95%CI) = 0.86 (0.80; 0.92), p < 0.01] and Time Chair Rise (< 13.6s) [0.92 (0.87; 0.97), p = 0.01] Sex was not a significant predictor of walking speed or Time Chair Rise *(Regression)*

Staples et al., 2020, USA	111 78.4%	74.9 (7.2), males 77.1 (3.8), females	Education Age	Walking time (10-Meter Walk Test) Physical functioning (TUG)	Years of education (β = 0.194, p = 0.027) and age (β = -0.235, p = 0.010) were significant predictors of 10-meter walk test. Age was associated with Time up and Go test (β = 0.285, p = 0.002). *(Multivariate Spearman's rho correlation)*
Tanaka et al., 2020, Japan	388 78.0%	74.4 (7.4)	Age Sex Marital Status Education	Physical functioning (TUG)	Age was a significant predictor of TUG scores [β (95%CI) = 0.26 (0.14; 0.30), p < 0.01]. *(Regression)* Men performed better on the TUG test [mean (SD) = 12.8 (5.2)] compared to women [14.5 (6.5)] (p = 0.010). Those with a spouse [mean (SD) = 13.7 (5.8)] performed better on the TUG test than those without [15.1 (7.1)] (p = 0.019). *(Mann-Whitney U tests)* Participants with low education level took longer to complete the TUG (p < 0.001). *(ANOVA)*
Thinuan et al, 2020, Thailand	1806 70.5%	70.7 (7.5)	Gender	Walking speed	The prevalence (%) of slow walking was higher in female (30.6%) than in male (22.4%) *(Chi-square)*
Trevisan et al., 2020, Sweden	2656 61.5%	72.3 (9.9)	Age	Walking speed	There was a statistically significant difference in walking speed classifications between age groups (p < 0.001). Amongst those who could walk >1.2 m/s, 80.2% were aged 60-66, 50.5% were aged 72-78, 21.8% were aged 81-87 and 6.9% were aged 90+. Amongst those who could walk between 0.8 and 1.2 m/s, 15.6% were aged 60-66, 31.0% were aged 72-78, 33.0% were aged 81-87 and 21.8% were

					aged 90+. Amongst those who could walk <0.8 m/s, 4.2% were aged 60-66, 18.4% were aged 72-78, 45.2% were aged 81-87 and 71.3% were aged 90+. *(Student's t-test)*
Tuntland et al., 2020, Norway	738 70.1%	81.2 (6.9)	Age	Walking speed	Age was significantly associated with slower walking speeds ($p < 0.001$). *(one-way ANOVA test)*
Wu et al., 2020, Taiwan	137 100.0%	74.6 (NR)	Age	Gait speed Physical functioning (Sit to Stand test & TUG) Balance (Berg Balance Scale)	Physical capacity differences across the four age groups: 65–69 years (n = 37); 70–74 years (n = 40); 75–79 years (n =29); and ≥ 80 years (n = 31). Compared with the age group 65–69years, the age groups 75–79 years and≥80 years showed significantly slower gait speed scores and BBS scores, and higher 5times Sit to Stand test and TUG test scores ($P< .05$, for all). There was no significant difference between the 65–69 and 70–74 age groups in all five physical tests. In addition, for the 5times Six to Stand test scores, the 70–74 years old and older groups had mean values greater than the cut-off point. The 75–79 years old and older groups had mean values greater than the cut-off points for TUG, and BBS, while for gait speed, only those ≥ 80 years had a mean value greater than the cut-off point. (*Multilevel regression model*)
Yoo et al., 2020, South Korea	92 35.9%	64.7 (8.6)	Age Sex	Walking distance (2-Mintute Walk Test) Physical functioning (30-s Chair Raise Test)	Individuals aged <65 years walked further [mean difference (SD) = 27.857 (6.596), $p < 0.001$] on the 2MWT than those aged ≥ 65 years. Age was not correlated with Chair Raise test performance ($p = 0.303$). Females walked a shorter distance [mean difference (SD) = -29.864 (10.809), $p = 0.007$] on the 2MWT ($p = 0.007$) and performed worse [-6.985 (2.228), $p = 0.002$] on the Chair Raise test than males. (*Multiple linear regression*)

Zarzeczny et al., 2017, Poland	26 100.0%	85.8 (3.6)	Age	Physical functioning (TUG & 30-s Chair Stand Test) Walking distance (6-Mintues Walk Test)	Age was significantly correlated with total TUG performance time ($r = 0.484$, $p < 0.05$). Age was inversely correlated with 6MWT distance in meters ($r = -0.482$, $p < 0.05$) and 30s-Chair Stand Test ($r = -0.422$), $p < 0.005$). *(Pearson's correlation)*
Self-reported and mobility outcomes and personal factors (n = 25)					
Adler et al., 2005, USA	118 100.0%	75.3 (5.6)	Age Marital status	Driving duration Driving distance	Age was inversely correlated with the longest trip made in the last year ($r = -0.37$, $p = 0.001$) and with miles driven (-0.18, $p = 0.05$). Compared to single women, married women report driving more now than five years ago ($p = 0.024$) and are more likely to have someone depend on them for transportation ($p = 0.016$) *(Pearson correlation)*
Andersson et al., 2021, Sweden	299 43.8%	72 (11.2)	Age Sex	Mobility domain of the Stroke Impact Scale	Individuals aged ≥ 65 reported lower mobility scores [mean (SD) = 90.6 (15.8)] compared to individuals aged < 65 [97.2 (9.3)] ($p = 0.001$). Sex was not correlated to mobility scores. (*Chi-square test and t-tests*)
Ang et al., 2019, Singapore	9334 55.6%	71.1 (7.7)	Education Age Gender/ethnicity Marital status	Mobility limitation	Individuals who were highly educated had a lower average number of mobility limitations [β (SE) = -0.59 (0.09), $p < 0.0001$] and tended to develop mobility limitations at a slower pace [-0.07 (0.03), $p < 0.0001$] than those with lower education. Being older was associated with reporting mobility limitation [0.047 (0.0006), $p < 0.001$] and tended to develop mobility limitation at faster pace [0.0006 (0.002), $p < 0.01$]

					Being male was associated with lower odds of reporting mobility limitation and developing mobility limitation across all ethnicity groups, including Chinese and Malay females. Marital status was not associated with mobility limitation *(Ageing vector models)*
Auais et al., 2017,	1841 51.9%	69 (2.8)	Sex	Life space mobility	The average LSA total score was significantly higher in men ($p < 0.001$). (Chi-square)
Blazer et al., 2006, USA	1229 63.7%	77.0 (5.0)	Education Age Sex Race	Mobility limitation	Lower education (<9th grade) [β (SE) = 0.18 (0.06), p = 0.004], age [-0.03 (0.01), p < 0.001], male [-0.20 (0.06), p < 0.002] were significantly associated with mobility impairment after 4-years follow-up [0.18 (0.06), p = 0.004]. Race was not associated with mobility impairment *(Linear regression)*
Braitman & Williams, 2011 USA	2650 58.0%	74.3 (6.3)	Age Sex Marital status	Driving cessation Driving duration Driving distance Driving performance	Being older was associated increased likelihood to cease driving t-statistics (1,431) = -6.4, p < 0.0001], driving fewer miles [t (1,275) = 3.3, p = 0.001], and avoiding more driving situations [t (1,370) = -3.9, p = 0.0001]. *(Independent sample t-tests and chi-square tests)* Women are more likely to cease driving than men (p < 0.05). 70% of the females in the study had stopped driving at least temporarily. Those who reported that they had stopped driving were more likely to be unmarried [$\chi 2(1) = 4.9$, p = 0.03]. *(Chi-square test)*

Choi et al., 2013, USA	556 61.0%	80.0 (NR)	Age Sex	Driving performance (Avoiding night and highway driving)	Age is significantly associated with increased likelihood of avoiding night driving [OR (95%CI) = 1.14 (1.08; 1.20), $p < 0.001$] and highway driving [1.06 (1.00; 1.12), $p < 0.052$]. Women were more likely to avoid night driving [OR (95%CI) = 5.81 (3.74; 9.04), $p < 0.001$] compared to men. Women were more likely to avoid highway driving [3.02 (1.81; 5.05), $p < 0.001$] compared to men ($p < 0.001$). *(Multivariable logistic regression models)*
Clarke et al., 2009, Canada	294 72.0%	84.8 (6.3)	Age Sex Marital Status Education	Use of walker or cane Use of wheelchair	Compared to those aged 69-79, being aged 80-89 was not associated (OR 1.373, $p > 0.05$) with walker/cane use. However, being aged 90+ was associated with increased walker/cane use (26.031, $p < 0.01$). Compared to those aged 69-79, being 80-90 (1.085, $p > 0.05$) or 90+ (4.457, $p > 0.05$) was not associated with wheelchair use. Being female was not associated with walker/cane use (0.264, $p > 0.05$) or wheelchair use (0.999, $p > 0.05$). Being married was not associated with walker/cane use (1.026, $p > 0.05$) or wheelchair use (2.187, $p > 0.05$). Having less than a high school education (0.796, $p > 0.05$) was not associated with walker/cane use. Having less than a high school education (6.183, $p < 0.05$) was associated with increased wheelchair use. *(Multinomial logistic regression).*
Cornman et al., 2008, USA	1224 60.0%	77.0 (7.3)	Age Sex Marital Status	Mobility limitations Likelihood to use AD	Older adults had significantly lower thresholds for reporting difficulty vs. no difficulty (more likely to report difficulty) for all activities except walking 200-300m ($p < 0.05$).

			Race Ethnicity	(self-reported)	Reported difficulty was worse for women than men. Women are more likely than men to report difficulty lifting and carrying heavy objects ($p < 0.05$). Reported difficulty was worse for those not currently married compared with currently married ($p < 0.05$). Difficulty running 20–30 m differed significantly by ethnicity (Mainlanders had the most difficulty; 48%-no difficulty, 25%-difficulty, 27%-unable) ($p < 0.05$). Hakka had higher thresholds for reporting difficulty (less likely to report) running a short distance than Mainlanders with the same underlying ability. Blacks were more likely than Whites to use any device vs. no device [OR (95%CI) = 1.83 (1.52; 2.21), $p < 0.05$]. Hispanics were more likely than Whites to use any device vs. no device [1.33 (1.03; 1.71), $p < 0.05$]. Blacks were more likely than Whites to use canes vs. no device [2.12 (1.74; 2.59), $p < 0.01$]. Blacks were more likely than Whites to use walkers and or wheelchairs vs. no device [1.58 (1.18; 2.12), $p < 0.01$]. Blacks were more likely than Whites to use devices only (vs. no devices or personal care) [1.77 (1.48 ;2.12), $p < 0.01$]. Hispanics were more likely than Whites to use canes vs. no device [1.31 (0.94; 1.82), $p > 0.05$]. Hispanics were more likely than Whites to use walkers and or wheelchairs vs. no device [1.35 (1.00; 1.82), $p > 0.05$]. Hispanics were more likely than Whites to use devices only (vs. no devices or personal care) [1.25 (0.97; 1.61), $p > 0.05$]. *(Ordered probit model, Wald test with chi-square distribution)*
Cousins et al., 2002, Canada	389 54.0%	69.7 (7.8)	Age Sex	Mobility efficacy	Age was a significant predictor of stair-climbing efficacy ($\beta = -0.0175$, $p < 0.01$), but not with walking efficacy.

			Birthplace Education		Gender was a significant predictor of efficacy to walk distances (β = 0.125, p < 0.05) and stair-climbing (β = 0.154, p < 0.01), with higher efficacy related to males. Birthplace was a significant predictor for stair-climbing efficacy (β = 0.154, p < 0.001), with those born in Canada more likely to report higher efficacy. Birthplace was not a significant predictor for walking efficacy. Education was not a significant predictor for walking and stair climbing efficacy *(Multiple regression analyses)*
*Cruz et al., 2020, Brazil	50 68.0%	75.0 (8.0)	Age Sex	Ambulatory assistive device use	Age was not correlated with use of ambulatory assistive devices (p = 0.389). Sex was not correlated with use of ambulatory assistive devices (p = 0.566). (*Student's t-test*)
Dirik et al., 2006, Turkey	331 45.1%	75.3 (6.7)	Age Sex	Rivermead Mobility Index (RMI)	RMI scores showed a significant negative correlation with age (p = 0.0001). *(Spearman correlation)* Older women (mean score = 11.6) had less mobility level than men (13.6) (p = 0.0001). *(Mann-Whitney U-test)*
Gell et al., 2015, USA	7609 NR	NR (NR)	Age Sex Race/Ethnicity Education	Likelihood to use assistive devices (AD)	Age (≥90) was significantly associated with increased prevalence of using any AD [prevalence (95%CI) = 70% (65.5; 75.2)]; cane [36.6% (32.3; 41.2)]; walker [49.5% (45; 53.9)]; wheelchair [20.3% (16.9; 24.2)] and ≥2 Mobility AD [32.1% (27.6; 36.8)] (p < 0.001). Females are more likely to use any AD [prevalence (95%CI) = 28.1% (26.5; 29.8)], cane [18.3% (17.1; 19.5)], walker [14.9% (13.6; 16.2)], wheelchair [7.4%

					(6.7; 8.3)], and ≥2 Mobility AD [11.5% (10.5; 12.6)] ($p < 0.001$). Being from a race other than "White non-Hispanic", "Black non-Hispanic" or Hispanic was associated with increased likelihood of any AD usage [prevalence (95%CI) = 20.5 (16.7; 24.9)]; cane usage [16.3 (12.6; 20.7)]; walker usage [9.43 (6.8; 13)]; wheelchair usage [5.7 (3.8; 8.4)]; and using ≥2 mobility AD [7.9 (5.5; 11.2)] ($p < 0.001$). Compared to having "high school", "some college or vocational", or "college graduate", having an "advanced degree was associated with reduced prevalence of any AD usage [prevalence (95%CI) = 14.6 (12.6; 16.8)]; cane usage [10.7 (8.7; 1.31)]; walker usage [4.9 (3.6; 6.7)]; wheelchair [2.7 (1.7; 4.2)]; and using ≥2 mobility AD [3.6 (2.5; 5.1)] ($p < 0.001$). *(Poisson regression)*
Hall et al., 2005, Canada	12 42.0%	86.6 (9.5), Baycrest area 81.7 (5.9), Sunnybrook area	Age Gender Education	Driving performance (self-reported questionnaire)	Age was inversely correlated with motor function skills related to driving ($r = -0.25$, $p = 0.267$), but it was not significant. Gender was correlated with driving performance. Males with shorter duration of training had higher post training scores compared to females ($r = 0.645$, $p = 0.012$). Education was inversely correlated with motor function skills related to driving ($r = -0.451$, $p = 0.78$), but it was not significant. *(correlation)*
Hjorthol et al., 2013, Norway	4723 57.0%	67+	Age Sex	Walking tendencies/frequency Likelihood to experience	Problems with walking increases with age [21% for < 70 vs 80% for 90+] ($p < 0.001$). The desire to go for a walk generally increases with age [45% for < 70 vs 57% for 90+] ($p < 0.01$).

				difficulty with public transport Walking tendencies/frequency Driving cessation Dependence on public transport. Problems with public transport	Problems travelling by public transport [9% for < 70 vs 59% for 90+] and with driving [5% for < 70 vs. 21% for 85-89] increase with age (p < 0.05). Women walk more than males (47% for women vs 46% for men) but this was not significant (p > 0.05). Average age of giving up a driver's licence is for women is 76.5 years while it is 79.5 years for men (p < 0.01). Women are less likely to have access to a car (62% of women vs. 87% of men, p < 0.001), and more likely to have never owned a car (21% of women vs 6% of men, p < 0.001) or experience problems travelling by public transport (26% of women vs. 12% of men, p < 0.001). *(Chi-square test)*
Jorgensen et al., 2019, Sweden	1186 57.2%	NR (NR)	Occupation	Mobility limitation	Older adults with offspring with manual occupation had poorer mobility performance [OR (95%CI) = 0.14 (0.00; 0.28)] than older adults with offspring with the non-manual occupation. *(Linear regression analyses)*
Keall & Woodbury, 2014, New Zealand	657 NR	NR (NR)	Age	Number of minutes spent walking per week	From 2007-2010, the walking frequency, measured by the number of minutes walked per week was higher for the younger age group of 65–74-year-olds (55 min/week) in comparison to the 75+ age group (50 min/week), but this did not reach statistical significance (p > 0.05). *(Descriptive)*
King et al., 2017, Australia	295 62.0%	NR (NR)	Age Sex	Driving duration Driving as the driver or passenger	Older adults aged 61-65 years drive longer hours/week (9.21 hours/week) compared to those aged 71+ (5.68 hours/week) (p < 0.01). There was no significant difference in hours driven/week between 61-65 and 66-70 (6.94 hours/week) (p > 0.05). Males drive more days than females (4.59 vs 4.30 days per week, p < 0.05), though there is no difference in

					hours driven per week overall by males and females (8.08 vs 6.88). Males spend less time as a passenger than females (0.91 vs 2.21 hours/week, $p<0.05$) *(ANOVA and post hoc comparison)*
Kostyniuk & Shope, 2003, USA	1053 58.0%	74.2 (5.9)	Age Sex	Driving cessation Driving cessation (Preference to be driver vs. passenger) Dependence on public transportation	Older adults did not plan on ceasing driving. Men (33%) are more likely to continue driving without a license compared to women (14%). Women are 3-4 times more likely to be passengers than men. Older adults prefer their private automobile for both former drivers and drivers. No one relied primarily on public transit buses and only a small portion of the former drivers relied on a dial-a-ride (a form of special transit) for their primary mode of transportation. Riding as a passenger was a secondary mode of transportation. Very few relied on public transport. The remaining former drivers reported walking, using taxis and special transit services as secondary mode. *(Descriptive analysis)*
Melzer et al., 2001, USA	8871 60.0%	NR (NR)	Education	Risk of developing mobility limitation	Men with 0-7 years of education had a greater risk [RR (95%CI) = 1.65 (1.37; 1.97), $p < 0.05$] of developing mobility limitations than men with 12 or more years of education. Women with 0-7 years of education had a greater risk [1.70 (1.15; 2.53), $p < 0.05$] of developing mobility limitations than women with 12 years or more of education. *(Transition probabilities using logistic link function)*
Ogawa et al., 2020, Japan	21 66.0%	67.4 (11.4)	Age	Train or bus usage	Age was not correlated with bus/train use post-discharge ($p = 0.066$).

					(*Two-sided Mann-Whitney U test*)
Olawole & Aloba 2014, Nigeria	250 49.0%	NR (NR)	Age	Driving frequency (Transport)	Number of trips generated decreases with age ($r = -0.309$, $p < 0.005$). Satisfaction with transport service significantly increases with increasing age, as older participants tend to drive less and rely more on public transport ($p < 0.05$). *(Correlation)*
Seinsche et al., 2020, Germany	28 64.0%	78.7 (7.9)	Age Sex Education	Life space mobility	Age ($r = - 0.424$) was demonstrated a significant relationship with LSA, but sex and years of education did not. *(Spearman's correlations)*
Skantz et al., 2021, Finland	479 59.7%	77.7 (3.1), no difficulties 78.4 (3.3), waking modifications 79.6 (3.7), walking difficulties	Age Sex Education	Self-reported walking capabilities	Those with walking difficulties [mean (SD) = 79.6 (3.7)] were significantly older than those with no walking difficulties [77.7 (3.1)] ($p < 0.001$). Those with walking difficulties [10.8 (4.1)] had significantly fewer years of education than those without walking difficulties [12.2 (4.2)] ($p = 0.006$). Those with walking difficulties were more likely to be female (71%) compared to those without difficulties (54.8%) ($p = 0.003$). *(ANOVA, Chi-square test)*
Performance based and self-reported mobility outcomes and personal factors (n = 4)					
Auais et al., 2019, Albania, Brazil, Colombia, & Canada	1506 52.0%	69.1 (2.9), males 69.0 (2.8), females	Gender	Physical functioning (SPPB) Mobility limitation	Women have higher incidence rate of mobility disability than men (higher by 40%) [Incidence Rate Ratio (95%CI) = 1.40 (1.04; 1.88)]. Although there was a difference between women and men in the incidence of poor physical performance, the different was not statistically significant after adjusting for baseline functional performance. (Poisson regression analyses)

Caladas et al., 2020, Albania, Brazil, Colombia, and Canada	1988 52.0%	69.1 (2.9), males 69.0 (2.8), females	Sex	Life space mobility Physical functioning (SPPB)	Women reported more restricted life space than men ($p < 0.001$). Women were more likely to have a SPPB score <8 than men ($p < 0.001$). *(Chi-squared test)*
Hamel et al., 2004, USA	32 50.0%	82.7 (NR), males 82.2 (NR), females	Sex	Physical functioning (Stair Climbing Test) Mobility efficacy	There were no significant sex differences in the measured speeds of stair ascent [men average (SD) = 0.51 m/s (0.09); women average (SD) = 0.49 m/s (0.13); $p = 0.51$] or stair descent [men = 0.56 m/s (0.16); women = 0.48 m/s (0.17); $p = 0.16$]. Non-significant differences were found regarding Activities-Specific Balance Confidence scores between women (75.2; 22.7) and men (82.4; 14.1) ($p = 0.29$). Females were found to demonstrate significantly lower total stair self-efficacy scores (58.1; 25.1) than men (73.6; 17.3) ($p = 0.052$). *(Chi-square test)*
Umstattd et al., 2007, USA	231 100.0%	69.0 (NR)	Age Race	Mobility self-efficacy Physical functioning (Gait speed, Stair climbing, TUG)	More efficacious women were younger in age ($\varphi = -0.22$, $p < 0.05$). Age was significantly associated with physical function, as older women ($\gamma = 0.38$, $p < 0.05$) scored higher on physical function tests (lower performance). More efficacious women were more likely to be Caucasian ($\varphi = 0.17$, $p < 0.05$). *(Covariance modeling)*

Notes: AD – Assistive device; ANOVA- Analysis of Variance; ANCOVA- Analysis of Covariance; BBS- Berg Balance Scale; m - Meter; mins – Minutes; NR- Not reported; LSA - Life Space Assessment; OR - Odds Ratio; RR - Relative Risk; r – Correlation; SPPB - Short Physical Performance Battery; S - Seconds SD – Standard Deviation; SE – Standard Error TUG - Time Up and Go Test; Vs- Versus; 2MWT- Two-Minute Walk Test; 6MWT - Six-Minute Walk Test; 95%CI - 95% Confidence Interval, β - Beta Coefficient; φ – Non-directional relationship of Standardized Coefficient

Mobility limitation includes self-reported inability on all or either of the following: walking up and down a flight of stairs (10 steps) or several flights of stairs, walking a mile (1600meter) or half a mile (800meter) or a quarter mile or a block (400meter) or 100-300meter, or across the room and running/jogging for 20-30 minutes.

Result highlighted in gray indicates no significant association between personal factor(s) and mobility outcome.

Most findings in the table were reported verbatim as the authors reported them in their paper.

Appendix 3B: Details of included quantitative studies details for environmental factors and mobility

Author, year, country	**Total Sample size included in analysis** **% Female**	**Mean Age (SD)**	**Social Environment**	**Built Environment**	**Natural Environment**	**Mobility Outcome(s)**	**Findings (Analysis type)** Note: All variables in each study were analyzed using the same type of analysis unless otherwise stated.
Performance-based mobility outcomes and environmental factors (n=22)							
Cress et al., 2011, USA	61 61.3% Community-dwelling participants (CD) 60.0% Residential community participants (RC)	76.3 (7.6), CD 82.7 (5.5), RC	-	Community - dwelling setting versus residential – community setting	-	Steps per day excluding intentional exercise	Older adults residing in the residential home settings took fewer steps than those in the community-dwelling settings (p = 0.03). *(ANOVA)*
Donovan et al., 2008, New Zealand	71 30.0%	61.3 (11.1)	-	Locations: clinic; street; mall	-	Gait speed Step length	Older adults walking in the street had faster gait speed (m/mins) [mean (SD) = 41.1 (12.9)] and longer step length [49.2 (8.7)] compared to those that walked in the mall [39.2 (11.2); 47.7 (8.7)] and clinic [40.7 (11.1); 19.2 (8.7)]. The only significant environmental difference in gait speed [mean difference (95%CI) = -2.1(-3.8; -0.5), p = 0.01] or step length (cm/step) [-2.1 (-3.9; -0.4), p < 0.01] was between the street walkers and mall walkers. (*Mixed linear model*)
García-Esquinas et al.,	2012; 46.3%	71.7 (0.4)	-	Types of poor housing conditions:	-	Physical functioning (SPPB)	In comparison to older adults who lived in homes without poor housing conditions, those with >2 poor housing conditions showed lower scores in the

2016, Spain				no elevator; no heating; frequently feeling cold. Categorized as: no poor condition, one poor condition, more than two poor conditions			SPPB [β (95%CI) = -1.02 (-1.39; -0.66)]. Individuals who lacked heating at home had a lower score in the SPPB [-1.61 (-2.00; -1.21)]. (*Linear regression*)
Gell et al., 2015, USA	28 75.0%	67 (9.4)	-	Street density; population density; crime rates; slope within the home neighborhood; neighbourhood length	-	Walking (active trips vs non-active trips - those using powered wheelchair for outdoor transportation or recreational wheeling), Global Positioning System (GPS)	There were significant differences between participants with active trips from home compared to those without for Walk Score (83.1 vs. 65.9, p = 0.03, effect size (d) = 1.0), population density (5230.7 vs. 2662.9, p = 0.01, d = 0.9), and street connectivity as estimated by street density (60.5 km vs. 42.6 km, p = 0.01, d = 1.2). Also, participants who used the home neighbourhood for active trips had less slope within 1 km of home, but the difference was not significant [mean (SD) = 73.5 m (± 22) vs. 100.8 m (± 38.1), p = 0.06, d = 0.8]. There were no statistically significant differences in mean scores for crime rates or street block length. (*t-test and the Wilcoxon rank sum test*)
Hunter et al., 2018, Canada	28 57.1%	73.1 (9.2) partic	-	Straight path versus curved path	-	Time to complete a 6-Meter	Gait was significantly slower in people with? Alzheimer's dementia (AD) for both the straight path [mean (SD) AD =

		ipants with Alzheimer's 72.9 (9.5), control				straight path and a curved path (Figure of 8 Test) walking task	6.05 (1.26); Control = 5.09 (0.76), p = 0.02] and the curved path configuration [AD = 11.25 (4.87); Control = 8.28 (2.44), p = 0.05]. *(Paired t-test analysis)*
King et al., 2016, USA	530 57.0%	63.1 (NR)	-	The following were assessed between mall walker vs non-mall walkers: Parking available on site; close to entry; accessible, well lit, marked walkway to entrance; traffic control near walkways; places to rest near entrance	Aesthetically pleasing	Walking time	There was no significant difference between walkers in the mall and non-mall in relationship to parking available on site, close to entrance, accessible, well lit, marked walkway to entrance and traffic control near walkways, places to reset near entrance and aesthetically pleasing. (*Fishers exact test*)
Koohsari et al., 2019, Japan	314 36.9%	74.6 (5.3)	-	Population density; availability of destinations;	-	Maximum gait speed Physical functioning (TUG)	Maximum gait speed and TUG performance were not significantly associated with environmental attributes of walkability in both males and females.

				intersection density; access to public transport station		Balance (1- legged stance)	Among men, there were significant associations among population density within 1600 m [β (95%CI) = 3.11 (0.39;5.83), availability of destinations within 1600m [4.73 (1.99;7.47)], intersection density within 800 m [3.39 (0.32;6.47)], and 1-legged stance with eyes open. There was no significant difference between 1-legged stance with eyes open and environmental attributes among females. *(Linear regression)*
Lachapelle and Cloutier, 2016, Canada	1649 61.8%	NR (NR)	-	Presence of cycling infrastructure; arterial road; traffic calming device; street median; no pedestrian-specific light; behavioral characteristics of pedestrians (crossed in straight line, on sidewalk until crossing, hesitation, looking	-	Time taken to cross a pedestrian signal (Participants with Cane/crutches/white cane, walker, 3- or 4-wheel scooter)	Older age groups crossed in location with a higher mean number of seconds for the numerical countdown pedestrian signals, the younger age group is significantly associated with a shorter time span (ANOVA: df = 2; F = 14.04: p<0.001) Compared to those age 20 to 64 years, those aged 65 to 79 were more likely to end up crossing on a red hand or on a phase where either red light or red hand were on. Using a cane, white cane or crutches made users nearly twice as likely to end a crossing late. The use of a walker increased the odds by 2.8 to 4.5 times, depending on the outcome used. As scooters reduced the odds of finishing late, but this variable was only significant in the last model. Presence of cycling infrastructure has the strongest odds of being associated with finishing a crossing late.

				towards ground, waiting for green light, mid crossing tempo)			*(ANOVA, multilevel mixed-effects logit models)*
Leung et al., 2018, Hong Kong	679 80.1%	NR(NR)	Companionship Encouragement Social Cohesion	Residential density; land use mix; access; street connectivity; infrastructure for walking; indoor places for walking; presence of people; fences separating pavements from the traffic; easy access to residential entrances; seating facilities; physical barriers; crowdedness; traffic hazards; speed; crime	Aesthetics	Walking behaviour (step count)	Land use mix (β = 0.36), street connectivity (0.59), infrastructure (0.69), indoor facilities (0.41), presence of people (0.45), and entrance (0.50) were predictive of an older adult's step count per day. Crowdedness, Traffic hazards, Crime, Companionship, encouragement, social cohesion, Aesthetics were not predictive of an older adult's step count per day. (*Structural modelling*)

Levy et al., 2004, USA	11 27.0%	70.7 (7.8)	-	Wheeling over a variety of terrains: level surface; a carpet; an incline	-	Time taken to complete walking task (Wheelchair (manual vs prototype-pushrim-activated power-assist wheelchair)	Of the 11 participants, 10 found the prototype to be "very easy" or "easy" to push on level and inclined surfaces; 9 gave that assessment on carpeted and inclined surfaces. Seven would "definitely" or "probably" trade their manual chairs for the power-assist chair if given the opportunity. Nine thought they would venture to new and different places in a power-assist wheelchair. Time and number of pushes to complete walking did not differ significantly between chairs. *(Descriptive analysis)*
Lindemann et al., 2015, Germany	22 50.0%	NR (NR) Median (IQR) = 82.0 (79 - 86.3)	-	Interference between door and wheeled walker.	-	Time taken to walk through the door [Wheeled walker (WW) vs non-WW users]	Walking through the door was faster without using the WW than with using the WW [Median (IQR) = 8.71s (7.81;10.19) versus 12.86 s (10.76;14.29), $p < 0.001$]. Interference between door and WW was documented in 93% cases. 59% of the older adults rated walking through the door without using the WW easier. *(Median, IQR and non-parametric tests)*
Lindemann et al., 2016, Germany	20 70.0%	NR (NR) Median (IQR) = 84.5 (78.3-87.8)	-	Walking level; uphill walking; downhill walking (All performed with or without wheeled	-	Gait speed Stride length Cadence Walk ratio	When using a wheeled walker while walking on a level, the walk ratio improved (0.58 m/[steps/min] vs 0.57 m/[steps/min], $p = 0.023$) but gait speed (1.07 m/s vs 1.12 m/s, $p = 0.020$) decreased when compared to not using a wheeled walker. With respect to the walk ratio, uphill and downhill walking with a wheeled walker decreased walking performance

				walker [WW])			when compared to level walking (0.54 m/[steps/min] vs 0.58 m/[steps/min], p = 0.023 and 0.55 m/[steps/min] vs 0.58 m/[steps/min], p = 0.001, respectively). At the same time, gait speed decreased (0.079 m/s vs 1.07 m/s, p < 0.0001) or was unaffected. When compared to walking on a level with a WW, uphill walking with a WW was slower (median values 0.79 m/s vs 1.07 m/s, p < 0.001) and had a worse walk-ratio of 0.54 m/(steps/min) vs 0.58 m/(steps/min) (p = 0.023) with decreased stride length (1.01 m vs 1.25 m, p < 0.001) and cadence 94 step/mins vs 108 steps/min (p < 0.001) (*t-test*)
Lord et al., 2006, USA	27 26.0%	61.0 (11.6)	-	Environment: shopping mall; clinic; street	-	Gait speed Step frequency Step length	There was no significant difference in gait speed, step frequency and step length among older adults walking in the shopping mall, clinics or on the street. (*ANCOVA and ANOVA*)
Portegijs et al., 2017, Finland	174 68.2% adult with physical limitation (APL) 62.3% adult with no physical	81.3 (4.2), APL 80.2 (4.2), ANPL	-	Perceived environmental facilitators; walkability index	-	Daily steps	Participants living in areas with highest walkability index had higher step counts than those living in an area with lowest walkability [β (SE) = 0.5 (0.2), p = 0.010]. Perceived environmental facilitators were not associated with steps counts. (*GLM, logistic regression*)

	limitation (ANPL)						
Richardson et al., 2004, USA	24 100.0%	67.1 (7.9), women with peripheral neuropathy 70.2 (4.3), women with no peripheral neuropathy	-	Standard environment (SE)- smooth walking surface, normal lighting; challenging environment (CE) - irregular surface, low lighting	-	Step-width/variability Step-width range Step width-to-step length ratio Step time/variability Step length Step speed	Repeated measures ANOVA showed that environment had a significant effect on all gait parameters. The CE was associated with increases in step width, step-width variability, step-width range, step width-to-step length ratio, step time and step-time variability, and decreases in step length and speed, compared to the SE ($p < 0.05$). (*ANOVA*)
Richardson et al., 2005, USA	42 47.6%	64.7 (9.8)	-	Standard environment (SE) - smooth walking surface, normal lighting; challenging environment (CE) - irregular surface, low lighting	-	Step width variability Step time variability Step width-to-step length ratio Step length Step time and speed	In the SE, gait parameters of subjects with and without a history of falls did not differ significantly. In the CE, significant differences were noted in step time variability ($p = 0.001$), step length ($p = 0.013$), speed ($p = 0.028$), but not in step width variability, step width/step length and step time of subjects with and without a history of falls. (*t-test*)
Shumway-Cook et al., 2002, USA	36 65.0% adult with	83.2 (5.7), APL	Travel companions; familiarity;	Temporal factors (traffic, busy	Ambient conditions (temperature, outdoor	Community Mobility [Participants had	The older adults without ambulation problems made 95% of trips into the community unaccompanied. Familiarity with travel destination was comparable

	physical limitation (APL) 58.0% adults with no physical limitation (ANPL)	77.7 (4.7), ANPL	distractions	streets); terrain (flights of stairs, curbs, slopes/ramps, uneven surfaces, obstacles, etc.); density (crowded place)	light level, precipitation)	three field trips (one per week) with research assistant videoing their trips]	for both groups. All the older adults chose to travel to familiar locations. Streets with traffic lights were crossed during only 4 (7%) of the 57 trips observed in older adults without mobility problems and during only 5 (10%) of the 51 trips observed in those with disabilities. Crossing busy streets without traffic lights occurred more often than crossing a street with a traffic light for both groups. Unexpected collisions or near collisions occurred in 6% of the total trips of the subjects without disabilities and in 0% of the total trips of the subjects with disabilities. Both groups were comparable with respect to the percentage of trips in which they encountered curbs (40% of trips), uneven surfaces (60% of trips), and slopes or ramps (65% of trips). There was no difference between the 2 groups with respect to temperature, level of precipitation, or light levels during observed trips into the community. *(Descriptive statistics)*
Stemmons et al., 2002, USA	27 74.0%	78.2 (6.2)	-	Distracting (busy corridor) versus non distracting corridor	-	Physical functioning (TUG)	Among the older adults, there was no significant difference in scores on the TUG test between tests performed in distracting and non-distracting environments.

							(Paired t-tests)
Xu et al., 2018, China	9 40.0%	67.7 (7.1)	-	Regular terrain versus irregular terrain	-	Speed Cadence Step length Step width	People with PD showed significant differences for several spatiotemporal variables when comparing the dual-task performance between regular terrain and irregular terrain. These variables included walking speed (t (8) = 3.074, p =0.015); cadence (t (8) = 2.400, p = 0.043); step length (t (8) = 2.615, p = 0.031) and step width (t (8) = 3.074, p = 0.023) *(Paired t-test)*
You et al., 2012, South Korea	27 48.1%	60.7 (4.8)	-	Hospital environment versus outdoor environment	-	Walking time (30-Meter Walking Distance Test) Walking distance (Six-minute Walk Test) Physical functioning (TUG) Balance (Berg Balance Scale)	The results showed an improvement in time taken to complete 30-meter and distance walked in six minutes after the treatment in the hospital environment, but not in the outdoor environment. The Berg Balance Scale and TUG scores improved after the treatment in both environments but did not reach significant difference. (*paired t-test*)
Zhang et al., 2014, China	4308 29.0%	65.3 (5.6)	Employed population; household income	Bike lane density; land-use mixture; bus stop density; euclidean	-	Frequency of cycling and duration of cycling	Employed population (coefficient = -1.448), elderly population (-4.379), medium income household (0.313), bike lane density (0.052), population density (0.074), land use mix (0.536), bus stop density (-0.616) and distance

				distance from the centroid of the neighborhood to the central business district; population density; elderly population			to central district (-0.132) were associated with frequency of cycling. Elderly population (-5.183), bike lane density (0.134), population density (0.131), land use mix (1.416), and bus stop density (-0.792) were associated with duration of cycling. High income household was not associated with frequency and duration of cycling. Bus stop density was not associated with duration of cycling. *(Logit Regression Analysis and Zero-inflated Poisson regression)*
Zukowski et al., 2020, USA	26 77.0% fallers 69.0% non-fallers	76.8 (9.4), fallers 78.3 (7.3), non-fallers	-	Real environment versus laboratory setting	-	Stride velocity Stride length variability Stride duration variability Gait speed	Environment has no significant effect on gait variability among fallers and non-fallers. The Group x Environment ANOVA exhibited only a significant main effect of Group on gait speed ($F(1,24) = 5.45$, $p = 0.03$, effect size (partial eta square = 0.185), such that, on average, non-fallers walked 0.2 m/s faster than fallers. The number of people present in the real-world environment, which includes both individuals in and outside of the participant's walking path, was related to the change between the lab and lobby in gait speed ($r_s = 0.56$, $p = 0.003$) and stride length variability (-0.56, $p = 0.003$), across fallers and non-fallers. The relationship between environmental busyness and environmental changes in unadjusted gait speed and stride length

							variability was driven by the number of people (bystanders) in the real-world environment who were outside the participant's walking path (21.65 ± 7.47 people, r_s = 0.58, p = 0.002 and r_s = -0.54, p = 0.005 for gait speed and stride length variability, respectively) rather than by people within the participant's walking path (0.75±0.72 people, r_s = -0.07, p>0.05 and r_s = -0.27, p>0.05 for gait speed and stride length variability, respectively) *(ANCOVA and ANOVA)*
Self-reported mobility outcome and environmental factors (n=52)							
Ahrentzen et al., 2010, USA	719 58.0%	70.8 (NR)	-	Paths with views of building or homes; paths where I can see other people	Paths with view of greenery and scenery	Walking preferences	81.5% of participants reported paths with a view of greenery were the most preferred walking path. 55.8% of participants reported paths with views of building or homes were the 2nd most preferred walking path. 60.2% of participants reported paths where they can see other people was the 3rd most preferred walking path. *(Descriptive statistics)*
Berke et al., 2007, USA	936 64.2%	78.5 (6.1)	-	Shorter distance to closest grocery store (< 440 m); more dwelling units per acre of the parcel where the residence is located	-	Walking for exercise	Shorter distance to closest grocery store (< 440 m) [OR (95%CI) = 2.26 (1.12; 4.56)], more dwelling units per acre of the parcel where the residence is located (> 21.7) [1.96 (1.15; 3.35)], more grocery store, restaurant, or retail clusters in 1-km buffer (> 1.8) [1.70 (1.11; 2.60)], fewer grocery stores or markets within 1-km buffer (< 3.7) [1.50 (1.02; 2.20)], smaller size of closest office complex (< 36 659 sq m) [1.28 (1.08; 1.53)], longer distance to closest office/mixed-use complex (> 544 m) [1.27 (1.04; 1.56], smaller

				(> 21.7); more grocery store, restaurant, or retail clusters in 1-km buffer (> 1.8); fewer grocery stores or markets within 1-km buffer (< 3.7); smaller size of closest office complex (< 36 659 sq m); longer distance to closest office/mixed-use complex (> 544 m); smaller size of block where residence is located (< 23876 sq m)			size of block where residence is located (< 23876 sq m) [1.19 (0.99; 1.43)] were associated with walking exercise. *(Regression)*
Boakye-Dankwa et al., 2018, Australia	1277 60.0% Brisbane sample	NR (NR)	-	Perceived destination accessibility	-	Walking for transportation	Hong Kong older adults accumulated significantly more minutes of walking than their Brisbane counterparts and reported higher accessibility to most destinations. The between-city

and Hong Kong	58.5% Hong Kong sample						differences in the percentage of older adults with access to various destinations were considerable for shorter distances (5- and 10- minute walk from home). *(Regression)*
Boakye-Dankwa et al., 2019, Australia and Hong Kong	1277 60.0% Brisbane sample 58.5% Hong Kong sample	NR (NR)	-	Perceived access to destinations (good vs. limited) within 5/10/20 minutes' walk from home	-	Walking for Transport Walking for Recreation	Perceived good access to a destination 5 mins walk from home [OR (95%CI) = 0.56 (0.34; 0.92)], perceived limited access to a destination 10 mins walk from home [0.55 (0.36; 0.83)], and perceived good access to a destination 20 mins walk from home [0.70, (0.51; 0.97)] were associated with being a non-walker for transport. Perceived good access to a destination 20 mins walk from home [0.69 (0.49; 0.98)] was associated with being a non-walker for recreation. Perceived good access to a destination 10 or 5 minutes from home was not associated with being a non-walker for recreation. (*Regression*)
Borst et al., 2009, Netherlands	364 60.0%	68.0 (7.1)	-	Pavement separate walking route; ramps on/off pavement; slopes and/or stairs; quality of pavement; obstacles; zebra crossings; trees along route; waste terrain; blind walls; benches; bus	Green strips; front gardens	Walking route choice (destination and no of trips)	The presence of slopes and/or stairs (β = 0.26), green strips (0.05), blind walls (0.09), litter on the street (0.08) and parks (0.43) increased resistance to walking. Significantly lower resistance to walking along links with pavements (-0.11) and front gardens (-0.05). *(Multivariate linear regression)*

				or tram stops; litter on street; dog droppings; graffiti dwellings, ground level; dwellings, first floor; high-rise (>3 storeys); shops; business buildings; catering establishments; vacant buildings; parks; city centre			
Cauwenberg et al., 2014, Belgium	50986 55.6%	74.3 (6.6)	Contacts with neighbors; satisfaction contacts with neighbors; neighbor' social support; neighborhood satisfaction; neighborhood involvement; participation; volunteering	-	-	Daily walking for transportation	Weekly or more contact with neighbours [OR (95%CI) = 1.87 (1.61; 2.19)], neighbours social support [1.10 (1.04; 1.16)], neighborhood involvement [1.11 (1.05; 1.18)], participation [1.02 (1.01; 1.04)], volunteering [1.11 (1.03; 1.20)], were positively associated with daily walking for transportation. Neighbourhood satisfaction and satisfaction contacts with neighbours were not associated with walking for transportation. *(Regression)*
Cauwenberg et al., 2016, Belgium	1131 47.5%	71.9 (6.2)	-	Sidewalk presence; sidewalk evenness; separation from traffic sidewalk sidewalk	Vegetation	Walking for transportation	In the total sample, sidewalk evenness was the most important street feature for walking for transportation [% of participants responded (95%CI) = 56.2 % (55.0; 57.4)], followed by traffic volume [9.1 % (8.6; 9.6)], and overall upkeep [7.7 % (7.5; 7.9)]. These were followed by speed limit [5.9 % (5.6;

				separated from cycling path by a curb; sidewalk separated from cycling path by color; sidewalk separated from cycling path by real separation (parked cars, shrubs, etc.); obstacles; traffic volume; speed limit; presence of traffic calming; overall upkeep; presence of bench			6.3)], separation from traffic [5.7 % (5.4; 6.0)], and vegetation [5.2 % (4.9; 5.5)] for which the importance did not significantly differ from each other. Consecutively, importance decreased significantly for the presence of a bench [4.5 % (4.2; 4.8)], an obstacle on the sidewalk [3.3 % (3.2; 3.4)], and traffic calming [2.3 % (2.2; 2.5)]. *(Choice-based conjoint analyses)*
Cauwenberg et al., 2019, Belgium	895 47.8%	71.8 (5.2)	-	Type of cycle path; traffic density; cycle path evenness	-	Cycling for transportation	Type of cycle path was the most important environmental attribute determining older adults' preference for cycling for transportation (OR = 40). The second most important attribute was traffic density (16.7), followed by cycle path evenness (11.8)

							and distance (10.6). *(Hierarchical Bayes analyses)*
Cerin et al., 2020, Australia	909 66.3%	76.5 (6.0)	-	Densities of different categories of destinations (food outlets and retail; civic and institutional; entertainment; recreational)	-	Walking for transportation Walking for recreation	Neighbourhood residential density was positively associated with (a) both within (frequency [e^b = 1.008] and amount of walking [1.015]) and outside neighbourhood walking (frequency [1.003] and amount of walking [0.997]) for transportation and (b) both within (frequency [1.002] and amount of walking [1.004]) and outside neighbourhood walking (frequency [1.014] and amount of walking [1.053]) for recreation. *(Generalised additive mixed models)*
Clarke et al., 2017, Canada	161 63.0%	74.3 (6.3)	-	Neighbourhood walkability	Precipitation	Total number of different destinations participants walked to in the past 30 days	Older adults living in more walkable neighbourhoods (greater intersection density, shorter block length, more amenities) walked to more destinations in the past month. Snow had a negative effect on mobility. At average levels of rain, a one per cent increase in the proportion of days with snow decreased the expected number of destinations older adults walked to in the past 30 days by a factor of 0.24 ($p < 0.01$). *(Poisson regression)*
Clarke et al., 2013, USA	1188 71.0%	78.7 (10.0)	-	Sidewalks in place on both sides of street; continuous unbroken sidewalks;	-	Number of days participants goes outside in a typical week and	Older adults living in more accessible environments had 18% higher odds of being in the more mobile group [OR (95%CI) = 1.18 (1.01;1.41), $p < 0.01$].

				smooth sidewalk surfaces; sidewalks free from obstructions; sidewalks wide enough for two people to pass; public transit stop on the block; urban accessibility score (range, 0 – 6)		mobility impairment based on client's difficulty in walking	*(A generalized growth mixture model)*
Clarke et al., 2005, USA	4154 66.0%	73.6 (6.7)	-	Housing density; land use diversity	-	Mobility limitation	Housing density modified the effect of lower extremity functional limitations on activities of daily living disability (β = -0.181, $p < 0.05$). A significant interaction between functional limitations and decreasing land use diversity was noted (0.050, $p < 0.05$) *(Hierarchical Poisson Regression Models)*
Clarke et al., 2019, USA	1331 65.0%	64.5 (10.4)	-	Barriers getting around outdoors; barriers accessing stores;	-	Use of wheeled mobility aids (scooter, manual wheelchair,	For those using walking aids, or a combination of walking and wheel aids, only other unspecified store barriers significantly reduced participation ($p < 0.01$) but poor access to buildings was not associated with participation.

				other unspecified barriers		power wheelchair) Walking aids (cane, walker, crutches, orthotics)	For those using mobility aids, there was no significant effect of inaccessible buildings on participation. For those using wheel aids only, there was no significant difference in participation among those reporting store access barriers, other store barriers, or no store barriers. There was no interaction effect between mobility aids and sidewalk accessibility. *(Linear regression and interaction effects)*
Dalton et al., 2016, England	15672 NR	62.2 (9.1)	-		Green space in home neighborhood (least or most)	Mobility limitation	Those living in neighbourhoods in the least green area were more likely to have difficulty walking half a mile than those living in the greenest area of neighbourhoods (10.2% in least vs 7.9% in greatest, $p = 0.001$). *(ANOVA)*
Etman et al., 2014, Netherlands	408 52.9%	75.1 (6.6)	-	Number of observed streets; functional features; destinations; safety	Aesthetics	Self-reported walking for transportation	An increase in functional features (e.g., presence of sidewalks and benches) within a 400-meter buffer, in aesthetics (e.g., absence of litter and graffiti) within 800- and 1200-meter buffers, and an increase of one destination per buffer of 400 and 800 meters were associated with more walking for transportation, up to 2.89 minutes per two weeks (95%CI 1.07-7.32, $p < 0.05$). Safety was not associated with working for transportation *(Linear regression analyses)*

Giehl et al., 2016, Brazil	1705 61.4%	70.4 (8.0)	Area income	Land use mix; street density; street connectivity; population density; street lighting; saved streets; sidewalks	Public open spaces	Walking for transportation Walking for leisure Defined as: any walking (≥ 10 minutes/week) or no walking (< 10 minutes/week)	High street connectivity [OR (95%CI) = 1.85 (1.16; 2.94)], high population density [2.19 (1.40; 3.42)], medium % of paved streets [1.61 (1.04; 2.49)], high % of paved streets [2.11 (1.36; 3.27)], high % of sidewalks [1.77 (1.11; 2.83)] were all associated with walking for 10 or more minutes/week of transportation. Neighbourhood income, street density, percentage of streetlights, land use mix, and public open spaces were not associated with walking for transportation. Neighbourhood income [medium income, 1.49 (1.04; 2.12)] and street density [medium street density, 1.47 (1.02; 2.10)] were associated with walking for leisure. All other environmental factors were not associated with walking for leisure. *(Regression)*
Giehl et al., 2016, Brazil	1705 63.9%	70.3 (7.7)	Social support from friends/neighbors; social support from family; walking with the dog	Sidewalks; sidewalk steepness; presence of garbage; open air sewers; traffic as barrier for walking/cycling; existence of crosswalk;	Green areas; presence of hills	Walking for transportation	Presence of sidewalks was related to walking for transportation. Existence of crosswalks in the neighborhood (OR = 1.43), safety during the day (1.43), presence of street lighting (2.30), recreational facilities (1.60), and having dog (2.23) were significant predictors of walking for transportation ($p < 0.01$). *(Multinomial logistic regression)*

				smoke pollution by cars; street lighting; bikeways, trails; parks, recreational facilities; promoted sports and/or walking events; safe to walk during the day; safe to walk at night			
Gitelman et al., 2016, Israel	110 60.0%	NR (NR)	-	Use of paths/sidewalks; time of day; crowded places	Terrain (hill place)	Use of mobility scooters (MS)	The probability of an older adult's willingness to use MS decreases when the person beliefs that MS use in the city requires separated paths on the sidewalks or on the roads, that MS use during evening hours is dangerous due to a lack of conspicuity markers, that MS is not suitable for use in hilly areas and that using MS in crowded places is difficult [β (SE) = -1.634 (0.455), p < 0.0001]. *(Binary logistic regression)*
Gómez et al., 2010, Colombia	1966 62.5%	70.7 (7.7)	-	Street connectivity; public park density; presence of	-	Walk for 60+ mins in typical week, walk for 150+ mins in	Older adults who resided in areas in the highest tertile of the connectivity index (1.81–1.99) were significantly less likely to walk for at least 60 minutes during the week as compared to those in the lowest tertile [prevalence

				a Ciclovía corridor; presence of TransMilenio stations		typical week (y/n)	OR (95%Cl) = 0.64, (0.44; 0.93), p = 0.021). Those who resided in areas within the middle tertile of public park density (4.53-7.98) were more likely to walk for at least 60 minutes than those who lived in areas within the lowest tertile [1.42 (1.02; 1.98), p = 0.039)]. Those participants who reported feeling safe or very safe from traffic when crossing the streets were more likely to walk for at least 60 minutes than those who felt very unsafe, unsafe, or neither [1.50 (1.11; 2.03), p = 0.007)]. Quality and maintenance of the sidewalks, presence of Ciclovia corridor, and transMilenio stations were not associated with walking for at least 60mins or 150mins per week. Street connectivity, public park density, safety were not associated with walking for at least 150mins per week. *(Regression)*
Gong et al., 2014, Wales	1225 0%	73.3 (4.1)	-	-	Neighbourhood vegetation	Mobility limitation	The interaction between variations in neighbourhood vegetation and lower extremity physical function was statistically significant [OR (95%Cl) = 1.92 (1.12; 3.28), p = 0.017]. The interaction between amount of neighborhood green space and lower extremity physical function was not statistically significant. *(Logistic regression)*
Hand and Howrey, 2019, USA	4283 58.0%	74.5 (6.9)	Neighborhood social cohesion;	Neighborhood	-	Mobility limitation	Older adults with no mobility limitation and living in a higher density area were more likely to

				population density			participate in social activities than those with mobility limitation and living in a less density area [OR (95%CI) = 1.64 (1.08; 2.51), p < 0.05]. The main effect of the interaction between physical mobility and neighborhood social cohesion was not significant for any outcome variable. *(Logistic regression)*
Hand et al., 2015, Canada	237 58.2%	72.0 (7.5)	Neighborhood cohesion	Public transportation within easy walking distance; stores within easy walking distance; neighbourhood safety; no traffic problems; no graffiti problems; no noise problems; no crime problems	No air quality problems	Community mobility (measured using on using a single item from the Keele Assessment of Participation: 'During the past four weeks, I have moved around outside my home, as and when I have wanted')	Satisfaction with community mobility was associated with the perception of no traffic problems [adjusted OR (95%CI) = 3.0 (1.4; 6.2)] and neighbourhood safety [3.4 (1.2; 9.8)] among older adults (p < 0.05). Other environmental factors were not associated with community mobility. *(Regression)*
Herbolsheimer et al., 2020, Canada	434 64.7%	71.6 (8.1)	-	Presence of sidewalks; continuous sidewalks on both sides; public	Green open space	Walking for transportation	Building types [OR (95%Cl) = 1.81 (1.05; 3.13), p = 0.034], safety (street crossing) [5.15(2.02; 13.15), p = 0.001] were significantly associated with walking for transport.

				spaces; outdoor fitness/recreation area; safety and comfort; crossing area with ramps or curb cuts; grooves or bumps; intended crossing area for pedestrians; signs for pedestrians /children/; signs for school speed zone; park/playground			Mixed used houses, undeveloped land, benches, intersections, and traffic-calming were not associated with walking for transport. *(Linear regression)*
Hoenig et al., 2006, USA	1002 100%	78.0 (8.0)	-	Presence of barriers vs no barriers at the entry way or at multilevel living space	-	Use of assistive devices	The likelihood that assistive device will be used during mobility (vs none) was significantly higher in those with environmental barriers at home [OR (95%CI) = 1.67 (1.04; 2.68)]. p-value not reported. (*Regression*)
Holle et al., 2014, Netherland	1269 62.0%	74.0 (6.0)	-	Walkability index	-	Transport-related walking Transported related	Findings showed a positive relationship between neighborhood walkability and weekly minutes of older adults' self-reported walking for transportation [β (95%CI) = 4.625 (2.571; 6.679), p < 0.001]

						cycling Recreational walking Recreational Cycling	Walkability was not associated with weekly minutes of older adults' self-reported cycling for transportation and recreation and walking for recreation. *(Multilevel linear regression)*
Inoue et al., 2011, Japan	1921 48.1%	69.5 (2.9)	Seeing people being active	Residential density; access to shops; public transport; sidewalks; bicycle lanes; access to exercise facilities; traffic safety	Aesthetics	Transportation walking for daily activity (min/week) Recreational walking (min/week), Total neighborhood walking (min/week)	Good bicycle lanes [OR (95%Cl) = 1.26 (1.03; 1.55), p = 0.026], good access to exercise facilities [1.26 (1.03; 1.54), p = 0.027], seeing people being active [1.31 (1.06; 1.61), p = 0.011], and good aesthetics [1.31 (1.07; 1.61), p = 0.009] were positively associated with transportation walking. Seeing people being active [1.42 (1.16; 1.75), p = 0.001] and aesthetics [1.55 (1.26; 1.86), p < 0.001] were positively associated with recreational walking Access to exercise facilities [1.23 (1.00; 1.51), p = 0.047], social environment [1.39 (1.14; 1.71), p = 0.001], and aesthetics [1.48 (1.21; 1.81), p < 0.001] were associated with total neighborhood walking. *(Multilevel logistic regression analyses)*
Keskinen et al., 2020, Finland	848 62.0%	80.6 (4.2)	-	Resident location: city center; subcenter; dense area outside centers;	-	Walking difficulties	There was no difference in walking difficulties between older adults residing in the city, subcenter, dense area outside centres and dispersed areas outside centres. *(Chi-square)*

				dispersed areas outside centers			
Keysor et al., 2010, USA	438 70.0%	70.0 (4.0)	-	Community mobility barrier items: uneven sidewalks or other walking areas (some or a lot); no parks and walking areas that are easy to get to and easy to use; no safe parks or walking areas; no places to sit and rest at bus stops, in parks, or in other places where people walk; no curbs with curb cuts Transportation facilitators: public transportation that is close to your home (some or a lot); public transportation with adaptations for people who are limited in their daily activities (some or a	-	Mobility limitation (measured by LLFDI)	Older adults who reported community mobility barriers had about twice the odds of reporting high daily activity limitation [OR (95%Cl) = 2.0, (1.2; 3.1)]. Older adults who reported high transportation facilitators reported less DAL [0.5 (0.30; 0.8)]. Community mobility barriers or transportation facilitators were not associated with daily activity frequency. *(Multivariable logistic regression)*

				lot); handicap parking (some or a lot); have a car available to you at your home			
Kylberg et al., 2013, Sweden	154 77.0%	NR (NR)	-	Type of living area (urban, semi-urban/rural); type of dwelling (multi-dwelling block, one/two family house/other); number of barriers (entrance, indoor, outdoor)	-	Use of walking sticks, crutches, wheeled walking frame	Number of outdoor barriers was a statistically significant predictor for becoming a new user of assistive devices for mobility six years later ($p < 0.05$). OR data not reported in the study. *(Logistic regression analyses)*
Laatikainen et al., 2018, Finland	844 57.0%	64.3 (5.5)	-	Walkway density; residential density; public transit stop density; intersection density; share of sporting places	-	Total monthly walking	Walkway density ($\beta = 0.278$, $p < 0.0001$), residential density (0.720, $p < 0.0001$), public transit stop density (0.535, $p < 0.0001$), intersection density (0.092, $p < 0.05$), and share of sporting places (0.132, $p < 0.001$) were all positively associated with total monthly walking. *(Regression)*
Li et al., 2005, USA	577 64.0%	74.0 (6.3)	Number of places of employment	Neighbourhood level: household; street intersection; area of green and open space for recreation Residential level:	-	Self-reported neighbourhood walking	Density of places of employment in the neighbourhood ($\beta = 0.15$), household density (0.27), number of street intersections (0.37), and area of green and open spaces (0.23), were all significantly related to walking activity at the neighbourhood level. At the residential level, number of recreational facilities (0.22) and

				access to recreational facilities; safe to walk; safe from traffic; number of recreational facilities; number of street intersections ; number of street intersections by safe from traffic; area of green and open space for recreation; area of green and open space by access interaction			areas reported by the residents that were safe for walking (0.12) were significantly related to walking activity. Residents in neighbourhoods with more street intersections who reported being safer from traffic tended to report more neighbourhood walking activity. No significant interaction was observed between proximity of physical activity facilities and areas of green and open space. *(Multi-level regression modelling)*
Li et al., 2008, USA	1221 43.0%	62.0 (6.9)	Neighbourhood level	Land use mix; street connectivity; public transit; stations	Green open spaces	Neighborhood walking Walking for transportation Walking for errands	Neighborhood walking was associated with land use mix [β (SE) = 1.403 (0.291), p < 0.000], and not associated with street connectivity, public transit stations, green and open space. Walking for transportation was associated with land use mix [1.752 (0.384), p < 0.001], street connectivity [0.180 (90.061), p = 0.004], public transit stations [0.137 (0.053), p = 0.011] and not green and open spaces. Walking for errands were associated with street connectivity [0.104 (0.046), p = 0.025], not associated with land use mix, public transit stations, green and open spaces

							(Multilevel poisson regression models)
Marquet et al., 2017, Spain	1300 59.5%	79.1 (2.7)	-	Levels of population density; land use mix; measures of connectivity and design	-	Total time walking, travelling, driving and number of trips	High walkability was associated with more minutes spent walking [OR (95%CI) = 1.83 (-0.8; 2.28), p < 0.01], total time travelling [1.05 (-6.8; 22.5), p < 0.05], total time driving [1.17 (-2.06; 10.3), p < 0.05], and not number of trips. *(Regression model-Difference-in-difference models)*
Mendes et al., 2009, USA	4317 61.0%	74.5 (6.7)	Neighbourhood level cohesion & disorder; Individual level cohesion & disorder	-	-	Total minutes of walking among persons, walking for exercise and walking for other things.	Individual level cohesion was associated with total mins of walking (coefficient = 2.05, p < 0.001), walking for exercise (1.75, p < 0.001) and other walking during the past 2 weeks (1.33. p < 0.001). Neighbourhood level disorder was associated with total mins of walking (-2.69, p < 0.05) and walking for others (-2.35, p < 0.05) and not with walking for exercise. Neighbourhood level social cohesion and individual level disorder were not associated with total mins walked or walking for exercise or other walking. *(Regression)*
Michael et al., 2006, USA	582; 67%	75.1 (6.3)	-	Sidewalk quality; presence of shopping malls; perception near home of shopping mall, public	Aesthetics; Presence of parks; Presence of trails;	Neighborhood walking (low walkers (no to moderate walking) vs high walkers (quite a bit & a	Neighborhood walking was associated with objective neighbor characteristics [the presence of a mall (OR = 4.12, p = 0.147) and the presence of graffiti and vandalism (0.57, p = 0.28)]. Neighborhood walking was associated with perceived neighborhood characteristics [presence of a mall (2.10, p = 0.108)], p-values were set at 0.25.

				park, or trails for walking, hiking, or running; perception of issues in neighborhood: "no sidewalks (or foot-paths)," "unsafe sidewalks (obstacles to walking);" perception of issues in neighborhood: "graffiti," and "vandalism."		great deal walking))	No other perceived and objective neighborhood environment variables were associated with neighborhood walking *(Regression)*
Mifsud et al., 2017, Malta	500 67.8%	NR (NR)	Participation in social activities; Presence of personal assistance	Distance to bus stop; district of residence; household type (single or multi member)	-	Self-reported driving (yes/no) and use of public transport (daily, weekly, monthly, infrequently, never)	District of residence was a strong predictor for how frequency the older adults use public transport. The odds for those who participated in social activities to use public transport weekly rather than never were almost three times more than for those who did not participate in any social activity. The model showed that older people with personal assistance used public transport less than those who did not require any assistance (β = -1.357 when comparing weekly with never

							and -0.654 when comparing infrequently with never). None of the other environmental factors were predictors of driving among older adults. *(Binary regression, multinomial regression)*
Mortenson et al., 2021, Canada	22 68.0%	68.9 (13.9)	-	Navigating some environments: maneuvers sidewalks, ascends or descends steps, side slopes, curbs	-	Wheelchair skills or confidence	Navigating environment (WheelCon scores) were positively significantly correlated with Wheelchair still test (WST-Q) capacity (r = 0.488), WST-Q confidence (r = 0.787) and not WST-performance. *(Pearson's correlation)*
Nagel et al., 2008, USA	546 70.0%	74.0 (NR)	-	Percentage of high-volume streets; percentage of medium-volume streets; percentage of low-volume streets; percentage of sidewalk coverage; number of intersections; number of bus lines; number of	-	Total walking time	Within a quarter- mile radius around participants' homes, a higher number of commercial establishments (β (SE) = 0.23 (0.07), p < 0.001), select establishments (0.60 (0.27), p = 0.024), and a greater percentage of high-volume streets (1.00 (0.50), p = 0.048) were all significantly associated with increased total walking time. A higher percentage of low-volume streets (-1.16 (0.40), p = 0.004) was associated with fewer minutes walked per week. At the half-mile buffer, total walking time was associated with number of commercial establishments (0.06 (0.02), p = 0.002), select establishments (0.31 (0.1), p = 0.002), and percentage of high-volume (1.50 (0.61), p = 0.015)

				commercial establishments; number of select establishments			and low-volume (-1.69 (0.5), p < 0.001) streets. Number of intersections, percentage of medium-volume streets, percentage of sidewalk coverage, no of bus lines were not associated with total walking time within a quarter or half a mile radius around participants home. *(Multilevel regression analysis)*
Nathan et al., 2012, Australia	2918 55.9%	72.9 (5.4)	-	Access to commercial destination within 400m and 800m neighbourhood service areas; destination mix within 400m and 800 m service area	-	Prevalence of weekly walking (none vs some) and sufficient mins of walking per week (insufficient, <150 mins) vs sufficient (>150 mins)	Older adults with access to general services within 400m [OR (95%CI) = 1.33 (1.07; 1.66), p = 0.011] and 800m [1.20 (1.02; 1.42), p = 0.027], and social infrastructure within 800m [1.19 (1.01; 1.40), p = 0.043] were more likely to engage in some weekly walking. Access to medical care services within 400m [0.77 (0.63; 0.93), p = 0.008] and 800m [0.83 (0.70; 0.99), p = 0.044] reduced the odds of sufficient walking. Access to food retail, general retail, financial services and the mix of commercial destination mix within 400m and 800m service area were not association with walking among Australian older adults. *(Logistic regression)*
Patterson and Chapman, 2004, USA	372 100.0%	78.0 (5.7), urban 78.1 (4.2), suburban	-	Estimated distance to grocery store; total number of services used within	-	Transportation (how do you usually get to places) Walkability assessed	New urbanism partially explained several differences in service use and activity: distance to a grocery store (r^2 change = 0.11, p = 0.001), number of services used within 1 mile from home (0.06, p = 0.007), number of walking activities (0.08, p = 0.001), number of services accessed by walking

				1 mile of home; total number of walking activities; total number of services accessed by walking; total number of services accessed by driving Urban vs suburban		via walking activity, frequency, endurance, driving ability and purpose	(0.14, p = 0.000), and number of services accessed by driving (0.05, p = 0.001). *(Multiple linear regression model)*
Perchoux et al., 2019, Luxemburg	471 47.0%	NR (NR)	-	Number of amenities; diversity of amenities; number of public transports stops; street connectivity; distance to activities	Greenness index	Utilitarian walking (mode of transport to reach regular destination)	The odds of walking were positively associated with the number of amenities [Coefficient (SE) = 0.006 (0.002)] and negatively associated with the number of public transport stops [-0.030 (0.013)]. Street connectivity ranging from 0 to 8 intersections was positively associated with the odds of walking [0.176 (0.059)] while intersections above 8 were negatively associated with utilitarian walking. An increase of 5-min in the walking distance from the place of residence is strongly negatively associated with walking [-0.189 (0.010)] Diversity in amenities and greenness were not associated with walking.

							(Regression model)
Portegijs et al., 2017, Finland	2550 64.0%	80.6 (4.3)	-	Objectively recorded and perceived environmental barriers	-	Moving out of home daily	The odds for moving out-of-home less than daily increased when participants perceived entrance-related barrier(s) (intermediate barriers OR = 1.9, multiple barriers OR = 3.5) or when they lived in homes with higher numbers of objectively recorded environmental barriers at entrances. Older adults living in homes with multiple objectively recorded environmental barriers at the entrance and those reporting perceived entrance related barrier(s) had increased odds ratios (OR = 3.5, $p < 0.05$) of not moving out of home daily. *(Bivariable logistic regression)*
Portegijs et al., 2020, Germany, the Netherlands, Spain, Sweden, United Kingdom, Italy	2455 60.0%	74.1 (5.1)	-	Parks and walking areas; places to sit and rest; public transportations; an additional, similarly formulated item on public facilities	-	Active travel time, daily walking and cycling related to transportation and activities (frequency and duration)	Overall, reporting a lot of public facilities [β (95%CI) = 0.24 (0.09; 0.38)] was associated with longer active travel times than reporting no such facilities at all. Similarly, reporting some [(0.18 (0.05;0.32)] or a lot [0.31 (0.17; 0.45)] of parks and walking areas was associated with longer active travel times than reporting no parks and walking areas at all. Reporting a lot of, not some, places to sit and rest [0.29 (0.15;0.43)] and public transportation stops [0.27 (0.12;0.42)] was associated with longer walking and cycling times than when no such places were reported. In terms of variety in perceived neighborhood resources, reporting "at least some" presence for all four of the neighborhood resources [0.26 (0.12;0.39)] was associated with longer

							active travel time than reporting "at least some" presence for two or fewer of the resources. Reporting the presence of "a lot" for one to two [0.16 (0.06;0.27)] or for three to four [0.36 (0.25;0.47)] of the perceived resources was associated with longer active travel time than not reporting "a lot" for any of the resources. All p < 0.05 *(Mixed modeling approach)*
Sabback et al., 2005, USA	40; 80%	73.3 (NR), New York 78.9 (NR), Florida	-	Windy roads; very busy roads; roads less well maintained; bridges; narrow roads; construction; expressways or interstates /highways; dirt Roads	-	Driving	60% of participants from New York reported driving less during the winter, while 20% from Florida reported driving less in various sessions (one participant in spring, 3 in summer, 1 fall and 2 winter). 70% of participants from New YORK reported avoid driving at least one type of road condition while 80% of participants from Florida reported avoid driving at least one type of road condition. *(Descriptive statistics)*
Salvador et al., 2010, Brazil	385 60.5%	NR (NR)	-	Good perception of safety during the night; presence of soccer fields in the district; walking time of not more than 10 minutes from home to soccer field; pharmacies; primary healthcare, bar; absence of open-air sewers;	-	Walking time (transport-related walking and leisure time walking)	Presence of soccer fields in the district [OR (95%CI) = 4.12 (1.41; 12.02), p = 0.011], and walking time of not more than 10 minutes from home to a soccer field [4.43 (1.46; 8.10), p = 0.006] were associated with the greater chance of walking in elderly men. Present of square [4.70 (1.43; 15.43), p = 0.012] and walking time of not more than 10 minutes from home to a primary healthcare [3.71 (1.19; 11.54), p =

				presence of places for walking in district; having a pet dog; presence of public lighting; presence of bar; square and absence of smoke pollution; perception that drivers respected pedestrian crossing the streets			0.025] were associated with greater chance of walking among elderly women. Other factors (n=12) were not associated with chance of practicing walking (Multiple logistic regression)
Shigematsu et al., 2009, Japan	1623 56.5%	81.1 (4.5)	-	Residential density; land use mix-diversity; land use mix-access; street connectivity; walking/cycling facilities; neighborhood esthetics; pedestrian/traffic safety; recreational facilities near home; park near home; safety from crime	Neigborhood esthetics	Walking for transportation Walking for lesiure	Walking for transportation was correlated to land use mix- diversity and access, recreational facilities near home ($p < 0.05$), but not street connectivity, neighbourhood esthetics, pedestrian/traffic safety, safety from crime among older adults 66 years and older. Walking for leisure was correlated with land use mix diversity and access ($p < 0.05$), but not residential density, street connectivity, walking/cycling facilities, neighborhood esthetics, pedestrian/traffic safety, safety from crime, recreational facilities near home and park near home among older adults 66 years and older ($p < 0.05$) *(Pearson correlation)*

Slaug et al., 2011, Latvia, Germany, Sweden, Hungary	1542 80.0%	NR (NR)	-	188 environmental barriers according to the Housing Enabler Instrument		Use of walking aids, wheelchairs	The top 20 environmental barriers experienced by the participants that had limitations in movement and use of Mobility devices were: outdoor environment [routes with steps (7), high kerbs (11), no resting surfaces or too far between resting surfaces (8), unstable walking surface in parking space (10), no/too few seating places (9), extremely low, high or narrow seating surfaces (3)], entrances [heavy doors without automatic opening (15), doors that do not stay in open position/close quickly (16), stairs the only route (12), no handrails (stairs) (4), steep gradients (17), long runs without level resting surface (18), no handrails (ramps) (19), heavy doors without automatic opening (20)] and indoor environment [stairs to upstairs with necessary dwelling functions (13), stairs to basement with necessary dwelling functions (14), no handrails (stairs) (5), handrails placed too high/low (6), wall-mounted cupboards and shelves placed extremely high (2), no grab bars at shower/bath and/or toilet (1)]. *(Simulated accessibility analysis)*
Todd et al., 2016, USA	714 53.1%	74.5 (6.3)	-	Walkability (residential density, intersection density, land use mix, retail floor area ratio, transit stop	-	Walking for errands and exercise	"Low walkability, low transit access, low recreation access" (L-L-L) profile walked the least for both errands & exercise. "High walkability, high transit access, high recreation access" (H-H-H) profile walked the most for both errands & exercise. Only the difference between the L-L-L profile and the H-H-H profile was statistically significant (p=0.017) for walking for exercise.

				density, park density, recreation facility density); public transportation access; recreation environment access.			The "Medium walkability, transit and recreation access" profile did not differ significantly from either the L-L-L profile (p = 0.358) or the H-H-H profile (p = 0.064). *(Latent profile analysis)*
Travers et al., 2018, USA	832 51.0%	75.6 (NR), community participants 79.5 (NR), retirement village participants	-	Accessibility; land use mix; safety from traffic; safety from crime; pleasantness	-	Total walking time Occasions of walking	There was no significant association between accessibility, land use mix, safety from traffic, safety from crime and pleasantness with total walking time and total minutes spent walking. *(Correlation)*
Tsunoda et al., 2012, Japan	421 52.2%	73.3 (5.3)	Seeing people exercise; household car or motor bike	Residential density; access to shopping, public transportation, and recreational facilities; presence of sidewalks and bike lanes;	Aesthetics; presence of hills	Walking at least 60 mins per week and walking at least 150 mins per week	Older adults were more likely to walk at least 60 mins per week when they perceived there were good traffic safety [OR (95%CI) = 1.64 (1.03; 2.60)] and pleasant aesthetics [2.12 (1.34; 3.36)]. There was also a positive association between pleasant aesthetics [2.00 (1.33; 3.02)] and walking at least 150 mins per week. On the other hand, good access to public transportation [0.64 (0.42; 0.98)] was negatively associated with walking at least 150 mins per week ($p < 0.05$).

				crime safety; traffic safety			Residential density, access to shop, access to recreational facilities, presence of sidewalks, bike lanes, crime safety, presence of hills, seeing people, and household or motor bike were not associated with walking at least 60mins/week or at least 150ms/week. Traffic safety and access to transportation was not associated with walking at least 150mins/week or 60 mins/week, respectively. *(Logistic regression)*
Vasquez et al., 2019, USA	3716 55.2%	69.0 (0.2), Mexicans 69.6 (0.3), Puerto Rican 72.6 (0.5), Cuban 70.8 (7.6), Dominican 69.3 (0.4), Central or South American	Social cohesion	-	-	Walking difficulty	Those with high neighborhood social cohesion reported lower odds of walking limitations [OR (95%CI) = 0.90 (0.68; 1.2)], compared with those living in low social cohesion neighborhoods. *(Logistic regression analysis)*

White et al., 2009, USA	436 69.0%	70.4 (3.9)	-	Uneven sidewalks or other walking areas; no parks and walking areas that are easy to get to and easy to use; no safe parks or walking areas; no places to sit and rest at bus stops, in parks, or in other places where people walk; no curbs with curb cuts; public transportation that is close to your home; public transportation with adaptations for people who are limited in their daily activities; adequate handicap parking; have a car available to you at your home	-	Late Life Disability Instrument	Older adults with 'no parks and walking areas' reported less frequent engagement in social activities compared to those with neighborhood parks and walking areas (OR = 0.5, $p < 0.001$). Older adults reporting adequate handicap parking reported more frequent engagement 'visiting friends and family' (1.8), going out with others to public places' (1.8) and providing care and assistance to others (1.5), and 'working at a volunteer job' (1.6) compared to those without adequate handicap parking ($p<0.001$). *(Logistic regression)*
Yang and Sanford, 2012, USA	239 64.0%	72.5 (8.5)	Social support	Environmental features included 17 features (e.g., steps, toilets, kitchen appliances, and bedroom closets) in four areas of the home (i.e., circulation, bathroom, kitchen, and bedroom) and 7 features in the community (i.e., stores, streets, sidewalks, visual appeal,	-	Community participation (how often do you move to various destination)	When toilet space, toilet, tub/shower space, and tub/shower were perceived as barriers, the odds of infrequent travel were 46.7, 25.0, 29.0, and 8.0 times higher, respectively, compared to when they were perceived as facilitators. Among community features, the odds of infrequent community travel were 17.8 times higher when sidewalks were perceived as barriers and 21.3 times higher when social environments at the destination were perceived as barriers. *(Stepwise regressions)*

				public transit, and destination).			
Performance based and self-reported mobility outcomes and environmental factors (n=2)							
Leung and Chung, 2020, China	450 79.7%	NR (NR)	Social environment facilitators and barriers	Physical environment facilitators and barriers	-	Total walking time Walking for Transportation	Physical environment facilitators (β = 15, $p < 0.05$) and social environment (0.16, $p < 0.05$) were found to predict the total walking time. The effects of the physical environment barriers were not significant for total walking time. Only the physical environment facilitators had a significant and positive effect on walking for transportation (0.15, $p < 0.05$). Social environment and physical environment barriers were not predictive of walking for transport. (*Structural equation model*)
Van Holle et al., 2016, Belgium	438 54.1%	74.3 (6.2)	-	Land use mix density; access to recreational facilities; access to services; connectivity; physical barriers to walkers; infrastructure for walking; safety from crime; safety from motorised traffic speeding	Aesthetics	Physical functioning (SPPB) Walking for transportation and recreation (self reported)	Objective neighborhood walkability moderated the association between older adults' physical functioning and weekly minutes of transport walking (β = 0.792, $p = 0.003$). None of the perceived environmental factors moderated the association between physical functioning and older adults' transport walking. (*Multi linear regression*)

Notes: ANOVA- Analysis of Variance; ANCOVA- Analysis of Covariance; e^b - Exponentiated Regression Coefficient; df – Degree of Freedom; IQR - Interquartile Range; m - Meter; mins – Minutes; NR- Not reported; OR-Odds Ratio; r - Correlation, r^s - Spearman Rho; SPPB - Short Physical Performance Battery; SD – Standard Deviation; SE – Standard Error TUG - Time Up and Go Test; 95%CI - 95% Confidence Interval, β - Beta Coefficient.

Mobility limitation includes self-reported inability on all or either of the following: walking up and down a flight of stairs (10 steps) or several flights of stairs, walking a mile (1600meter) or half a mile (800meter) or a quarter mile or a block (400meter) or 100-300meter, or across the room and running/jogging for 20-30 minutes.

Result highlighted in gray indicates no significant association between environmental factor(s) and mobility outcome.
Most findings in the table were reported verbatim as the authors reported them in their paper.

Appendix 3C: Quantitative studies that examined the association between multiple factors and mobility outcomes (n=113).

Author, year, country	**Total Sample size included in analysis** **% Female**	**Mean age (SD)**	**Factors**	**Mobility outcome used**	**Findings** ***(Analysis type)*** **Note: all variables in each study were analyzed using the same type of analysis unless otherwise stated**
			Performance based mobility outcome and >1 factors (n = 18)		
Angel et al. 2003, USA	3050 58.0%	NR (NR)	**F:** Income **P:** age; sex; education; marital status	Walking time (4.5-Meter Walk Test)	Income between $5,000-9,999 [β (SE) = 0.377 (0.203)] and 10,000-14,9999 [0.382 (0.170)] were associated with the time taken to walk 4.5-meter walk ($p < 0.05$) Older adults aged, between 75-84 [(0.231 (0.111)] and 85+ [1.15 (0.208)] were associated with more time taken to complete 4.5-meter walk ($p < 0.05$). Not married [-0.252 (0.108), $p < 0.05$] is associated with time taken to walk 4.5-meter walk. Education, and being female was not associated with the time taken to walk 4.5-meter walk. *(Logistic regression)*
Bann et al. 2016, United Kingdom	947 66.7%	78.3 (5.3)	**F:** Income **P:** Education	Gait speed (grouped as major and persistent mobility disability)	The effects of reducing the incidence of mobility disability were more significant for individuals with post graduate degrees [HR (95%CI) = 0.72 (0.51; 1.03)] than individuals with lower education [0.93 (0.70; 1.24)] ($p < 0.05$). The reduction of incidence of mobility disability was larger for individuals with an income of ≥$50 000 [0.82 (0.5; 1.16)] compared to individuals with an income ≤ $24 999 [0.86 (0.63; 1.17)] ($p < 0.05$). *(Cox regression)*

Barbosa et al., 2015, Brazil	158 37.0%	64.0 (9.0)	**E:** Lack of green space areas **P:** Age	Steps per day	Steps per day was inversely associated with lack of green areas ($\beta = -1363.54$, $p < 0.001$) and age (-81.13, $p < 0.001$) (*Multiple linear regression*)
Carrapatoso et al, 2018, Portugal	85 69.0%	68.6 (5.0), male 68.4 (4.8), female	**E:** Types of residences; distances to facilities; walking or cycling infrastructure; traffic safety; neighborhood safety; pleasantness; home environment and workplace or study environment **P:** Sex	10,000 steps per day Peak 30 mins cadence above 100	Older women who presented positive perceptions about traffic safety [OR (95%CI) = 4.395 (1.024; 18.866)] and pleasant environment [8.718 (1.803; 42.149)] were more likely to achieve 10,000 steps per day. The positive perception of nearby parks appeared to be a statistically significant predictor of the compliance with peak 30-minutes cadence above 100, but only in men [14.353 (1.321; 15.591)]. There was no significant difference between peak 30-minute cadence and steps per day between men and women. (*Logistic regressions*)
Dollman et al., 2016, Australia	157 67.0%	73.3 (4.1)	**E:** Pleasant neighbourhood; safety; walkability **F:** Income **P:** Age; sex; education; marital status; occupation	Walking steps	Pleasant community [OR (95%CI) = 5.85 (2.01; 16.99)], safety [0.40 (0.21; 0.78)] and walkability [2.45 (1.08; 5.55)] were predictors of steps by individuals in Riverland area ($p < 0.05$) and not in Yorke Peninsula. Age [0.88 (0.82; 0.95), $p < 0.001$] and education [0.64 (0.45; 0.91), $p < 0.05$] were significant predictors of steps in the Yorke region, but not the Riverland area. Being single (compared to being married), was a predictor of steps in the Riverland [0.16 (0.04; 0.64), $p < 0.01$] and Yorke regions [0.17 (0.05; 0.52), $p < 0.01$].

					Being female, being unemployed (compared to working part or full-time), and income were not predictors of steps by individuals in both Riverland and Yorke regions. (*Logistic regression*)
Dong et al., 2014, USA	3159 58.9%	72.8 (8.4)	**F:** Income **P:** Age; sex; education; marital status	Physical functioning (SPPB)	Having a higher level of education was significantly correlated with better SPPB scores ($r = 0.26$, $p < 0.0001$). Younger age ($r = -0.46$), being male ($r = -0.12$), higher level of education ($r = 0.26$), being married ($r = 0.24$), had significant correlations with better SSPB scores. Income was not significantly correlated with SPPB scores. *(Bivariate correlation)*
Dong et al., 2017, USA	2713 58.4%	72.6 (NR)	**F:** Income **P:** Age; sex; education; marital status	Physical functioning (SPPB)	Older age ($\beta = -0.15$, $p < 0.001$), female sex (0.42, $p < 0.001$), lower education (0.11, $p < 0.001$), lower income (0.10, $p < 0.05$), were associated with lower level of physical function at baseline. On average, total physical performance is declining at an annual rate of 0.35 units. Older age significantly increased the rate of physical performance decline among the overall physical performance tests ($\beta = -0.02$, $p < 0.001$) and chair stand ($\beta = -0.01$, $p < 0.01$). Higher education was associated with physical performance decline in the walk test ($\beta = -0.04$, $p < 0.001$) and the overall physical performance measure ($\beta = -0.03$, $p < 0.01$). Income and marital status were not associated with physical performance decline. *(Mixed effects models)*

Haas et al. 2012, USA	14564 61.0%	67.4 (10.6)	**F:** Income **P:** Age; sex; education; race; occupation; marital status	Walking time (2.5-Meter Walk Test)	Education [β (SE) = -0.04 (0.01), p < 0.001], age [0.07 (000), p < 0.001], sex [-0.30 (0.05), p < 0.001], no of income sources [-0.09 (0.02), p < 0.001], race [US-born Black [0.64 (009), p < 0.001] vs Foreign Born Hispanic [0.28 (0.13), p < 0.05] were associated with time to complete 2.5 meter. Marital status, occupation, and household income were not associated with walking time. (*Linear regression*)
Hall and McAuley, 2010, USA	153 100.0%	69.8 (5.9)	**E:** Residential density; land use-diversity; land use-access; street connectivity; walking/ cycling facilities; pedestrian/traffic safety; crime safety; overall neighborhood satisfaction; aesthetics **F:** Income **P:** Age; education; race; marital status	Step counts (steps per day)	Individuals with more than 10,000 steps/day [mean (SD) = 2.77 (0.66)] had higher street connectivity than those with less than 10,000 steps/day [2.45 (0.65)] (p = 0.02). Individuals with more than 10,000 steps/day [3.04 (0.78)] had higher pedestrian/traffic safety than those with less than 10,000 steps/day [2.77 (0.6)] (p = 0.04). There was no significant difference in means score of residential density, land use mix diversity, land use mix access, walking/cycling facilities, aesthetics, crime safety and neighbourhood satisfaction among individuals with more than 10,000 steps/day and those with less than 10,000 steps/days. Those that took <10,000 steps/day were older [mean = 70.5 (6.05)] than those who took >=10,000 steps/day [68.1 (5.16)] (p = 0.04). Marital status, income, education, and race were not different between those who took <10,000 steps/day and those who took >=10,000 steps/day. (*MANOVAS*)

Idland et al. 2013, Norway	300 100.0%	80.9 (4.1)	**E:** Living alone **P:** Age; education	Physical functioning (TUG)	Education and living alone were not associated with time taken to complete a 3-meter walk at baseline, and 9-year follow up among community-dwelling women Age was associated with time taken to complete a 3-meter walk at baseline, and 9-year follow up among community-dwelling women ($\beta = 0.35$, $p < 0.001$). *(Univariate linear regression)*
Jancova-Vseteckova et al., 2015, Czech	3205 67.0%	67.1 (3.9)	**F:** Income **P:** Education	Gait speed Physical functioning (Chair Rise Test)	Men and women with a higher level of education were 0.10m/s and 0.12m/s faster than those with a lower level of education ($p < 0.001$). Men and women with a higher level of education were 1.8 seconds and 2 seconds faster in performing chair rise test faster than those at the lower level of education ($p < 0.001$). Income was not associated with gait speed and ability to perform the chair rise test. *(Linear regression)*
Menant et al., 2019, Australia	26 46.0%	78.5 (4.2)	**E:** Floor surface: control; irregular; wet **P:** Age	Walking velocity Stopping time Stopping distance	Subjects walked faster on the control surface than on the irregular and wet surfaces ($p < 0.05$). The wet surface impeded gait termination, as indicated by greater total stopping time and stopping distance ($p < 0.05$). Younger individuals had greater walking velocity ($p < 0.001$) and had smaller stopping distances ($p = 0.019$). Age was not associated with total stopping time. *(Mixed method three-way repeated ANOVA)*
Nascimento et al.	1190 60.1%	NR (NR)	**E:** Green area	Physical functioning (TUG)	Individuals with 1-3 years of education were more likely [OR (95%CI) = 0.96 (0.59; 1.55)] to take a longer time to complete TUG compared to those with 4-7

2018, Brazil			**F**: Income **P**: Age; education; sex; marital status; race	Walking time (3-Meter Walk Test)	years [0.65 (0.41; 1.0)] and 8 years or more of education [0.36 (0.22; 0.61)] ($p < 0.05$). Age was associated with TUG [5.02 (3.01; 8.38), $p < 0.05$] Green area, sex, race, marital status was not associated with TUG Individuals' levels of income were not associated with time taken to complete 3 Meter Walk Test. *(Multi-level logistic regression)*

Pothisiri et al., 2020, Thailand	7847 51.0%	69.2 (NR), male 69.1 (NR), female	**F**: Income **P**: Age; sex; education	Walking speed	The mean walking speed was similar between men and women at approximately 1.0-1.1m/s for both sexes. *(Descriptive)* Men with secondary education or higher walked, on average, 0.207 m/s faster than their counterparts with no education, whereas women with at least a secondary education walked, on average, 0.145 m/s faster than their counterparts with no education ($p < 0.05$). Men aged 60 years with no education walked at the same speed as those with some primary education who were 3.1 years older, those with primary education who were 6.3 years older, and those with at least a secondary education who were 16.7 years older. At age 85, men with no education had the same average walking speed as men with at least some education who were 2.2–12.5 years older. Uneducated women at age 60 walked at the same speed as educated women 2.8–11.4 years older, and the difference in α – ages was reduced to 2.0–8.4 years for educated women compared with uneducated women at age 85 Older men in higher economic groups, particularly those in the highest income tercile, had significantly greater walking speed than those in the lower economic groups [β (SE) = 0.094 (0.012), $p < 0.01$]. A similar pattern was observed for walking speed among older women [0.056 (0.012)]. *(Multivariate analysis)*
Prins and Van Lenthe, 2015, Netherlands	43 52.5%	NR (NR)	**E**: Temperature; wind speed; rain time; sun time **P**: Age; sex	Time walked Cycling minutes (Estimated from GPS logger)	Higher temperature [β (95% CI) = 0.06 (0.00; 0.12)], higher wind speed [0.05 (0.00; 0.09)] and the absence of rain [-0.08 (-0.12; -0.04)] were associated with more walking ($p < 0.001$). Sun hours was not associated with walking.

					Higher temperature [0.09 (0.03; 0.15)] was associated with more cycling. Rain, wind speed and sun hours were not associated with cycling. Being female was associated with time walked [0.15 (0.05; 0.26)] and was not associated with time cycled. Age was not associated with time walked and minutes of cycling. *(Multivariable linear regression)*
Yeom et al., 2015, Korea	384 75.5%	72.0 (5.8)	**F:** Income **P:** Age; education; sex; religion	Walking distance (6-Mintues Walk Test)	By age groups, the 6MWT distances were 246.68 meters for persons in their 60's, 212.32 meters for persons in their 70's, and 175.54 meters for persons in their 80s, showing a gradual decrease with advance in age ($p < 0.001$). (*Analysis of variance)* The mean 6MWT distance was 217.85 meters in women and 192.66 meters in men, indicating that women showed a significantly higher walking mobility than men ($p = 0.023$). Individuals with higher income walked longer [mean distance (SD) = 253.29 (86.85)] compared to those with lower income [205.17 (92.74)]. ($p = 0.001$) No significant mean difference in 6WMT was noted across the older adults with religious affiliations and with levels of education *(t-test)*
Zandieh et al., 2017, United Kingdom	173 57.0%	74.2 (5.9)	**E:** Socioeconomi c deprivation (low deprivation	Walking durations and frequencies (GPS tracking unit)	Participants residing in high-deprivation areas are more likely to take shorter outdoor walks than those residing in low-deprivation areas ($\beta = -0.98$, $p < 0.001$).

			areas vs high deprivation areas) **P:** Age; sex; education; marital status; ethnicity		Educational attainment (0.77, p < 0.01), marital status (0.77, p < 0.01), and ethnicity (0.71, p < 0.05) were associated with walking duration. Age and sex were not associated with walking duration. No factors were associated with walking frequencies. *(Linear regression)*
Zaninotto et al., 2013, United Kingdom	7225 53.4%	71.2 (7.9)	**F:** Income **P:** Age	Gait speed	People in the richest wealth quintile had a mean gait speed 0.22 m/s higher than those in the poorest wealth quintile at baseline, which decreased by 0.03 m/s over each additional wave of the study, meaning that they had a faster decline in walking speed than those in the poorest quintile. The mean gait speed of men aged 71 years declined from 0.77m/s to 0.74m/s in 4 years. *(Latent growth model)*
Self-reported mobility outcome and >1 factors (n = 85)					
Allman et al., 2006, USA	1000 45.0%	74.9 (NR), male 75.7 (NR), female	**E:** Rural residence **F:** Income **P:** Age; education; sex; race; marital status	Life space mobility	Income (β = 0.143, p < 0.001), African American (-0.084, p = 0.004), age (-0.197, p < 0.001), female (-0.184, p < 0.001), and rural residence (0.156, p < 0.001) were independently associated with lower life space mobility (0.143, p < 0.001). Education and being married were not associated with life space mobility. *(Multivariant model)*
Alvarado et al., 2007, Canada	10661 NR	NR (NR)	**E:** Rural setting (yes or no)	Mobility limitation (number of lower extremity limitations)	Women had significantly greater odds [OR (95% CI) = 2.39 (2.04; 2.79), p < 0.05] of functional limitations than men.

			F: Income **P**: Sex; education; marital status; occupation		Odds of limitations in lower extremity function were higher among those living without a partner in all cities except Sao Paulo [City: Buenos Aires: 1.57 (1.10; 2.25), Havana: 1.18 (0.90; 1.55), Mexico City: 0.82 (0.61; 1.09), Montevideo: 0.94 (0.71; 1.25), Santiago de Chile: 1.51 (1.10; 2.07), São Paulo: 0.85 (0.67; 1.08)]. In Buenos Aires and Santiago, the absence of a partner was an important predictor of mobility limitations. Rural [1.05 (0.93; 1.81)], education [1.39 (1.17; 1.64)], occupation [manual vs non-manual [1.11(0.97; 1.27)] and housewives vs nonmanual [1.04 (0.84; 1.27)] and perception of income [1.54 (1.35; 1.74)], was an important predictor of mobility limitation *(Logistic regression)*
Avlund et al., 2000, Denmark	480 54.0%	NR (NR)	**F**: Income **P**: Sex; education; occupation	Mobility limitation (Mobility Help & Tiredness Scale)	More women (71%) than men (59%) felt tired (p = 0.007), and more women (22%) than men (14%) needed mobility help (p = 0.019). *(Chi-square test)* Individuals who had low education were more likely [OR (95%CI) = 1.8 (1.0; 3.1), p < 0.05] to report being tired during mobility compared to those with high education. Individuals whose longest-held jobs were manual were more likely [1.3 (0.7; 2.4), p < 0.05] to report being tired during mobility compared to those whose longest-held job was non-manual professional. Individuals with low income were times more likely to request for help during mobility [2.49 (1.3; 4.7), p < 0.05]. *(Regression model)*
Avlund et al., 2003, Denmark	748 55.0%	NR (NR)	**F**: Income	Mobility limitation	Among women, the need for help in mobility was significantly associated with education [OR (95%CI) = 2.5 (1.2; 5.1), p < 0.05].

			P: Sex; education; occupation	(Mobility Help & Tiredness Scale)	Among men, the need for help in mobility or being tired during mobility was not associated with education. Occupation was not associated with the need for help in mobility or being tired during mobility. The need for help in mobility was associated with income in both men [2.5 (1.3; 5.0), $p < 0.05$] and women [2.3 (1.3; 3.8), $p < 0.05$]. *(Logistic regression)*
Avlund et al., 2004, Denmark	606 52.2%	NR (NR)	**F**: Income **P**: Sex; education	Mobility limitation (Mobility Help Scale)	Men [OR (95%CI) = 1.6 (0.8; 3.2)] and women [1.2 (0.6; 2.4)] with low education were more likely to require help during mobility compared to those with high education ($p < 0.05$). Men [1.1 (0.5; 2.4)] and women [1.4 (0.7; 2.6)] with low income were more likely to require help during mobility compared to men and women with high income ($p < 0.05$). *(Multiple logistic regression)*
Barnes et al., 2016, Canada	30865 NR	NR (NR)	**E**: Transit score **P**: Sex; education	Self-reported transportation use	Those in neighbourhoods with Excellent Transit/Rider's Paradise had over three-and-a-half times higher odds of walking for transport and three times higher odds of using transit than those in neighbourhoods with Minimal Transit/Some Transit. A 10-point higher Transit Score was associated with 37% higher odds of walking for transport (OR = 1.37) and 40% higher odds of transit use (1.40). Compared to being male, being female was not associated with walking for transport or general transit use. Compared to having less than secondary education, having secondary [OR (95%CI) = 2.40 (1.51; 3.82)] and post-secondary [2.38 (1.57; 3.59)] were associated

					with walking for transport. Having secondary [1.79 (1.06; 3.02)] and post-secondary [3.32 (2.18; 5.06)] were also associated with general transportation use. *(Logistic regression)*
Bishop et al., 2016, USA	17713 59.3%	66.2 (3.0)	**F**: Income **P**: Age; sex; education; occupation; race; marital status	Mobility limitation	Higher education (12 years and above years of education) was negatively associated with initial limitations [β (SE) = -0.23 (0.07); for WB ("War Babies"; 0.27 (0.04) for HRS ("Health and Retirement Study"); -0.14 (0.04) for AHEAD ("Asset and Health Dynamics among the Oldest Old cohort"], and individuals with higher education develop fewer initial mobility limitations than those who completed less than 12 years of education ($p < 0.001$). Another occupational tenure was associated with more initial mobility limitations relative to those reporting white collar occupation tenure in the HRS [0.34 (0.06)], and AHEAD [0.18 (0.05)] cohorts ($p < 0.001$). Both house income [-0.11 (0.01)], and household assets [-0.04 (0.00)] were negatively associated with initial mobility limitations ($p < 0.001$). Age was associated with mobility limitation for HRS [-0.05 (0.01)]; for CODA ("Children of the Depression") [-0.06 (0.01)]; for AHEAD [-0.04 (0.01)] ($p < 0.01$), **but not for WB.** Female had more initial mobility limitations than did males, for WB [0.57 (0.06)], or HRS [0.49 (0.03)]; for CODA [0.40 (0.05)]; for AHEAD [0.30 (0.04)] ($p < 0.01$). Being married was associated with mobility limitation for WB [0.27 (0.08)], **but not for HRS, CODA and AHEAD.** Being black was associated with mobility limitation for CODA [-0.20 (0.08)], p < 0.01] **but not for WB, HRS, AHEAD.**

					Being Hispanic was associated with mobility for AHEAD [-0.21 (0.09), p < 0.01], **but not for WB, HRS, CODA.** *(Multivariate growth model)*
Brüchert et al., 2020, Germany	2189 45.5%	NR (NR)	**E**: Land use mix; walking infrastructure; cycling infrastructure; shared infrastructure; street connectivity; traffic safety; aesthetics **F**: Income **P**: Age; sex; education; partner status,	Walking for transport Frequency of walking for transport Amount of walking for transport (mins/week)	land use mix [OR (95%CI) = 1.82 (1.68; 2.13)], walking infrastructure [1.36 (1.21; 1.53)], shared infrastructure [1.13 (1.03; 1.24)], street connectivity [1.67 (1.44; 1.95)], traffic safety [1.22 (1.04; 1.43)], aesthetics [1.30 (1.13; 1.50)] were associated with walking for transportation Age (p = 0.0035) and education (p = 0.0005) were associated with walking for transport. Cycling infrastructure, partner status and income were not associated with walking for transportation. Land use mix [1.88 (1.67; 2.11)], walking infrastructure [1.33 (1.19; 1.49)], street connectivity [1.64 (1.42; 1.89)], aesthetics [1.25 (1.09; 1.43)] were associated with frequency of walking for transportation. Sex (p = 0.036), age (p = 0.035), education (p = 0.0004), and income (p = 0.0033) were associated with frequency of walking for transport. Cycling infrastructure, shared infrastructure, traffic safety and partner status were not associated with frequency of walking for transportation. Income (p = 0.0155) was associated with amount of walking for transport. Land use mix, walking infrastructure, cycling infrastructure, shared infrastructure, street connectivity, traffic safety, aesthetics, education, partner status, age and sex were not associated with among of walking for transport. (*Regression, chi-square, Wilcoxon test*)

Cauwenberg et al., 2012, Belgium	48879 55.7%	74.4 (6.7)	**E:** Area of residence; safety; satisfaction with public transit; distance to services **F:** Income **P:** Age; sex; education	Self-reported walking and cycling for transportation Walking/cycling for recreational	Urban participants were more likely to walk daily for transportation compared to rural and semi-urban participants ($p < 0.05$). Perceived short distances to services and satisfaction with public transport were significantly positively related to all walking/cycling behaviors ($p < 0.05$). Feelings of unsafety was negatively related to walking for transportation and recreational walking/cycling ($p < 0.05$). In females, it was also negatively related to cycling for transportation ($p < 0.05$). Area of residence was unrelated to weekly recreational walking/cycling. Age was associated with daily cycling for transportation [OR (95%CI) = 0.60 (0.57; 0.64), $p < 0.05$], but not daily walking for transport. Being female (compared to being male) was associated with daily cycling for transport [0.69 (0.66; 0.73), $p < 0.05$] and daily walking for transport [0.79 (0.76; 0.83), $p < 0.05$]. Compared to having no higher education, having higher education was associated with daily cycling for transport [0.68 (0.63; 0.75), $p < 0.05$] and daily walking for transport [1.11 (1.03; 1.19), $p < 0.05$]. *(Multilevel logistic regression)*
Cauwenberg et al., 2013, Belgium	67563 55.0%	74.2 (6.4)	**E:** Absence of high curbs; presence of different shops and services; benches; crossings; bus stops; street lighting;	Self-reported walking for transportation	The following four environmental variables were significantly positively related to walking for transportation: presence of bus stops (OR = 1.29), street lighting (1.2), number of shops (1.2) and safety from crime (1.08) ($p < 0.05$). Compared to being female, being male was associated with daily walking for transport ($\beta = 0.222$, $p < 0.05$). Compared to being widowed, being married/cohabiting (0.306, $p < 0.05$) or living alone/divorced (-0.103, $p < 0.05$) were predictors of walking for transport. Compared to having only primary

			safety from crime **F:** Income **P:** Age; sex; education; marital status		education, having lower secondary education (0.067, $p < 0.05$) was associated with walking for transport, but having higher secondary education or tertiary education were not. Compared to having an income of 500-999 euros, having an income of 1000-1499 euros (0.115, $p < 0.05$) and 1500-1999 euros (0.128) were associated with walking for transport, but not having an income ≥ 2000 euros. Age was not associated with walking for transport. *(Multilevel logistic regression)*
Cerin et al., 2013, Hong Kong	484 58.0%	NR (NR)	**E:** Environmental (destination prevalence; destination diversity; infrastructure; safety; area socioeconomic variable) **P:** Education	Walking for transportation Frequency and duration (total minutes per week) of within neighborhood walking (neighborhood defined as an area approximately 15-minutes' walk from home).	The prevalence of public transit points (e^b = 1.02) and diversity of recreational destinations (0.99) were positively related to overall walking for transport. The presence of a health clinic/service (1.03) and place of worship (1.06), higher diversity in recreational destinations, and greater prevalence of non-food retails and services (1.01), food/grocery stores (1.02), and restaurants (1.01) in the neighborhood were predictive of more within-neighborhood walking for transport. Neighborhood safety-related aspects moderated the relationship of overall walking for transport with the prevalence of public transit points (1.02), this being positive only in safe locations. Similar moderating effects of safety-related attributes were observed for the relationships of within-neighborhood walking for transport with diversity of recreational and entertainment destinations (1.16). Pedestrian-infrastructure attributes acted as moderators of associations of within-neighborhood walking for transport with prevalence of commercial destination categories. Area socioeconomic status (1.16) was associated with percentage within neighborhood walking.

					(Generalized linear models (GLMs)) Individuals with secondary or higher education are more likely to walk within the neighborhood than individuals with primary school education or no education [OR (95%CI) = 1.5 (1.26; 1.82), $p < 0.001$]. *(Zero-inflated negative binomial (ZINB) regression models)*
Cheng et al., 2019, China	702 45.7%	NR (NR)	**E:** Population density; land use mixture; distance to shopping mall; distance to convenience store; distance to market; distance to park/square; distance to chess/card room; distance to gym/sports center; arterial density; the number of parking lots; distance to metro station; the number of bus stops; the number of bike-sharing stations **F:** Income **P:** Sex; education	Self-reported walking for travel	Population density (coefficient = 0.116) and land use (1.283) distance to market (0.420), distance to park/square (0.139), distance to chess/card room (0.891), number of bus stops (0.026) and number of bike-sharing stations (-0.88) were significantly associated with active walking travel frequency among Chinese older adults. Compared to being female, being male was negatively associated with travel frequencies in the elderly (-0.109, $p < 0.05$). Education and income were not associated with travel frequencies in the elderly *(Ordinal regression)*
Clares et al., 2014, Brazil	52 69.2%	72.6 (8.6)	**F:** Income **P:** Age; sex; education;	Mobility limitation (Questions regarding difficulties in	Education, marital status age was not associated with difficulties in moving, help with locomotion and/or to move

			marital status	moving, help with locomotion or to move)	Education was associated with help to move (p < 0.001). Gender was associated with difficulties in moving (p = 0.018), help with locomotion (p < 0.001) and help to move (p = 0.046) There was no association between income and difficulties in moving, needing help with locomotion, or needing help to move (*(Chi-square)*
Clark et al., 2009, USA	1884 59.0%	NR (NR)	**E:** Living in highest crime neighbourhoods; perceived neighborhood safety **F:** Income **P:** Sex; race	Mobility disability	Perceiving neighbourhood safety hazards due to crime (compared to not perceiving safety hazards) and living in highest crime neighbourhoods (compared to lower crime neighbourhoods) were not associated with mobility disability incidence. Compared to males, females had greater mobility disability incidence [OR (95%Cl) = 1.33 (1.13; 1.55), p < 0.01]. Compared to having an income above poverty, having an income below poverty was associated with mobility disability incidence [1.31 (1.08; 1.59), p < 0.01]. Compared to being Non-Hispanic White, being Non-Hispanic Black was not associated with mobility incidence. *(Bivariate associations)*
Clarke et al., 2014, USA	6578 56.6%	NR (NR)	**E:** Social disorder (e.g., litter or broken glass on sidewalks and streets); stairs or ramp leading to home.	Mobility limitation Use of assistive devices	Stairs at the entryway to the home are associated with a 50% higher odds of reporting some/lot of difficulty going outside independently (OR = 1.52, p < 0.01). Use of a wheeled mobility device was associated with a fivefold higher odd of some/a lot of difficulty going outside (5.36) but was attenuated when there was a ramp at the entrance to the home (1.97) (p < 0.01). Conversely, while use of a walker was associated with a twofold higher odds of reporting some/lot of difficulty going outside (1.92). This effect was even greater for older adults with stairs at the entry to their home (3.82) (p < 0.01).

			P: Age; sex; race; marital status		Older age is associated with some/lot of difficulty going outside (0.29), and women are more likely to report some/lot of difficulty than men (1.35) Hispanics have a higher odds of reporting some/lot of difficulty compared with whites (1.75) Widowed (1.40) and never married (1.72) older adults are more likely to report a little difficulty going outside than married respondents Respondents with less than a high school diploma have an odds of reporting some/lot of difficulty going outside that is 30% higher than those with a college degree (1.34) *(Regression)*
Collins and Goldman, 2008, Taiwan	1056 42.9%	67.7 (8.1)	**F**: Income **P**: Education; occupation	Mobility limitation	Higher education was negatively associated with mobility restriction across the three-year periods [β = -0.030 (year 1); -0.014 (year 2); -0.005 (year 3) ($p < 0.05$)]. Index of Occupational Prestige was not associated with mobility restriction across the three-year periods. Income was associated with mobility restriction across the three-year periods [-0.060 (year 1); -0.045 (year 2); -0.016 (year 3) ($p < 0.01$)]. *(Ordered probit regression)*
Cornman et al., 2011, Taiwan	1191 46.3%	NR (NR)	**F**: Income **P**: Age; sex; education; marital status; ethnicity	Mobility limitation	A higher percentage (83.7% to 94.6%) of individuals with 13+ years of education reported having no mobility difficulty compared to those with lesser years of education ($p < 0.05$). A higher percentage (86.8% to 97.0%) of individuals with the highest income level reported having no mobility difficulty compared to those with a lower income level ($p < 0.05$).

					(Chi-square) Age was negatively associated with mobility limitation [OR (SE) = -0.93 (0.22), p < 0.01 for run 20-30m; [-0.92 (0.26), p < 0.01)], expect difficulty walking 200-300m. Compared to Mainlander, being Hakka was associated with mobility limitation in running 20-30m [0.90 (0.34), p < 0.01] but not walking 200-300m or walking upstairs while being Fukienese was not with any mobility limitation. Marital status and sex were not associated with any mobility limitations. *(Ordered probit model)*
Darin-Mattson et al., 2017, Sweden	2036 41.7%	NR (NR)	**F:** Income **P:** Education; occupation	Mobility limitation	People who had low education (average marginal effects (AME) = 12.16), low occupation (10.15) and low income (13.05) had an increased risk of developing mobility limitations (p < 0.001). *(Kruskal Wallis equality of population rank test)*
Diaz-Venegas et al., 2016, Mexico	3283 64.3%	NR (NR)	**E:** Social support (help from neighbors and/or children); location size (no of inhabitants) **F:** Income **P:** Age; education	Mobility limitations	Social support was associated with progression of mobility in women (1.29, p < 0.05) and not in men. Location size was not associated with the progression of mobility limitation in both men and women. Women with 1-5 years of schooling were 1.3 times more likely to develop mobility limitations compared to those with 7 or more years of schooling (OR = 0.64, p < 0.01). Compared to those aged 65-69 years, those aged 75+ had higher progression of mobility disability in both men (1.89, p < 0.001) and women (1.99, p < 0.001). There was no significant association between men with 1-5 years of education and 7 or more years of schooling in terms of developing mobility limitation.

					There was no significant association between men with lower income and higher income in terms of developing mobility limitation. A similar trend was noted for women as well. *(Ordinal logistic regression)*
Ding et al., 2013, USA	880 56.0%	75.0 (NR)	**E:** Neighborhood walkability index; residential density; street connectivity; walking and cycling infrastructures; neighborhood; traffic safety; pedestrian safety structures; transit access; land use mix; aesthetics **P:** Age; sex; race; education; marital status	Self-reported driving status	Several interactions with driving status were significant, including reported street connectivity (OR = 1.51), walking-bicycling infrastructure (1.65), traffic safety (1.20), pedestrian safety structures (2.29) ($p < 0.0001$). Driving older adults were significantly younger than non-driving older adults [OR (95%Cl) = 78.8 (7.6), $p < 0.001$]. Drivers were less likely to be women (51.2% vs 81.2%, $p < 0.001$), and were more likely to be Non-Hispanic White (71.3% vs 63.6%, $p < 0.05$), to have completed college (49.5% vs 36.4%, $p < 0.01$), and to be married or living with a partner (57.4% vs 24.0%, $p < 0.001$). *(Linear regression, Descriptive statistics)*
Eronen et al., 2014, Finland	1310 75.5%	77.4 (1.8), people living with difficulty 78.0 (2.0), people with no difficulty	**E:** Having outdoor recreational facilities within a walking distance from home; attractive features in the nearby environment for outdoor activities; perceiving the surrounding environment or facilities nearby as motivating for	Self-reported walking difficulty	Perceived environmental facilitators for outdoor walking decreases the risk for developing walking difficulty among older community-dwelling individuals. Having features in one's home which make it easy to access the outdoors (OR = 0.8). Having a park or other green area within a walking distance from home (0.43). Having outdoor recreational facilities within a walking distance from home (0.59). Attractive features in the nearby environment for outdoor activities (0.65). Perceiving the surrounding environment or facilities nearby as motivating for physical activity (0.75).

			physical activity; having features in one's home which make it easy to access the outdoors; having a park or other green area within a walking distance from home **P**: Age; sex; education		Those without walking difficulty were likely to be younger [mean (SD) = 77.4 (1.8)] than those with walking difficulty [78.0 (2.0)] (p = 0.008). Education and sex were not associated with walking difficulty. *(Logistic regression, Mann-Whitney U test, Chi-square test)*
Eronen et al., 2016, Finland	848 62.0%	75+	**E**: Living conditions **P**: Age; sex; education; occupation	Life space mobility	High-educated participants had higher life space mobility scores [mean (SD) = 70.0 (1.6)] compared with those with intermediate [64.8 (0.9)] and low education [63.5 (1.0)] (p < 0.001). Participants holding higher non-manual occupations had higher life space mobility scores [74.8 (2.3)] compared with those holding lower non-manual [71.0 (1.5)] and manual occupations [71.0 (1.7)] (p < 0.001). Adults who were older had restricted life space mobility compared to those who were younger (p < 0.001). Individuals who were living alone and are women had restricted life space mobility compared to those not living alone and are men (p < 0.001). *(General linear model)*
Friis et al., 2003, USA	7527 62.0%	NR (NR)	**F**: Income **P**: Age; sex; education; race; marital status	Mobility limitation	Individuals with college or higher education are more likely [OR (95%CI) = 1.30 (1.08; 1.57)] to walk 1 mile/week compared to those with high school education [1.12 (0.98; 1.50)] (p < 0.01). Individuals with income level of $50000+ [1.93 (1.25; 2.99)] were more likely to walk 1 mile/week compared

					to those with income of $5000-19,999 [1.21 (0.99; 1.50)] ($p < 0.01$). Male [1.70 (1.47; 1.95)], being married [0.70 (0.56; 0.87)] or widowed [0.77 (0.61; 0.97)], younger age (70-74 years - [1.97 (1.65; 2.36)]; 75-79- [1.58 (1.31; 1.90)] reported walking one mile per week. Race was not associated with walking one mile per week. *(Logistic regression)*
Gallagher et al., 2014, USA	326 66.3%	76.8 (8.1), male 75.8 (8.5), female	**E:** Neighborhood density; neighborhood destinations; neighborhood design **P:** Age; sex; education; race	Neighborhood walking (Total mins walked for transportation or recreation/ exercise in a week).	Neighborhood density [β (95%CI) = 0.22 (0.08; 0.83), $p < 0.05$] and design [0.21 (1.49; 103.02), $p < 0.05$] were significant predictors for neighborhood walking in men but not in women. Neighborhood destinations was significant predictor for neighborhood walking in women [0.15(1.46; 49.89), $p < 0.005$] but not in men. Age was a significant predictor for neighborhood walking in women only 0.22 (-4.88; -1.23), $p < 0.01$], but was not in men. Race, education was not a significant predictor for neighborhood walking in either women or men. *(Multiple linear regression)*
Hardy et al., 2010, USA	9563 59.0%	73.4 (0.1), People with no walking limitations 76.2 (0.2), people with	**F:** Income **P:** Age; sex; education; race; marital status	Mobility limitation	Being of older age was associated with increased difficulty walking one-quarter of a mile ($p < 0.001$). Being of female sex was associated with increased difficulty walking one-quarter of a mile ($p < 0.001$). The likelihood of reporting mobility limitation decreases across non-Hispanic Black individuals, non-White Hispanic individuals, other counterparts, and Hispanic individuals ($p < 0.001$).

		walking difficulty 78.6 (0.2), people unable to walk			Participants who were married reported being more likely to have trouble walking than those who were not married (p < 0.001). Individuals with a low level of education are 1.4 [95%Cl = (1.1; 1.6)] times less likely to walk one-quarter a mile than those with a higher level of education (p < 0.001). Individuals with low income of <$10,000 [OR (95%CI) = 1.4 (1.0; 1.7)] are less likely to walk one-quarter a mile compared to individuals with high income >$25,000 [0.7 (0.5; 0.9)] (p < 0.001). *(Regression)*
Harris et al., 2015, USA	403 46.0%	66.2 (5.7)	**E:** Sidewalks; street intersections; curbs cuts/ramps **P:** Age	Difficulties with wheelchair use	Age was significantly associated with increased difficulties using wheelchairs at street intersections (p = 0.002), curb cuts/ramps that are too steep (p = 0.047), ramps without protective railing (p = 0.005), and on sidewalks (p = 0.035). Sidewalk without adequate width for a wheelchair, Curbs/ramps not at any corner, and ramps without protective railing were significant barriers to wheelchair use among older adults (p-value ranged from 0.000 to 0.05). Street intersections with traffic that do not provide enough time for older adults to cross was not significant barriers to wheelchair use among older adults. *(Chi-square test)*
Hinrichs et al., 2019, Finland	179 56.4%	83.7 (4.1)	**E:** Distance to the grocery store; street connectivity; perceived mobility	Self-reported walking for activities and transport	Higher street connectivity [OR (95%CI) = 2.68 (1.02; 7.0)], shop distance [29.93 (8.55; 104.73)], and perceived park or other green area [9.89 (3.11; 31.50)] significantly increased the odds of walking to the grocery store than their counterparts. Participants that perceived one of the facilitators [3.98 (1.33;11.84)] had higher odd of walking to the

			facilitators (park/green area and trails) **F:** Income **P:** Age; sex; education		stores than those with no perceived facilitator. There was no significant association between individuals that perceived both facilitators and those with no facilitator. The location of the park (in the area between the participant's home and the store vs. in another location) did not affect the mode of transportation. Reporting a trail as facilitator was not significantly associated with walking. Age, sex, perceived financial situation, and education were not associated with walking for transportation. *(Multivariable logistic regression)*
Kato et al., 2019, Japan	214 51.0%	73.8 (6.6)	**E:** Objective built environment: Retail shops; restaurants; supermarkets; department stores; city parks; general hospitals; clinics **E:** Subjective built environments: uneven sidewalks and other walking areas; parks easy to get to; safe parks and walking areas; curbs with curb cuts **P:** Age; sex	Frequency of going outdoors	Objective built environments at the local government were not associated with frequency of going outdoors. Parks easy to get to [β (SE) = 2.05 (0.68), $p = 0.003$] and car availability [0.92 (0.44), $p = 0.040$] were associated with frequency of going outdoors. Other factors were not. Age [-0.08 (0.04), $p = 0.033$] and female sex (compared to male sex) [1.07 (0.45), $p = 0.018$] were associated with frequency of going outdoors. *(Multivariate linear mixed effects model)*
*Keskinen et al., 2020, USA	551 NR	80.0 (NR)	**E:** Hilliness as a barrier;	Walking difficulties	Road network slope showed 1.7- fold odds for incident difficulties in walking 500 m at the 2-year follow-up. Whereas perceiving hilliness as a barrier was not associated with incident walking

			road network slope **P**: Age; sex; education		Age showed 1.09-fold odds while being women showed 0.59-fold odds for incident difficulties in walking 500m at the 2-year follow up. Education was not associated with incident walking *(Binary logistic regression)*
Kerr et al., 2014, USA	5625 100.0%	64.0 (7.7)	**E**: Neighborhood walkability index; recreation facilities density; distance to the coast; distance to the nearest park **F**: Income **P**: Age; education; race	Estimates of Walking (hrs/week, MET hrs/week and log-transformed MET hrs/week)	Total walking was significantly positively associated with the walkability index (β = 0.050: half-mile buffer), recreation facility density (0.036: 1-mile buffer), and distance to the coast (-0.064; half-mile, 1-mile, and 3-mile buffers, $p < 0.001$). Distance to nearest park was not associated with total walking. Walkability index was not associated with total walking at the 1-mile and 3-mile buffers. Recreation facilities density was most associated with total walking at the half-mile and 3-mile buffers. Age and race were not associated with walking at the half-mile, 1-mile, and 3-mile buffers. Education was associated with walking at the half-mile (0.048, $p < 0.001$), 1-mile (0.046, $p = 0.002$), and 3-mile (0.043, $p = 0.004$) buffers. Family income was associated with walking at the half-mile (0.037, $p = 0.014$), 1-mile (0.037, $p = 0.013$), and 3-mile (0.034, $p = 0.023$) buffers. *(Regression)*
Kikuchi et al., 2018, Japan	731 43.9%	69.3 (2.9)	**E**: Neighbourhood walkability **P**: Age; sex; education	Change of walking over the 5-year period (min/week) at 500m and 1000m network buffers.	Neighbourhood walkability was positively associated with change of walking over the 5-year period [β (95%CI) = 47.5 (1.6; 93.4), $p = 0.042$] at the 1000m network buffer. Neighborhood walkability was not associated with change of walking over the 5-year period at the 500m network buffer ($p = 0.079$).

					Being female (compared to being male), was negatively associated with change of walking at the 500m network buffer [-105.5 (-206.8; -4.1), p = 0.041], but not the 1000m network buffer (p = 0.051). Age was not associated at the 500m (p = 0.091) or 1000m (p = 0.082) network buffers. Compared to having a college degree or greater, having up to high school was not associated at the 500m (p = 0.971) and 1000m (p = 0.904) network buffers. *(Regression)*
König et al., 2020, Germany	761 67.4%	88.9 (2.9)	**E:** Living situation (institution vs community-dwelling) **P:** Age; sex; education; marital status	EuroQol- five-Dimension Scale - mobility domain	Living in institutionalised setting was associated with problems in mobility dimension [OR (95%Cl) = 1.59 (1.04; 2.34), p < 0.05)] Age [1.10 (1.04; 1.17), p < 0.001] and being single (compared to being married) [2.81 (1.26; 6.24), p < 0.01] were significantly associated with problems in the mobility dimension. Sex, education, and being divorced or widowed was not associated with problems in the mobility dimension *(Logistic regression)*
Koster et al., 2005, USA	3088 NR	NR (NR)	**F:** Income **P:** Education	Mobility limitations	Individuals with <12 years of education had an increased risk [HR (95%CI) = 1.47 (1.23; 1.77)] of mobility limitation compared to those with 12 years or more education [1.17 (1.00; 1.38)] (p < 0.001). Individuals with an income of <$10,000 had an increased risk [2.64 (1.93; 3.61)] of mobility limitations compared to individuals with higher income of $10,000-25,000 [1.61 (1.24; 2.09)] (p < 0.001). *(Cox proportional hazard regional models)*
Latham-Mintus and Aman, 2017, USA	3104 67.0%	71.2 (9.8)	**F:** Income **P:** Age; sex; education; race;	Recovery from mobility limitations	Individuals with lower income [OR (95%CI) = 1.54 (1.11; 2.12)] were more likely not to recovery from mobility limitation compared with individuals with higher income [1.45 (0.95; 2.20)] (p < 0.001).

			marital status		Sex (female) [0.68 (0.53; 0.87)], age [0.97 (0.96; 0.98)], race (being black [1.63 (1.15; 2.31)], Hispanic [1.88 (1.24; 2.86)] were associated with recovery from mobility limitation. Education and marital status were not associated with recovery from mobility limitations. *(Multinomial logit models)*
Latham-Mintus et al., 2019, USA	9378 60.0%	67.1 (9.7)	**F:** Income **P:** Age; sex; education; occupation; race/ethnicity; marital status	Recovery from Mobility limitations	Working status (OR = 1.10), income (1.07), sex (female) (0.79), age (0.98), was positively associated with mobility recovery ($p < 0.001$). Education, race, and marital status was not associated with mobility recovery. *(Multinomial logistic regression)*
Li et al., 2015, USA	1045 56.0%	NR (NR)	**E:** Social cohesion; nearby park/playground; safe neighborhood **P:** Age; ethnicity	Self-reported frequency of walking (min/week)	Social cohesion was associated with predicting minutes walked/week [OR (95%CI) = 1.14 (1.02; 1.26), $p < 0.05$] Chinese Americans are more likely [0.38 (0.17; 0.84), $p < 0.05$] not to be non-walkers when compared to Japanese Americans. Other ethnicities (Filipino, Korean, Vietnamese, and other Asians) were not significant predictors for non-walkers. Asian Americans between 65 and 74 years were more likely [0.52 (0.31; 0.85), $p < 0.05$] to be non-walkers compared to those ages 55 to 64 years. Ethnicity, age, nearby park/playground and safe neighborhood were not associated with predicting minutes walked/week or predicting non-walkers. *(Zero-inflated negative binomial)* On average, Asian adults reported walking 153.9 min per week, significantly more compared with their White counterparts (114.4 min/week) ($p < 0.05$).

					(Chi-square test)
Liao et al., 2017, Taiwan	1032 49.2%	72.3 (6.1)	**E**: Residential area; residential density; access to shops; access to public transportation; presence of sidewalks; access to recreational facilities; traffic safety; connectivity of streets; presence of a destination; crime safety at night; seeing people being active; aesthetics; living status **P**: Age; sex; education; occupation; marital status	Self-reported walking for transportation Self-reported walking for leisure	Older adults living in metropolitan areas were [OR (95%Cl) = 1.98 (1.45; 2.71)], having good access to shops [1.45 (1.04; 2.03)], sidewalks [1.50 (1.15; 1,96)] and recreational facilities [1.52 (1.12; 2.06)], walked towards a destination [1.56 (1.17; 2.07)], felt their neighborhoods were aesthetically placing [1.31 (1.01;1.69)], who saw people being active [1.52 (1.16; 1.99)] were more likely to walk 150 min/week for leisure than those who did not. All p-value were < 0.001. Older adults with presence of sidewalks [1.93 (1.37; 2.72)] and walked towards a destination [2.39 (1.60; 3.58)] were more likely to at least 150min/week as a mode of transportation compared to those who did not. Older adults who felt that traffic made their neighborhood less safe [0.72 (0.52; 0.98)] were less likely to walk 150min/week as a mode of transportation than those who did not. Residential density, access to shops and public transportation, crime safety at night, street connectivity and living status (alone) were not associated with walking for leisure or transportation. Access to shops and recreational facilities, seeing people being active were not associated with walking for transportation while traffic safety and residential area were not associated with traveling for leisure Older adults without a full-time job [3.40 (2.15; 5.35)] and with a tertiary degree [1.64 (1.22; 2.20)] were more likely to achieve 150 min or more of walking as a leisure-time activity than their peers. Age, sex, and marital status, living alone were not associated with self-reported walking for transport

					and leisure. Education and occupation were not associated with self-reported walking for transport. *(Forced-entry adjusted logistic regression)*
Lynott et al., 2009, USA	1636 61.1%	NR (NR)	**E**: Residential area: urban/town; suburban; rural/exurban **F**: Income **P**: Age; sex; education; race	Self-reported number of times out yesterday and a week	Seniors residing in urban/town areas were significantly more likely to make additional trips in the day prior [OR (95%CI) = 1.77 (1.23; 2.55), p < 0.01] and a week [2.19 (1.43; 3.39), p < 0.01] to their interview. Being male was associated with times out per week [1.61 (1.24; 2.09), p < 0.001], and times out the day before the interview [1.40 (1.10; 1.77), p < 0.01]. Being age >= 85 years was associated with times out per week [0.50 (0.39; 0.67), p < 0.01] and the day before the interview [0.65 (0.50; 0.85), p < 0.01]. Education was associated with times out the week before [1.17 (1.07; 1.27), p < 0.001] and the day before the interview [1.08 (1.00; 1.17), p < 0.05]. Compared to having the highest quartile of income, having the lowest quartile was associated with less walking the week before [0.41 (0.26; 0.64), p < 0.001] and day before [0.46 (0.31; 0.68), p < 0.001] the interview. Being white was not associated with times out per week or times out yesterday. *(Logistic regression)*
Maisel, 2016, USA	121 75.0%	NR (NR)	**E**: Residential density; land use mix-diversity; land use mix-access; street connectivity; walking/cycl	Job walking (min/week) Transportation walking for daily activity (min/week) Recreational walking (min/week)	Street connectivity had positive but low correlations with various walking behaviors including total weekly walking (r = 0.25, p < 0.01). Perceptions of traffic safety weakly correlated with job walking (0.20, p < 0.05) and total weekly walking (0.19, p < 0.05). Crime safety also weakly correlated with recreation walking and total weekly walking (0.23, p < 0.05 and 0.23, p < 0.05, respectively) while aesthetics only correlated with recreation walking (0.23, p < 0.05). Age was associated with job (p = 0.047), recreation (p < 0.001), and total weekly walking (p = 0.008).

			ing facilities; traffic safety; crime safety; aesthetics **F**: Income **P**: Age; sex; education; marital status; race	Total weekly mins walking	Household income was associated with recreation (p = 0.007), and total weekly walking (p = 0.014). Age was not associated with walking for transportation. Household income was not associated with walking for job and transportation. Sex, education, marital status, and race were not associated with all four walking behaviour variables. *(Spearman rank correlation)*
Melzer and Parahyba, 2004, Brazil	28943 60.0%	NR (NR)	**E**: Residential area; family size **F**: Income **P**: Education; race	Mobility limitation	White women [1.13 (1.03; 1.23)], women residing in rural area [0.65 (0.58; 0.74)] residing in rural area were more likely to report mobility limitation compared to black women and those residing in urban area. No association was noted in any of these among men. Family size was not associated with mobility in both sexes. Men [OR (95%CI) = 0.86 (0.76; 0.99)] and women [0.74 (0.67; 0.83)] who had 1-3 years of education were more likely to report mobility limitation compared to men [0.85 (0.69; 1.03)] and women [0.49 (0.42; 0.58)] with 8 years or more education (p < 0.0005). Men [0.69 (0.58; 0.81)] and women [0.89 (0.78; 1.01)] with lower income were more likely to report mobility limitations, respectively compared to men [0.43 (0.35; 0.53)] and women [0.72 (0.61; 0.84)] with higher income (p < 0.0005). *(Logistic regression)*
Melzer et al., 2005, UK	5424 55.4%	NR (NR)	**F**: Income	Mobility limitation	Individuals at the higher wealth quintile had lesser mobility disability compared to individuals at the intermediate (56%) and lowest wealth quintile (84%).

			P: Age; sex; education; occupation		Similar percentages of females and males reported mobility disability in the younger two age groups (8 versus 9% for 50-64 years and 20 versus 17% for 65-79 years), but the percentage of females with mobility disability was higher than males in the ≥80-year-old (47 versus 36%). Individuals with no education had more mobility disability (72%) compared with individuals with intermediate (47%) and degree education (44%). Individuals holding managerial and professional occupations (43%) had lesser mobility disability compared to those with intermediate (61%) and manual (69%) Similar percentages of females and males reported mobility disability in the younger two age groups (8 versus 9% for 50-64 years and 20 versus 17% for 65-79 years), but the percentage of females with mobility disability was higher than males in the ≥80-year-old (47 versus 36%). *(Descriptive analyses)*
Mertens et al., 2018, Belgium	438 54.1%	74.3 (6.2)	**E**: Land use mix diversity; access to recreational facilities; connectivity of the street network; physical barriers to walking or cycling; infrastructure for walking; infrastructure for cycling; safety from speeding motorized traffic; safety from crime; talking to neighbors; social interactions with neighbors;	Self-reported walking for transportation	Neighborhood social trust and cohesion [OR (95%CI) = 0.47 (0.27; 0.83)], land use mix diversity [3.42 (1.76; 6.64)], walking infrastructure, [0.29 (0.14; 0.60)] and crime safety [0.27 (0.11; 0.65)] were predictors of change in walking for transport ($p < 0.05$). Having higher education (compared to lower education), was a predictor of walking for transport [4.34 (1.96; 9.64), $p < 0.05$]. Neighbourhood social diversity and aesthetics were not predictors of change in walking for transport. Age was not a predictor of change in walking for transport.

			neighborhood social trust and cohesion; neighborhood social diversity; aesthetics **P:** Age; education		*(Multilevel logistic regression)*
Meyer et al., 2014 USA	6112 59.0%	74.7 (7.1)	**E:** Neighborhood safety; geographical location **F:** Income **P:** Age; education; marital status	Mobility limitation	Staying in the west (-0.30 $p < 0.05$) and northeast (-0.04, $p < 0.05$) was associated with community mobility. Other geographical location- Midwest and southcentral were not associated with community mobility. Education had a weak relationship with personal and community mobility (values not reported) Age was significantly associated with personal (β = -0.13, $p < 0.05$) and community mobility (-0.12, $p < 0.05$). Being married was significantly associated with personal (0.060, $p < 0.05$) and community mobility (0.13, $p < 0.05$) Neighbourhood safety was significantly associated with personal mobility (0.06, $p < 0.05$) and community mobility (0.10, $p < 0.05$) *(Structural equation models)* Income was significantly correlated with personal mobility ($r = 0.07$, $p < 0.01$) and community mobility (0.08, $p < 0.01$). *(Bivariate correlations)*
Miller and Buys, 2007, Australia	697 68.0%	NR (NR)	**E:** Residential location: Community vs retirement village	Self-reported participation in walking	There was a significant difference in participation in walking between older adults residing in a residential setting (64%) and in the community (54%) ($p < 0.001$). Sex, age, and marital status were not associated with participation in walking ($p > 0.05$).

			P: Age; sex; marital status		*(Chi-square, regression models)*
Nakao et al., 2020, Japan	1023 33.9%	65.0 (NR)	**E**: Social network score **P**: Age; sex	Life space mobility	Social network score was associated with LSA score [β (95%CI) = 0.77 (0.5; 1.1), p < 0.0001]. Being older [-0.55 (-0.7; -0.4), p < 0.0001] and a female [-4.65 (-6.1; -3.2), p < 0.0001] were negatively associated with LSA scores. *(Regression analysis)*
Nilsson et al., 2010, Denmark	2825 55.0%	NR (NR)	**E**: Social participation; cohabitating; network diversity **F**: Income	Mobility limitation (Mobility Help)	When descending from highest to lowest financial assets decile, the number of individuals who experienced onset of mobility disability increased (r = 0.11382). There was a significant gradient in the onset of mobility disability [OR (95%CI) = 1.11 (1.07; 1.15), p < 0.0001] for the onset of mobility disability per step down the deciles of financial assets. Having lower network diversity (e.g., very little [1.60 (1.03; 2.46)], living alone [1.41 (1.14; 1.74)], and low social participation [1.84 (1.31; 2.58)] increase the odds of developing mobility limitation. *(Univariate logistic regression analyses)*
Nilsson et al., 2011, Denmark	2839 55.0%	NR (NR)	**E**: Cohabitating status; social participation **F**: Income	Mobility limitations (Mobility Help)	Men [OR (95%CI) = 1.97 (1.33; 2.92)] and women [1.38 (1.33; 2.92)] with low financial assets were more likely to develop mobility limitations and at 3-year follow-up, than those with high financial assets. Women with low financial assets and low social participation had 2-foldhigher odds [2.29 (1.22; 4.29)] of onset of mobility limitations compared with the non-exposed.

					Men with low financial assets and living alone had 3-fold higher odds [3.04 (1.41; 6.56)] of onset of mobility limitations, compared with the non-exposed Men with low financial assets and low social participation had 5-fold higher odds [5.36 (2.51; 11.47)] of onset of mobility imitations compared with non-exposed *(Logistic regression)*
Nilsson et al., 2014, Denmark	2874 55.0%	NR (NR)	**F:** Income **P:** Age	Mobility limitations (Mobility Help & Tiredness)	Low financial assets were significantly associated with more mobility limitations only at 10-year and 3-year follow-ups ($p < 0.0001$). Among the 80-year-olds, low financial assets ($\beta = -0.34$, $p = 0.0422$) were significantly associated with more mobility limitations at a 4.5-year follow-up. Among the 75-year-olds baseline mobility-related fatigue was significantly associated with more mobility limitations at all three follow-up assessments (-0.39, $p < 0.001$ at 4.5-year follow-up) *(Multivariate linear regression models)*
Nordstrom et al., 2007, USA	3684 54.0%	72.0 (5.0)	**E:** Neighborhood income **P:** Education	Mobility limitations	Education and neighborhood income were not associated with incident mobility impairment. *(Regression analysis)*
Nyunt et al., 2015, Singapore	402 60.7%	69.1(8.5)	**E:** Resident density; street connectivity; land use mix-access; land use mix-diversity; infra-structure	Self-reported walking for transportation	Resident density ($\beta = 0.95$, $p < 0.001$), land-use mix density (0.72, $p = 0.009$) and aesthetic environment (0.17, $p < 0.001$) and the Accessibility Index (1.59, $p < 0.05$) were significant in explaining the level of walking for transportation. Age (-0.34, $p < 0.001$), sex (-3.34, $p = 0.007$), and education (2.59, $p < 0.001$) are associated with self-reported walking for transport. *(Multiple regression models)*

			for walking and cycling; crime safety; traffic safety; aesthetics **P**: Age; sex; education		
Ory et al., 2016, USA	272 50.4%	69.0 (NR)	**E**: Positive environmental perceptions of safety; neighbourhood cohesion **P**: Age; sex; education; race	Frequency of walking behavior (y/n individual walks at least 3 days in a 'typical' week) Frequency of walking behavior (y/n individual walks for at least 150 mins in a 'typical' week)	High neighbourhood cohesion ($p < 0.0001$) and high positive environmental perceptions of safety ($p = 0.0126$) were associated with walking for at least 3 days in a typical week. Frequent walkers were more likely to be 70+ years old ($p = 0.0047$), male ($p = 0.0026$), White ($p = 0.0036$), and have more than high school education ($p = 0.0006$) compared to non-frequent walkers. Low & moderate neighbourhood cohesion ($p < 0.0001$) and moderate ($p = 0.0020$) & high positive ($p < 0.0001$) environmental perceptions of safety associated with walking for at least 150 mins in a 'typical' week. Those that met the CDC recommend guidelines of at least 150 minutes of walking a week were less likely to be 70+ years old ($p < 0.0001$), male ($p < 0.0001$), White ($p < 0.0001$), and have more than high school education ($p < 0.0001$) compared to those who did not meet the guidelines. *(Regression)*
Oyeyemi et al., 2018, Nigeria	427 39.9%	68.9 (9.1)	**E**: Residential density and land use mix-diversity (proximity to non-residential destinations and ease of access to services and places); street/road connectivity;	Self-reported walking for transportation	Proximity of destinations ($\beta = 1.698$), walking infrastructure (1.660), safety (NR), traffic safety (1.591), and safety from crime (0.644) were related to higher weekly minutes of walking for transportation ($p < 0.01$).

			walking infrastructure; safety for walking; traffic safety; safety from crime; aesthetic **P**: Sex		Women had less transport walking per week [60 min/week (30-140)] than men [OR (95%Cl) = 105 (70-140)] (p = 0.027). *(Multilevel linear regression model, descriptive statistics)*
Palumbo et al., 2020, USA	89107 100.0%	63.6 (NR)	**F**: Income **P**: Education; occupation; sex	Mobility limitation	Education is a significant confounder in determining the impact of occupation on physical function, especially on intermittent workers and early workers. Women who left the workforce early (Class 4) had an 8% [RR (95%CI) = 1.08 (1.03; 1.13), p < 0.05] increased risk of physical limitations compared with women who worked continuously throughout adulthood. Women who experienced intermittent workforce participation (Class 3) had a 5% [0.95 (0.92; 0.99), p < 0.05] reduced risk of mobility limitations after adjusting for confounders. In the final model. later life employment was not a significant relative risk for mobility limitation. Associations involving education and occupation against mobility limitations were no longer significant after controlling for mediating factors including household income. *(Modified poisson regression))*
Peel et al., 2005, USA	1000 49.9%	75.3 (6.7)	**E**: Residence location (rural/urban) **F**: Income **P**: Age; sex; race	Life space mobility	Income is significantly correlated with LSA scores (β = 0.137, p < 0.001). The LSA scores differed in subjects with varied incomes, with a 30-point difference between subjects in the lowest income level (≤$7,999) and subjects in the highest income category (≥$50,000). Age (-0.112, p < 0.001), sex (-0.151, p < 0.001) and residence (1.39, p < 0.001) were associated with LSA scores. Race was not associated with LSA scores.

					(Regression analysis)
Perracini et al., 2021, Brazil	1482 73.9%	70.0 (8.14)	**E**: Living alone **F**: Income **P**: Age; sex; education; occupation	Life space mobility	There were significant relationships between change in LSA and male sex [β (95%Cl) = 3.32 (0.33; 6.32)], living alone [-3.75 (-7.09; -0.41)], age between 70 and 79 years [-4.95 (-9.13; -0.78); ref = 80 years and over], black race/ethnicity [-7.76 (-13.14; -2.37)], having more than 4 years of schooling [7.94 (4.60; 11.28); ref = illiterate or 1–4 years], having an income of ≥4 minimum wage salaries [4.76 (1.77; 7.75); ref = <3 minimum wage salaries], and currently employed [0.57 (-2.23; 3.37); ref = inactive/unemployed]. (*Regression analysis*)
Peterson et al., 2017, USA	5503 56.0%	76.1 (NR), male 76.3 (NR), female	**E**: Residential location; living alone **F**: Income **P**: Age; sex; education; race	Likelihood to use AD (cane or walker)	Age [OR (95%CI) = 0.73 (0.56; 0.96), p < 0.05], women [0.73 (0.57; 0.93), p < 0.01], education [1.16 (1.04; 1.31), p < 0.05], income [0.90 (0.84; 0.97), p < 0.01], being black [1.94 (1.49; 2.54)], retirement community [1.59 (1.14; 1.22), p < 0.01], living alone [1.28 (1.02; 1.61), p < 0.05] were associated with increased likelihood of cane usage. *(Multivariate logistic regression)*
Plys and Kluge, 2016, USA	96 65.6%	82.0 (6.5)	**E**: Loneliness **P**: Age; sex; marital status	Life space mobility	Marital status was associated with total life space mobility (p = 0.027). Separated-divorced residents have higher life-space mobility than those who were married or cohabiting or widowed. Age, sex and loneliness were not associated with life space mobility. *(Chi-square, t-tests)*
Procter-Gray et	745 64.0%	78.1 (5.4)	**E**: Environmenta l	Life space mobility: walking ≥5days/week;	Income level was associated with "utilitarian walking" than walking ≥5 days/week and "recreational walking" (p < 0.001).

al., 2015, USA			(access to amenities) **F:** Income **P:** Education; race	recreational and utilitarian walking at least once a week	Individuals with a median household income of $10,000 or more were more likely [OR (95%CI) = 0.87 (0.77; 0.99)] to participate in "utilitarian walking" compared to those with lower median household income. Being a minority (20-50% of the participants) was associated with walk at least five days per week [1.63 (1.13; 2.36)], and utilitarian walk [3.98 (1.85; 8.54)] at least once per week but not recreational walk at least once per week Individuals with access to amenities were more likely to participate in utilitarian walk at least once per week and walk at least 5 days per week than recreation walking at least once per week. Education was not associated with walking ≥5 days/week, utilitarian, and recreational walking. *(Logistic regression)*
Rantakokko et al., 2012, Finland	632 66.8%	77.7 (1.7), perceived walking difficulty group 77.1 (2.0), no perceived walking difficulty group	**E:** Lack of resting places and long distances (distances); hilly terrain and poor street condition (terrain); noisy traffic and dangerous crossroads (traffic) **F:** Income	Self-reported mobility difficulty	The cumulative incidence over 3.5-year follow-up for difficulties in walking 2 km was 59% and for walking 0.5 km 45%. The rate of walking difficulty ranged from 1.4 to 5.4 per 10 person years according to the presence of barriers in the outdoor environment and the mobility task in question. Barriers in the outdoor environment increased the risk of new walking difficulty up to almost threefold. Those with development of perceived difficulty in walking 2km were older (p = 0.019). Financial situation, education, and sex were not associated with perceived difficulty walking in 2km. *(Cox regression model)*

			P: Age; education; sex		
Rantakokko et al., 2015, Finland	848 62.0%	80.1 (NR)	**E**: Environmental (perceived environmental barriers to outdoor mobility; facilitators for outdoor mobility) **F**: Income **P**: Age; sex; education	Life space mobility	Poor street conditions [OR (95%CI) = 1.5 (1.1; 2.3)], high curbs [5.4 (2.8; 10.7)], hills in nearby environment [2.0 (1.4; 2.8)], long distances to services [2.1 (1.3; 3.3)], lack of benches [1.8 (1.2; 2.8)], busy traffic [1.9 (1.1; 3.2)], dangerous crossroads [1.9 (1.1;3.1)], snow and ice [1.8 (1.3; 2.4)], vehicles on walkways [4.9 (1.4; 17.4)] were associated with outdoor mobility. Park or other green area [0.7 (0.5; 0.9)], walking trail & skiing track [0.4 (0.3; 0.6)], nature & lakeside [0.5 (0.4 ;0.8)], good lighting [0.6 (0.5; 0.8)], safe crossings [0.7 (0.5; 0.9)] are the facilitators associated with outdoor mobility. *(Regression)* Individuals with low education have more restricted (LSA mean score = 10) life space compared to those with higher education ($p < 0.001$). Increased age is associated with restricted life space ($p < 0.001$) *(t-test)* Individuals with restricted life-space perceived their financial situation as moderate or poor (58.6%) compared to those with unrestricted life space (41.4%) ($p < 0.001$). A greater percentage (74.9%) of women had restricted life space compared to those with no restricted life space (53.0%) *(Chi-square)*

Rosso et al., 2014, USA	674 72.8%	74.5 (7.1)	**E:** Neighborhood social capital; neighborhood crime **F:** Income **P:** Education; race	Life space mobility	Individuals with post high school degrees were more likely to travel beyond home zip code (49.7%), than stay in home zip code (40.8%) or stay at home (31.5%) (p < 0.001). *(Chi-square)* Individuals who reported that they were "below 200% of federal poverty level" were more likely to stays at home (57.7%,) or stays in home zip code (49.43%) than travels beyond home zip code (31.9%) (p < 0.001). Being in a neighborhood with the highest social capital compared with the lowest was not associated with mobility for those in good health. Black participants who lived in neighborhoods with the highest social capital had greater mobility than those living in neighborhoods with the lowest social capital [mean difference (95%CI) = 7.4 (1.0; 13.7)]. Whereas for Whites, there was no association [0.11 (-0.05; 0.27)]. There were no significant associations for mobility and living in neighborhoods with the highest social capital compared with the lowest for either those living with others [4.1 (-2.7; 10.8)] or those living alone [-1.7 (-7.8; 4.4)]. *(Analysis of variance)* Neighborhood crime rates were significantly but weakly associated with mobility (personal crime: r = -0.18, p < 0.001; property crime: r = -0.076, p = 0.05). *(Correlation)*
Rosso et al., 2013, USA	680 73.4%	75.1 (6.9)	**E:** Living condition; social engagement **F:** Income	Life space Mobility	The odds of engaging in social activities outside the home (participating in more social organizations [OR (95%Cl) = 0.42 (0.26; 0.67)] and using senior centers [0.36 (0.19; 0.68)]) were lower for those with low mobility compared to those with high mobility.

			P: Age; sex; race; education		*(Regression)* Individuals who reported that they were "below 200% of federal poverty level" were more likely to report low mobility with disability (67.1%) or no disability (53.2%) than high mobility (31.5%) (p < 0.001). Individuals with disability were older, more likely to be female, non-White, less educated and live alone than those who had no disability. *(Analysis of variance)*
Rosso et al., 2013, USA	674 72.8%	74.5 (7.1)	**E**: Lives alone; amenity diversity **F**: Income **P**: Age; sex; education; race	Self-reported travel routine (stays at home, stays in home zip and travels beyond home zip)	Among individuals who spent most of their time within their home zip codes, the highest mobility was observed for those living in neighborhoods in the highest tertile of amenity diversity [Mean difference (95%Cl) = 8.3 (0.1; 16.6)] with approximately equal mobility for those in the middle tertile compared with the lowest tertile [-1.7 (-10.0; 6.6)]. Living alone was associated with stays in home zip -8.4 (15.1; -1.7), p < 0.01] but not with stay at home or travel beyond home zip code In adjusted analyses, no association was observed between amenity diversity and mobility. No association was observed for those who did not regularly leave home or for those who routinely spent time outside their home zip codes. Age was associated with mobility for all group (stays at home [-0.9 (-1.3; -0.4)]; Stay in home zip [-0.7 (-1.1; -0.2)]; travels beyond home zip [-1.1 (-1.6; -0.6)], p < 0.01)). Being female was associated with stays at home [-7.8 (-15.7; -0.009), p < 0.05] but not with stays in home zip or travels beyond home zip code Other race as against black and white were associated with stays at home [-14.6 (-27.7; -1.4), p < 0.05],

					but not with stays in home zip or travels beyond home zip. Education (<high school) was associated with stay at home [-10.5 (-19.9; -1.2), p < 0.05] and travel beyond home zip code [-11.3 (19.5; -3.0), p < 0.01], but not stay in home zip code. High school graduate was not associated with mobility. income (below 200% poverty was associated with stay in home zip code [-12.9 (-20.5; -5.2), p < 0.01] and travels beyond home zip [-8.5 (-16.5; -0.6), p < 0.05], but not stays in home zip code. *(Regression)*
Seeman et al., 2010, USA	8927 58.4%	NR (NR)	**F:** Income **P:** Age; sex; ethnicity; education	Mobility limitations	Individuals with more than high school education had 60% odd of not reporting mobility limitations (p < 0.005). Only functional limitations differed significantly over time for respondents aged 80 years and older, with decreased odds of reporting functional limitations in 1999 to 2004 [OR (95%Cl) = 0.6 (0.4; 0.8)]. Among participants aged 70 to 79 years, the increase in prevalence of functional limitations was also significantly greater among non-Hispanic Blacks [1.3 (0.8; 1.9), p = 0.04] and marginally greater among Mexican Americans 1.6 (0.9; 3.0), p = 0.07]. Among respondents aged 80 years and older, women had a significantly greater reduction in functional limitations [0.4 (0.3; 0.7)] than did men [1.0 (0.7; 1.4), p = 0.009]. The reduction in functional limitations was significantly greater among respondents with less than high school education [0.4 (0.2; 0.6)] than among those with more than high school education [0.8 (0.5; 1.3), p = 0.005].

					The association between income and mobility limitation was not reported. *(Logistic regression model)*
Seplaki et al., 2014, USA	875 100.0%	NR (NR)	**E:** Physical challenges in the home environment: having to step up/down to get into the house; not having bathroom/bedroom/ kitchen on the same floor; having more than four rooms in house; living alone vs with spouse or others **P:** Age; race; education	Self-reported use of assistive device (AD) for mobility (e.g., cane, walker, wheelchair)	Women living in more physically challenging home environments have 8% smaller odds of using a higher level of AD in the home [OR (95%CI) = 0.92 (0.85; 0.99), $p < 0.05$]. Age at baseline was associated with AD usage [1.03 (1.00; 1.05), $p < 0.05$]. Race, education and living alone were not associated with AD usage. *(Generalized ordered logistic regression model)*
Sharma et al., 2020, USA	6767 53.0%	60.3 (NR)	**F:** Income **P:** Age; sex; education; race; marital status	Functional mobility limitation	Relative to Asian Indians (i.e., reference group), Chinese [$\beta = 0.57$, $p < 0.01$) and Filipinos (0.74, $p < 0.05$) were associated with lower odds for functional limitations. Age was also a significant estimator with an odds ratio of 1.05, and, as such, each additional year was associated with a higher probability of having any functional limitations. Being Married was associated with decreased odds (0.69, $p < 0.01$). For educational attainment, the only advanced degree was significant (0.52, $p < 0.01$). Higher family income [between 35-49K (0.73, $p < 0.05$); 50- 74K (0.60, $p < 0.01$); 75-99K (0.60, $p < 0.01$) and 100K+ (0.64, $p < 0.01$) was also associated with lower odds across all levels relative to the less than $35k reference group. Gender was not associated with functional limitations.

					(Regression analysis)
Shumway-Cook, et al., 2003, USA, Canada	54 50.0%	76 (5.5), elite older adults 77.7 (4.7), older adults with no disability 83.2 (5.7), older adults with disability	**E:** Temporal factors (traffic, busy streets); terrain (flights of stairs, curbs, slopes/ramps, uneven surfaces, obstacles, etc.); density (crowded place); distance (walking long distance, >10 blocks); attentional demands (travel companions, familiarity, distractions); ambient conditions (temperature, outdoor light level, precipitation) **P:** Age; sex	Mobility disability (able to work half a mile and climb stairs without assistance or requires assistance walking)	There was a significant difference between mobility groups in distance walked ($p < 0.001$) crossing busy road ($p < 0.001$), going out when it is icy ($p = 0.003$), climbing a single flight of stairs ($p = 0.007$) or two flights of stairs ($p = 0.009$), and travelling alone ($p < 0.001$) There was no significant difference between groups in the density dimension, noisy or busy places, unfamiliar places, uneven surface, escalator, curbs, going out in the dark, when it is snowing, very hot, very cold, or wet and the presence of a crossing traffic light. Those in the "disabled" group were significantly older than those in the "able" and "elite" groups ($p < 0.001$). There was no significant association between proportion of females in the "elite", "able" and "disabled" groups. *(Analysis of variance, Fisher exact test)*
Shumway-Cook et al., 2005, USA	12737 63.3%	77.4 (NR)	**E:** Residential area (urban vs rural); living alone **F:** Income **P:** Age; sex; education; race	Mobility limitation	Individuals with less than high school education were more likely [OR (95%CI) = 1.25 (1.15; 1.36), $p < 0.001$] to report mobility limitations compared to those with >high school education. Individuals with income <$25,000 were more likely [1.35 (1.23; 1.47)] to report mobility limitation compared to those with income >$25,000 ($p < 0.001$). Older age [1.08(1.07; 1.08)], being female [0.60 (0.55; 0.66), being unmarried [0.71 (0.64; 0.80)], living with others [0.67 (0.60; 0.76)] were associated

					with a greater probability of being classified in a higher level of mobility. Race (being non-white), metropolitan area (rural vs urban) was not statistically associated with mobility limitations *(Polytomous logistic regression)*
Siberschmidt et al., 2017, USA	432 66.0%	83.8 (3.9)	**E:** Have someone to count on or talk to about problems **F:** Income **P:** Age; sex; education; marital status	Life Space Mobility	Age (p = 0.0004) and sex (p < 0.001) was associated with Life space mobility No significant difference between education, income, having someone to count on or talk to about problems or marital status and levels of Life Space Mobility. *(Chi-square)*
Skantz et al., 2020, Finland	848 62.0%	80.6 (NR)	**E:** Infrastructure (good/bad lighting, services close, even /uneven sidewalks, walkways without/with steep hills, resting places by the walking route, peaceful and good quality pedestrian routes, and safe crossings); safety (appealing landscape, familiar surroundings, own yard, other people outdoors, no car traffic, and no cyclists on walkways, noisy & busy traffic); nature	Self-reported modifications in walking 2 km (no walking modification, adaptative walking modification and maladaptive walking modification)	Older people reporting at least two nature - or infrastructure related environmental facilitators had two to threefold higher odds for using no walking modifications compared to those using maladaptive walking modifications. Similarly, at least two infrastructure [OR (95% CI) = 2.4 (1.6; 3.7)] or safety related [2.5 (1.4; 4.3)] facilitators for outdoor mobility were more likely to be reported by those using adaptive walking modifications than those using maladaptive walking modifications. Participants reporting at least two infrastructure-related environmental barriers had increased odds for using adaptive [2.5 (1.4; 4.2)] or maladaptive [2.3 (1.3; 4.2)] walking modifications compared to those reporting no walking modifications. Those with "no walking modifications" are significantly younger and have more years of education

			(e.g., hills in the area, ice, and snow in winter) **P:** Age; sex; education		than those with "adaptive" or "maladaptive walking modifications" ($p < 0.001$). Women were more prevalent in those with "adaptive" or "maladaptive walking modifications" ($p = 0.011$). *(Multinomial logistic regression analysis, descriptive statistics)*
Spalter et al., 2014, Israel	982 58.0%	70.9 (0.3)	**F:** Income **P:** Age; sex; education; ethnicity	Mobility limitation	Education, age, gender, and income were not correlated with change in mobility and difficulty to move. Being Jews/veteran immigrants was associated with change in movement difficulty, but not change in mobility difficulty *(General Linear model)*
Sun et al., 2020, Taiwan	1635 48.2%	65.3 (4.7)	**E:** Living alone **F:** Income **P:** Age; sex; education; marital status	Mobility limitation	Those who were older, [OR (95%CI) = 1.09 (1.06; 1.12), $p < 0.0001$], and female [1.96 (1.49; 2.57), $p < 0.0001$], had a higher risk of mobility limitations after controlling for baseline mobility status. Education, marital status, income and living alone were not associated with the risk of mobility limitation. (*Logistic regression*)
Suzuki et al. 2014, Japan	140 57.9%	76.0 (6.4)	**E:** Social network diversity; social ties **P:** Age; sex	Life space mobility	Increased age (β=−0.170, $p < 0.05$), women (0.342, $p < 0.01$) and poor social diversity (0.217, $p < 0.01$) were significant predictors of low LSA score. *(Multiple regression analysis).* Social ties (r=0.332) were correlated with LSA scores *(Correlations)*
Tanjani et al., 2015, Iran	1325 52.0%	69.1 (7.4)	**E:** Residential area (urban vs rural)	Mobility limitation	Men [OR (95%CI) = 1.76 (1.12;2.76), $p = 0.013$] and women [1.59 (1.04; 2.30), $p = 0.031$] that reported not satisfied with their financial situation were more likely to request help during mobility compared to

			F: Income **P**: Age; marital status		those that reported being satisfied with their financial situation. Men [2.95 (2.36; 3.45), p = 0.005] and women [1.85 (1.50; 2.11), p < 0.001] that reported not satisfied with their financial situation were more likely to report mobility limitations compared to those that are satisfied with their financial situation. Age was associated with mobility limitation in both men [1.09 (0.97; 1.04, p < 0.001) and women [1.50 (1.05; 2.16), p < 0.001] but not in requesting help during mobility. Marital status [4.55 (4.12; 4.56), p = 0.006] was associated with mobility limitation in female and not with in requesting help during mobility. Resident location (urban vs rural) and education were not associated with mobility limitation or requesting help during mobility. *(Logistic regression analysis)*
Thornton et al., 2017, USA	726 53.1%	74.4 (6.3)	**E**: Walkability; walking/cycling facilities; mixed-land use; intersection density **P**: Age; race	Weekly walking for errands Weekly walking for leisure/exercise	Walking/cycling facilities (β = 4.11, p = 0.04), intersection density (6.04, p = 0.009), land use mix (6.54, p = 0.01), and walkability (8.24, p = 0.005) associated with weekly walking for errands. Compared to being non-white, being non-Hispanic white was associated with weekly walking for errands (19.51, p < 0.0001). Land use mix (-8.01, p = 0.047) was associated with weekly walking for leisure/exercise. Age (-9.22, p = 0.01), and being non-Hispanic white (29.89, p = 0.0004; compared to non-white) were associated with weekly walking for leisure/exercise. *(Regression)*

Towne et al., 2016, USA	344 53.8%	63.9 (8.0), online respondents 70.0 (9.5), paper respondents	**E:** Perceived neighbourhood cohesion; walkability **F:** Income **P:** Age; sex; race; marital status	Self-reported walking for any purpose	Environmental factors associated with walking for any purpose for at least 150 minutes per week included residing in an area perceived as having medium neighborhood cohesion/safety (OR = 1.862), residing in an area perceived as having high neighborhood cohesion/safety (2.671) and living in a walkable vs. car-dependent areas (3.171) ($p < 0.05$). Compared to being aged 50-64 years old, being 65+ was positive associated with walking for any purpose [1.763 (1.105; 2.813), $p = 0.046$]. Sex, race, household income, and marital status were not associated with walking for any purpose. *(Multivariate logistic regression)*
Van Zon et al., 2016, US	4020 49.3%	65.7 (4.6)	**F:** Income **P:** Age; education; race; occupation; marital status	Mobility limitation	Higher education [β (95%CI) = -0.19 (-0.218; -0.155), $p < 0.001$], White collar job [-0.203 (-0.023; 0.001), $p < 0.001$], Wealth [-0.148 (-0.171; -0.126), $p < 0.001$], older age [0.003 (0.010; -0.004), $p < 0.001$] were negatively associated with mobility limitations. limitations in mobility functions were more common in females [0.314(0.262; 0.366), $p < 0.001$], in African Americans [0.128 (0.046; 0.210), $p < 0.001$] and other races compared to non-Hispanic Whites, and in those who are not married/partnered [0.101 (0.051; 0.152), $p < 0.001$]. *(Linear regression analysis)*
Viljanen et al., 2016, Finland	848 62.0%	80.6 (4.3)	**E:** Living situations **F:** Income **P:** Age; education	Life space mobility	Lower education was significantly associated with restricted life space (LSA mean score = 8.8) ($p = 0.001$). *(t-test)* Men [OR (95%CI) = 0.88 (0.41; 1.88)] and women [1.08 (0.65; 1.79)] with a perceived poor financial situation were more likely to report restricted life space compared to those with a perceived good financial situation ($p < 0.000$).

					Increased in age was associated with restricted life space among men [1.24 (1.15; 1.34)] and women [1.18(1,13; 1.24)] Living alone was associated with restricted life space among men [1.83 (1.00; 3.36)] and women [2.19 (1.43; 3.34)] *(Multivariate logistic regression)*
Vivoda et al., 2020, USA	6387 53.9%	NR (NR)	**E**: Household size **F**: Income **P**: Age; sex; education; race; marital status	Self-reported Driving status	Compared to full driving, older adults with a high school degree had about 23% lower odds of reducing their driving compared to those with less than a high school education. Respondents over age 75 had higher odds of both modifying and ceasing driving as compared to the youngest participants (65–69-year-olds). As compared to men, women had 2.7 and 3.5 times the odds of driving reduction and no longer drive, respectively, compared to full driving. Nonwhite respondents had almost 29% higher odds of driving reduction versus full driving, and 144% higher odds of driving cessation versus full driving, compared to white respondents Accumulated wealth was highest among the unrestricted drivers and lowest among those who had stopped driving ($p < 0.05$). In terms of relationship status, higher odds of driving reduction and cessation were observed for those who never married, and higher odds of driving cessation compared to full driving were noted for widowed respondents. Household size did not influence drove with modification (driving reduction) compared to full driving.

					(Logistic regression)
Winters et al., 2015, Canada	1309 55.0%	75.0 (8.3)	**E:** Walkability; street connectivity (using Street Smart Walk scores) **F:** Income **P:** Age; sex; education; country of birth	Mobility limitations Yes or no to meeting the Canadian PA guideline of ≥150 min PA/week (used walking)	Street Smart Walk Scores [somewhat walkable [OR (95%CI) = 1.83 (1.16; 2.88)], very walkable [1.95 (1.25; 3.07)], and walker's paradise [3.57 (1.62; 7.87)] were all associated with walking ≥150 min/week. The higher the walkability the higher the likelihood of walking ≥150 min/week. Having post-secondary education [1.75 (1.20; 2.56)] or secondary education [1.65 (1.10; 2.48)] is associated with walkability score ($p < 0.05$). Compared to individuals with higher incomes, those with lower income are most likely to have mobility level 2 (can be able to walk around the neighbourhood with difficulty but does not require waking aid or help of someone) or 3 (able to walk around in the neighbourhood with walking equipment but without the help of another person ($p < 0.05$). Age, sex and country of birth were not associated with walkability score. *(Logistic regression)*
Yang et al., 2018, USA	75862 57.0%	NR (NR)	**E:** Land use mix; street connectivity ; traffic conditions; proximity to destinations ; safety; aesthetic **F:** Income **P:** Age; sex; race	Self-reported transportation Active travel	Higher level of neighborhood poverty was associated with lower numbers of total trips and trip diversity (OR = 0.92, $p < 0.05$). A Higher level of street connectivity was associated with a lower total distance and lower maximum distance (1.12, $p < 0.05$), while a higher walk score was associated with higher numbers of total trips and trip diversity (1.08, $p < 0.05$). Compared to being aged 65-74 years, being aged 75-84 ($p < 0.001$) and aged >85 years was associated with lower public transportation use and lower active travel.

					Compared to being male, being female was associated with lower public transit use and lower active travel ($p < 0.001$). Compared to being White, being Black (1.19, $p < 0.001$), Asian (3.03, $p < 0.001$), Hispanic (1.53, $p < 0.001$), or Other (2.30, $p < 0.001$), was associated with higher public transit use. Compared to being White, being Black (0.61, $p < 0.001$), Asian (0.94, $p < 0.001$), Hispanic (1.00, $p < 0.001$), or Other (0.97, $p < 0.001$) was associated with active travel. Compared to earning <$20,000, earning $20,000 to $40,000 (0.70, $p < 0.001$), $40,000 to $80,000 (0.54, $p < 0.001$), and >=$80,000 (1.29, $p < 0.001$), was associated with public transit use. Compared to earning <$20,000, all other income ranges were positively associated with active travel ($p < 0.001$). *(Linear regression)*
Yeager et al., 2006	3848 46.0%	68.4 (8.8)	**E**: Social ties **P**: Age; sex; education; religious affiliation/ belief	Mobility limitations	Religious attendance (rarely: $\beta = -0.129$, $p < 0.05$; sometimes: -0.201, $p < 0.01$ often: -0.187, $p < 0.01$) and religious practices (0.009, $p < 0.10$), age (0.030, $p < 0.01$), Being female (0.245, $p < 0.01$), education (-0.027, $p < 0.05$) was associated with mobility limitation. Religious affiliations, religious belief, being married and social ties with friends and neighbors were not associated with mobility limitation. *(Regression)*
Zang et al., 2019, Hong Kong	3961 52.3%	74.5 (NR)	**E**: Land-use mix; number of retail shops; distance to mass transit rail; population density;	Self-reported Walking Total number of trips Total distance travelled	Urban greenness [OR (95%CI) = 1.14 (1.02; 1.27), $p = 0.02$], population density [1.14 (1.04; 1.24), $p < 0.01$] and number of retail shops [1.28 (1.15; 1.43), $p < 0.01$] predicts the odd of walking among elderly in private house. Land use mix [1.17 (1.4; 1.32), $p = 0.01$] number of retail shops [1.18 (1.04; 1.34), $p = 0.01$] predicts the odd of walking among elderly in public housing.

			urban greenness **F**: Income **P**: Age; sex	Walking times	The number of retail shops [β (95%CI) = -0.07 (-0.12; -0.01), p = 0.01] and Distance to mass transit rail [-0.06 (-0.11; -0.01), p = 0.01] negatively predicted the total number of trips elderly people in public housing. Population density [-0.03 (-0.07; 0.00), p = 0.05] and number of retails shops [-0.11 (-0.16; -0.07), p < 0.01] negatively predicted the total number of trips elderly people in public housing. Population density [-0.09 (-0.14; -0.03), p < 0.01], number of retail shops [0.09 (0.02; 0.16), p = 0.01] and distance to mass transit rail [0.06 (0.01; 0.12)] predicted the total travel distance among elderly in private housing. Number of retail shops [0.08 (0.01; 0.17), p = 0.05] and distance to mass transit rail [-0.10 (-0.19; -0.01), p = 0.02] predicted the total walking time among elderly in public housing. Urban greenness [0.23 (0.06; 0.39), p = 0.01], number of retail shops [0.11 (0.04; 0.17), p < 0.01], and distance to mass transit rail [-0.07 (-0.12; 0.01), p = 0.02] predicted the total walking time for elderly in private housing. Compared to being male, being female positively predicted the odds of walking in private housing (p < 0.01), but not in public housing. Being female was negatively associated with total number of trips and total travel distance in both public and private housing (p < 0.01). Sex was not associated with total walking time in public and private housing. Age was negatively associated with odds of walking in private housing (p = 0.04), but not public housing. Age was negatively associated with total number of trips and total travel distance in both public and private housing (p < 0.01). Age was negatively associated with total walking time in private housing (p = 0.02), but not public housing.

					In private housing, medium-high ($p = 0.01$) and high ($p < 0.01$) income were negatively associated, and medium-low was not ($p = 0.17$). In public housing, compared to low household income, medium-low, medium-high, and high income were not associated with odds of walking. In private housing, compared to low household income, medium-low, medium-high, and high income were not associated with total number of trips. In public housing, medium-low ($p = 0.04$) and high ($p = 0.02$) were negatively associated, medium-high was not. For total travel distance, only high income ($p < 0.01$) was positively associated in public housing. All other associations with total travel distance were not significant. For total walking time, income was not associated in public and private housing (*(Logistic regression model)*
Zang et al., 2020, Hong Kong	180 43.0%	NR (NR)	**E:** Land use mix; street connectivity; population density; green view index **P:** Age; sex; education; occupation	Total number of mins walked (reported)	Green view index ($\beta = 0.137$, $p = 0.05$), land use mix (0.09, $p = 0.28$), street connectivity (-0.09, $p = 0.26$), population density (0.14, $p = 0.10$) were not significantly related to total walking time. Age was negatively associated with walking time (-0.20, $p = 0.01$). Sex (-0.09, $p = 0.22$), education (0.11, $p = 0.13$), and occupation ($p = 0.04$, $p = 0.63$) were not associated with total walking time. *(Regression)*
Zhang et al., 2016, China	1264 49.5%	67.5 (6.6)	**E:** Population density; intersection density; land-use mix; bus-stop density;	Frequency of cycling trips	Population density [Coefficient (z) = 0.0025 (1.43), $p < 0.1$], intersection [-0.091 (-2.39), $p < 0.05$] and bus stop [-0.112 (-3.71), $p < 0.01$] were significantly associated with frequency of cycling trips. Land mix use and commercial accessibility were not associated with frequency of cycling trips.

			commercial accessibility **P**: Age; sex		Compared to being female, being male [0.294 (1.83), p < 0.1] was associated with cycling trips. Age was negatively associated [-0.035 (-2.53), p < 0.01] with cycling trips. *(Binomial regression)*
Performance based and self-reported mobility outcomes and >1 factors (n = 10)					
Ahmed et al., 2016, Brazil, Colombia and Canada	1967 52.0%	69.1 (2.9), male 69.1 (2.8), female	**F**: Income **P**: Age; gender; sex; education; marital status	Physical functioning (SPPB) Mobility limitation	The prevalence ratio for developing mobility limitations was higher for individuals who reported insufficient income [PR (95%CI) = 1.57 (1.30; 1.89)] compared to those with sufficient income [1.28 (1.07; 1,52)] (p < 0.001). Lower education was associated with mobility limitation [0.97 (0.96; 0.99), p < 0.001]. There was a higher prevalence of poor physical performance among participants endorsing the feminine role [1.37 (1.01; 1.88), p < 0.05] or the undifferentiated role [1.58 (1.18; 2.12), p < 0.01] compared to those endorsing the masculine role. Sex (ref, men) was associated with self-reported mobility limitation [1.61 (1.41; 1.83), p < 0.001] and poor physical performance [1.53 (1.19; 1.98), p < 0.001]. Married status (ref, married), being single was associated with self reported mobility limitation [1.23 (1.01; 1.50), p < 0.05], but not with poor physical performance. Age was not associated with self-reported mobility limitation and physical performance *(Poisson regression)*
Brown et al., 2011, USA	3322 59.0%	78.5 (6.3)	**E**: Perceived neighbourhood climate	Gait speed Blocks Walked (log-transformed)	Perceived neighbourhood climate was associated with number of blocks walked (r = 0.154, p < 0.05). Perceived neighbourhood climate was not associated with gait speed.

			F: Income **P**: Age; sex; education; marital status		Age was negatively associated with gait speed (-0.371, p < 0.01) and blocks walked (-0.207, p < 0.01). Female sex was negatively associated with gait speed (-0.279, p < 0.01) and blocks walked (-0.237, p < 0.01). Education was positively associated with gait speed (0.165, p < 0.05), but not blocks walked. Income and marital status were not associated with gait speed or blocks walked. (*Correlation matrix*)
Chudyk et al., 2017, Canada	161 63.3%	74.3 (6.2)	**E**: Walkability (Street Smart Walk score); safety (crime and traffic); broken glass or trash participants see in the neighbourhood; graffiti; neighborhood social cohesion; neighbourhood physical and social disorder; neighbourhood perception of aesthetics **P**: Age; sex	Steps per day Walking for transportation (trip/week)	Aesthetics was associated with steps taken by the older adults [β (95% CI) = 1.08 (0.94; 1.23)] but Street Smart Walk score was not associated. Street Smart Score [1.37 (1.18; 1.59)], neighbourhood physical and social disorder [0.36 (0.14; 0.89)] were associated with walking for transportation, but neighbourhood social cohesion, and aesthetics were not associated. Age was significantly associated with steps per day [-903 (-1642; -164), p = 0.017). Age was not associated with walking for transportation. Sex was not associated with steps per day or walking for transport. (*Regression*)
De Greef et al., 2011, Belgium	307 31.6%	61.6 (8.4)	**E**: Residential density; land use mix diversity; land use mix access; street network connectivity; availability and quality of walking and cycling infrastructures; safety for	Step counts per day Self-reported active transportation Self-reported	For step counts per day, an additional 4% of the variance was explained by the physical environmental factors beyond the sociodemographic. For self-reported active transportation, 6% of the variance was explained by physical environmental perceptions. Higher walkability was associated with more self-reported active transportation (p < 0.05).

			cycling; perceived safety from crime and traffic; physical activity equipment in the home environment; convenience of physical activity facilities; satisfaction with neighbourhood services; emotional satisfaction with the neighbourhood; aesthetics **P:** Age; sex	recreational walking	For self-reported recreational walking, environmental perceptions explained 5% of the variance. A higher convenience of PA facilities was associated with more self reported recreational walking ($p < 0.05$). Age was negatively associated with steps per day ($\beta = -0.27$, $p < 0.01$), but not active transport or recreational walking. Sex was not associated with steps per day, active transport, or recreational walking. (*Hierarchical multiple regressions*)
Giannouli et al, 2019, Germany	157 62.0%	72.4 (5.8), participants in wave 1 69.0 (4.9), participants in wave 2	**E:** Temperature; sociableness **P:** Age; sex; education	Gait time Gait step Life space mobility	For the pool data, Age (**$\beta = -$**0.287, $p <0.05$) was associated with active gait time but not gait steps. Age (-0.294, $p < 0.05$) and education (0.325, $p < 0.01$) was associated with active gait time on wave 2. Education **(**0.235, $p < 0.01$) was associated with steps taken on wave 2. Age (-0.241, $p < 0.05$) was associated with life space mobility, measured as the largest straight-line distance away from the home location to the study site. Temperature and sociableness were not associated with any mobility outcome measured. *(Regression)*
Gibson et al., 2010, Australia	471 65.3%	NR (NR)	**E:** Residential type (community dwelling vs. retirement dwelling) **P:** Age; sex	Physical functioning (TUG; Timed chair stands; 6MWT; postural sway open: total sway path (mm); postural sway closed: total sway path (mm); Berg balance score; Step test right	There was a significant difference between community and retirement village dwellers, favouring the community dwellers in single left leg stand (mean difference = -4.58, $p = 0.022$), single left leg stand scores (-4.18, $p = 0.045$) and LLFDI- function total scores (-2.27, $p = 0.015$). There were no significant differences between individuals in community dwelling or retirement dwelling in TUG scores, Time chair stands scores, 6MWT scores, Postural sway open and close scores, Berg balance scores, Step test right and left scores LLFDI disability frequency and limitation score.

				and left (steps); Single right and left leg stand (sec) LLFDI (total, disability frequency and limitation)	Being female was negatively associated with LLFDI scores [β (95%CI) = -4.75 (-6.73; -2.77), p < 0.001]. Being aged 75-79 was not associated with LLFDI scores. Being aged 80-84 [-1.88 (-3.65; -0.11), p = 0.038] and aged >85 [-2.46 (-4.76; -0.17), p = 0.036] were negatively associated with LLDFI scores. *(Multivariable linear regression)*
Lang et al., 2008, UK	4148 55.5%	NR (NR)	**E:** Environmental (neighborhood deprivation (ranked 1-5); population density; area type (urban vs rural vs small town) **F:** Income **P:** Age; education; sex	Gait speed Mobility limitations	Individuals with 15 or younger years of completing of schooling had a higher risk [RR (95%CI) = 1.11 (0.81; 1.53)] of slower gait speed compared to those with 17 years of completing of schooling [0.93 (0.63; 1.36)] (p = 0.000). Individuals with 15 or younger years of completing of schooling had a higher risk [0.93 (0.68; 1.29)] of reporting mobility limitation compared to those with 17 years of completing of schooling [0.89 (0.61; 1.30)] (p = 0.000). Individuals with the lowest income [1.84 (1.15; 2.94)] had a higher risk of slower walking speed compared to those with higher income [1.38 (0.90; 2.12)] (p < 0.000). Individuals with the lowest income [1.74 (1.09; 2.77)] had a higher risk of reporting mobility limitations compared to those with higher income [1.62 (1.07; 2.47)] (p < 0.000). Those living in the least deprived neighborhoods had greater proportions of individuals without mobility difficulties than those living in the most deprived neighborhoods (90.1% vs 76.2%, p = 0.000). Those living in the least deprived neighborhoods had greater proportions of individuals without gait speed impairment than those living in the most deprived neighborhoods (97.5% vs 90.8%, p = 0.000).

					Age [1.07 (1.05; 1.09)], sex (ref. Male), [1.39 (1.09; 1.78)] population density [1.01 (0.89; 1.14)], area type (ref. Rural) small town [1.18 (0.71; 1.97)] vs urban [1.00 (0.61; 1.61)] were associated with incident of self-reported mobility difficulties after a 2-year follow-up Age [1.10 (1.08; 1.12)], sex (ref. Male), [1.16 (0.90; 1.48)] population density [0.92 (0.81; 1.04)], area type (ref. Rural) small town [1.18 (0.70; 1.99)] vs urban [1.35 (0.85; 2.16)] were associated with incident of gait impairment after a 2-year follow-up. *(Logistic regression)*
Michael et al., 2011, USA	2421 100.0%	71.0 (5.0), participant with walking score at baseline 72.0 (5.0), participants with no walking score at baseline	**E:** Street connectivity; street density **P:** Age; education; occupation	Timed walk (walk speed) Chair-stand tests (time taken) Self-reported block walked	Among women, street connectivity (β = 9.63) and density [β (95%CI) = -0.79 (1.47; -0.12)] were associated with self reported blocked walked (p = 0.010), but not associated with chair stand, and walk speed. Among men, street connectivity and density were not associated with chair stand and walk speed. Age was negatively associated with blocks walked [-0.36 (-0.52; -0.21), p < 0.05] and walk speed [-0.01 (-0.013; -0.009), p < 0.05], and positively associated with chair stand time [0.19 (0.13; 0.25), p < 0.05]. Education was negatively associated with chair stand time [-0.10 (-0.19; 0.00), p < 0.05], positively associated with walk speed [0.006 (0.002; 0.010), p < 0.05], and not associated with blocks walked. Compared to none, working =<10 years of manual labour was negatively associated with chair stand time [-0.22 (-1.33; -0.21), p < 0.05], positively associated with walk speed [0.02 (0.01; 0.05), p < 0.05], and not associated with blocks walked. Compared to none, working >10 years of manual labour was not associated with blocks walked or chair stand time, but was

					positively associated with walking speed [0.03 (0.001; 0.05), $p < 0.05$]. *(Multi level linear regression)*
Thorpe et al., 2011, USA	2969 51.5%	73.5 (2.8), male, black 73.9 (2.9), male, white 73.4 (2.9), female, black 73.6 (2.8), female, white	**F:** Income **P:** Age; sex; education; race	Gait speed Mobility limitations	For both men [β (SE) = -0.05 (0.015)] and women [-0.04 (0.013)], reading below ninth grade level was negatively associated with walking speed ($p < 0.05$). For men, not graduating from high school [-0.09 (0.019)] or college [-0.05 (0.015)] was negatively associated with walking speed ($p < 0.05$). Women who are at or below the "150% poverty level" had slower walking speed [-0.03 (0.013)] compared to that above "150% poverty level". Men who perceived their income as inadequate had slower walking speed [-0.07 (0.022)] compared to those that perceived their income as adequate. Among women, being black [-0.10 (0.013)] and age [-0.01 (0.002)] were negatively associated with gait speed. Among men, being black [0.11 (0.015)] and age [-0.11 (0.002)] were negatively associated with gait speed Education, income, age, and race was not associated with difficultly walking ¼ mile. *(Logistic regression)*
Xu et al., 2019, Canada	271 65.7%	64.4 (11.5), male 63.8 (11.5), female	**F:** Income **P:** Age; sex; education; marital status	Walking distance (2MWT) Physical functioning (SPPB) LLFDI	For LLFDI function component score, sex, and marital status (widowed) were significant predictors [F (4, 266) = 37.45, $p < 0.0001$, $R^2 = 0.36$]; a significant ($p < 0.001$). Age category 74–100 years, sex, income level ($20k-$30k and 'do not know') and marital status (never married) were predictors for 2-minute walk distance [F (7, 241) = 17.76, $p < 0.0001$, $R^2 = 0.34$]. Age category 74–100 years, and income level ($10k-

					$20k) were the variables that predicted SPPB total score [R^2 = 0.19]. Education was not a predictor for any of the outcomes used. *(Multivariate regression analysis)*

Notes: AD – Assistive device; ANOVA- Analysis of Variance; e^b - Exponentiated Regression Coefficient; E – Environmental Factors; F – F Ratio; F – Financial factors; HR – Hazard Ratio; m - Meter; mins – Minutes; MANOVAS – Multivariate Analysis of Variance; NR- Not reported; LLFDI – Late Life Function Disability Index; LSA - Life Space Assessment; OR - Odds Ratio; P – Personal Factors; PR – Prevalence Ratio; RR - Relative Risk; r – Correlation; R^2 – adjusted R-square; SPPB - Short Physical Performance Battery; S – Seconds; SD – Standard Deviation; SE – Standard Error; TUG - Time Up and Go Test; Vs- Versus; 2MWT - Two-Minute Walk Test; 6MWT - Six-Minute Walk Test; 95%CI - 95% Confidence Interval, β - Beta Coefficient.

Mobility limitation (unless otherwise stated in the table) includes self-reported inability on all or either of the following: walking up and down a flight of stairs (10 steps) or several flights of stairs, walking a mile (1600meter) or half a mile (800meter) or a quarter mile or a block (400meter) or 100-300meter, or across the room and running/jogging for 20-30 minutes.

Result highlighted in gray indicates no significant association between factor(s) and mobility outcome. Most findings in the table were reported verbatim as the authors reported them in their paper

Appendix 3D: Details of included qualitative studies for personal, environmental and financial factors

Author, year, country	**Total Sample size included in analysis** **% Female**	**Mean age (SD)**	**Factors**	**Mobility outcome**	**Themes reported in the studies**
Alidoust et al., 2018, Australia	54 61.0%	76.4 (NR)	**E:** Proximity to service centers; perceived safety (from crime, risk of injury); existence and/or proximity to aesthetically attractive areas (natural green spaces, soft edges)	Frequency of mobility	(1) Different neighborhood-built form patterns (conventional and master-planned communities and their subcategories) (2) Different types of social ties (strong, weak, and absent) (3) Walking behavior and its determinants.
Brookfield et al., 2017, Scotland	22 NR	NR (NR)	**E:** Residential preferences; social activities; past time	Outdoor mobility	Residential preferences, environment and physical activity, health, ageing and physical activity, environment and affect, important components of a home/neighborhood and activities/pastimes
Brown et al., 2010, USA	19 84.0%	76.6 (5.8)	**E:** Access to destination	General mobility	(1) General living environment (2) Use of handicapped parking (3) Use of assistive devices (including motorized carts) (4) Transportation method (5) Any need for rest breaks when walking
Cauwenberg et al., 2012, Belgium	57 47.0%	73.4 (5.4)	**E:** Access to facilities; traffic safety; safety from crime; social contact; aesthetics (natural elements and weather)	Walking for transportation Walking for recreation	Access to facilities (including shops and services, public transit, and connectivity), walking facilities (including sidewalk quality, crossings, legibility, and benches), traffic safety (including busy traffic and other road users), familiarity, safety from crime, (including physical factors and other persons), social contacts, aesthetics (including buildings, natural elements, noise and smell, openness and decay) and weather

Cauwenberg et al., 2018, Belgium	40 42.5%	73.4 (5.7)	**E:** Physical environment	Cycling for transport	Traffic safety, cycling infrastructure, road design & maintenance, connectivity, aesthetics, hilliness, weather
Chu et al., 2019, USA	7 100.0%	NR (NR)	**E:** Built and natural environment barriers and facilitators	Walking for exercise	(1) Visual cues during walks provide recovery motivation and goal achievement. (2) Consistent activity is supported through access to a range of buildings and walking paths. (3) Concerns about safety are compounded by cancer-related physical limitations
Croxall et al., 2019, Canada	18 66.0%	72.0 (NR)	**P:** Culture	Use of wheelchair	Inability to access the outdoors safely and independently
Franke et al., 2019, Canada	24 NR	NR (NR)	**F:** Income	Maintaining high levels of mobility including walking, public transportation, and engaging in various forms of physical activity	Maintaining a sense of self, being resourceful, openness to engagement, engaging in superficial contact, experiencing social capital, accessing transportation, leaving the immediate neighborhood and facing affordability.
Gallagher et al., 2010, USA	21 90.0%	70 (8.7)	**E:** Environmental factors	Neighborhood walking	Presence of other people, neighborhood surroundings, and safety from crime, sidewalk and traffic conditions, animals, public walking tracks and trails, and weather.
Gallagher et al., 2011, Ireland	121 79.3%	64.7 (NR)	**E:** Rural and urban areas	Access to transport	Mobility, access to transport, loss of independence, loneliness, social isolation, coping strategies, public attitudes, disability awareness
Gardner et al., 2013, Canada	6 50.0%	82.5 (NR)	**E:** Neighborhoods (physical and social environments)	Community mobility (amount of people that got outside on regular per week)	Social engagement (loneliness), challenges created by the build environment (poorly maintained sidewalks, concern for personal safety, assess to facilities)
Grant et al., 2010, Canada	53 in focus, 22 in interview	75.0 (NR)	**E:** Safety; walking conditions	Walking experience	Multidimensional personal meanings, navigating hostile walk environments, experiencing ambiguity, getting around

	82.0%				
Greysen et al., 2014, USA	24 34.0%	63.0 (NR)	**E:** Environmental and social barriers **F:** Income	Barriers to mobility	(1) Traditional focuses of care transitions and "missing pieces" (2) Functional limitations and difficulty with mobility and self-care tasks (3) Social isolation and lack of support from family and friends (4) Challenges from poverty and the built environment at home
Jang et al., 2020, Canada	20 50.0%	NR (NR)	**E:** Environmental barriers **P:** Personal barriers	Use of mobility devices	(1) Ambulatory status and perceived cognitive capacity (2) Difficulties fitting into the built environment (3) Experiences of negotiating the social environment
Korotchenko and Clarke, 2014, Canada	29 48.3%	67.0 (NR)	**E:** Built environment	Use of mobility devices	(1) Technology: independence; autonomous mobility; battery life; device size and weight; breakdowns; and invisibility (2) Public space: environmental accessibility; transportation barriers; and social and emotional consequences of inaccessibility (3) Private space: accessible private spaces; and inaccessible private spaces.
Lord and Luxembourg, 2007, Canada and France	92 47.0%	NR (NR)	**E:** Physical environment	Daily mobility practices	1. Mobility practices and automobile 2. Daily mobility experiences and meaning 3. Aging in Suburbs, inevitable adaptation strategies 4. Aging in Suburb, a positive residential experience
Mitra et al., 2015, Canada	14 85.7%	70.7 (NR)	**E:** Environment and social enablers and barriers	Walking distance/frequency	Traffic conditions and street design, sidewalk quality, benches trees and areas to rest, personal safety, proximity to parks, proximity, and access to shops
Newton et al., 2010, United Kingdom	200 NR	NR (NR)	**E:** Environmental design features	Self-reported mobility, walking as main transportation	Footways, pedestrian and traffic segregation, changes in level, curbs at road crossing points, navigation, seating, street greenery, pedestrian crossings, bus stops, toilets, and wayfinding

Ottoni et al., 2016, Canada	192 58.0%	NR (NR)	**E**: Benches/seating	Mobility in the neighborhood	Benches positively contributed to participant's experiences with mobility for those with physical mobility impairment, as well as in green and blue spaces, and the social environment.
Ramachandran and Dsouza, 2018, India	10 60.0%	NR (NR)	**E**: Physical (poor road conditions; traffic; crowded roads; high step on buses; insufficient seating; poor lighting and quality; footpaths) and social environment (attitudes) **P**: Age **F**: Lack of financial resources	Community mobility (type of transportation including walking)	(1) Features of physical environment (e.g., encroached footpaths, poor road conditions, and disorderly traffic are sources of fear towards community mobility (2) Age, restrictions placed by family members, and unavailability of financial resources restrict community mobility (3) Inconsiderate attitudes of public transport drivers deterred participation
Rosenberg et al., 2013, USA	35 74.0%	67.0 (NR)	**E**: Built environment facilitators and barriers	Neighborhood-based activities	Curb ramps, parking, aesthetics, lighting, weather, street crossings, sidewalks, amenities, traffic, walking paths/trails, safety, ground/geographical features, outdoor stairs, and ramps.
Tong et al., 2020, Canada	18 77.8%	72.6 (4.8)	**P**: Gender; culture **E**: Walkability (residential characteristics, street characteristics, land mix use); access to transit	Physical activity including walking	(1) Walking for Wellbeing (2) A Supportive Social Environment (Psychosocial, Environment and Culture) (3) The Impact of Gendered Identity and Personal Biography

Note: E – Environmental factors; F – financial factors; NR-Not reported; P – Personal factors

Appendix 3E: Details of included mixed-method studies for personal, environmental and financial factors

Author, year, country	**Total Sample size included in analysis** **% Female**	**Mean age (SD)**	**Factors**	**Mobility outcome**	**Quantitative Findings** *(Analysis type)*	**Qualitative Themes**
Bödeker et al., 2018, Germany	65 57.8%	72.2 (8.6)	**E**: Household density; connectivity; land use mix; retail floor area ratio **P**: Age; gender; marital status; socioeconomic status	Habitual durations of neighborhood walking/total walking	Age, gender, marital status and socioeconomic status were not associated with neighborhood walking or total walking. Household density (p = 0.025), pedestrian connectivity (p < 0.001), land use mix (p < 0.001), and retail floor area ration (p < 0.001) were associated with walking. *(Regression analysis)*	Perceived neighborhoods
Cassarino et al., 2019, Ireland	112 64.3%	70.6 (8.6)	**E**: Variety of things to see (complexity, quietness, green space, and presence of people); level of urbanity (inner city, city suburbs, town, village, countryside) **P**: Gender	Walking preferences Walking destination	The presence of people was not associated with any of the other walking preferences. Participants living in the inner city assigned the lowest ratings of importance to this aspect of outdoor spaces [median (IQR) = 2.00 (2.00)] compared to the other groups [suburbs: 4.00 (2.00); towns: 4.0 (2.00); village: 4.00 (3.00); countryside: 3.00 (2.00)]. Frequent walker rated green spaces as important aspects of the places where they walk (rho = -0.21, p = 0.04), but complexity,	Diversity of walking purposes, Stimulation adjustment needs (preferences in environmental stimuli), Personal attitudes towards outdoor spaces, social dimensions of walking outdoors, Physical attributes of outdoor spaces

					quietness and presence of people did not reach significance. Participants who walked in their neighborhoods for recreational reasons preferred more to walk places with green spaces (rho = 0.34, p = 0.008) and people (rho = 0.31, p = 0.02), but correlations, although positive, were not significant for variety or quietness. Walking destinations and types did not vary by urbanity level, Women reported recreational walking in their neighborhood more than men, although these differences showed only a trend towards significance (Z = -1.94, p = 0.05); there were no significant gender-based differences for other types of use. *(Descriptive statistics, Spearman's correlation, Mann-Whitney test, Kruskal-Wallis test, ordinal logistic regression with proportional odds ratios)*	
Giesel et al., 2015, Germany	2696 NR	NR (NR)	**E:** Home environment (access to transport, facilities); suburban/urban **P:** Age; sex	Driving duration; Driving distance; Driving frequency	Age and sex were not significantly associated with decreased driving distance, decreased driving frequency (as measured by numbers of trips per day) (and decreased travel time: *(Chi-square test)*	No theme was derived. Participants quotes were used to support qualitative descriptions

					Residents in the suburban berlin drive more by car than residents in the city of Berlin, and public transport does not matter in suburbia at tall, but important in Berlin, especially among women. More women had limited satisfaction with places of entertainment, public transport, service facilities and shopping facilities than men *(Descriptive analyses)*	
Marquez et al., 2017, USA	35 57.1%	70.6 (5.6)	**E:** Neighborhood-specific landmark; universal landmark; street signs; land use items; transit stops; stores/businesses; idiosyncratic; unsafe situations	Neighborhood mobility (way finding)	Most participants sought information from other people as a primary method of route planning. Street signs and landmarks were overwhelming favorites as helpful way of finding features. When asked to recall the route following the walk, only half of participants gave completely correct directions. *(Descriptive analyses)*	Lack of familiarity, difficulty in judging distance, knowing when the destination is reached and not yet knowing area landmarks. Places with no good landmarks or missing signs, distractions (e.g. ringing phones and noise of the train), pressure (impatient drivers), angled streets or intersections and dead ends, safety were barriers in navigating the neighborhood

Risser et al. 2010, Austria, Germany, Ireland, Czech Republic, Poland, Italy, Spain, and Sweden	3309 64.0%	NR (NR)	**E**: Toilets; traffic safety; ramps; vehicles on foot path; negative social attitude towards aged people; stray animals	Walking barrier	Amongst the five highest ranked barriers to mobility amongst the senior citizens, three were related to the behavior of other road users, or other persons more generally: inconsiderate car drivers, vehicles on the pavement and a negative attitude towards senior citizens. The other two highly ranked barriers were missing toilets in the public space and overcrowded vehicles in public transport. Two highly ranked barriers to older people's mobility according to the experts were decreasing senses and having to rely on other people in connection with one's mobility. These were, however, not considered that important by the senior citizens themselves. The senior citizens also rank loose animals high while this is not at all considered as a barrier to senior citizens mobility by the experts. (*Descriptive analyses*)	Mobility barriers among seniors were: (1) Inconsiderate car drivers (2) Lacking toilets (3) Vehicles on footpaths (4) Public transport vehicles overcrowded (5) Negative attitudes toward aged people (6) Loose animals (7) Drivers are ruthless (8) Public transit does not match customer needs (routes/frequencie s) (9) Transfers badly designed (10) Decreasing senses (11) Lacking punctuality (12) Too few traffic signs (13) Insecure when walking (14) Ramps (15) Roundabouts (16) Reliance on people (17) Badly adapted signals (18) Uncomfortably designed car

Thies et al., 2020, United Kingdom	17 89.4%	70.3 (4.8)	**E:** Home environments	Walking frame use	On average, participants used their front-wheeled walkers incorrectly at home during 16% of single support periods, and 30 of dual support periods. Upon video analysis of the environmental context, home environments were often tight for space and required moving over carpet edges and turning corners. Rooms were often cluttered with furniture or walking frames left by others. Confined spaces and clutter appeared resulting in maneuvers which often deviated from safety guidelines. Moreover, for the front-wheeled walker, which has both front wheels fixed, it appeared impossible for users to turn whilst keeping the wheels on the ground. Users were observed to either completely lift the frame off the ground and then step to turn whilst unsupported (in fact, whilst carrying the frame), or the frame was spun on a single pivot point (one of its legs), resulting in near collisions between the person's feet and the frame's rotating legs. (*Descriptive analyses*)	(1) Enabling mobility (2) Design issues (3) Training/guidance (4) Usability & acceptability of the Smart Walker system Associated key outcomes were that walking aid use was clearly part of participants' everyday life
Tomsone et al., 2014, Latvia	3 100.0%	NR (NR)	**E:** 188 environmental barriers according to the Housing Enabler Instrument	Cane, rollator, crutches	Participant 1's accessibility score ranged changed from 55 (visit 1) to 313 (visit 2) to 262 (visit 3). Participant 2's accessibility score ranged from 327 (visit 1) to 363 (visit 2) to 261 (visit 3). Participant 3's	Barriers in the physical environment were complex to overcome, in combination with mobility device

			(higher score = more accessibility issues)		accessibility score ranged from 38 (visit 1) to 34 (visit 2) to 242 (visit 3). *(Descriptive analyses)*	use, for all participants. Barriers include: 1) narrow space, 2) complicated passageways, and 3) needing support from others. Support from others was important to overcome the barriers. Other practical aspects such as garage and parking locations for the mobility devices played a part for their use or non-use outdoors, since bringing the mobility devices indoors was impossible
Zandieh et al., 2016, United Kingdom	216 67.3%	69.6 (NR)	**E**: Safety; traffic condition; pavement condition; presence of amenities; quietness; air quality; aesthetic	Performance based outdoor walking levels	Safety [β (SE) = 1.33 (0.48), $p < 0.01$], quietness [0.54 (0.17), $p < 0.01$] and aesthetics [0.55 (0.22), $p < 0.05$] were predictors of outdoor walking levels while traffic condition, pavement conditions, presence of amenities and air quality were not. *(Regression)*	Safety, pedestrian infrastructure, and aesthetics
Zang et al., 2019, Hong Kong	180 43.0%	NR (NR)	**E**: Land use mix; residential	Walking time	Age (β = -0.20, $p < 0.01$) and commercial density (-0.28, p <	The five key words established as codes from the

			density; street connectivity; commercial density; intersections; 72 audit items **P**: Age; sex; occupation; education		0.01) were associated with walking. Gender, education, occupation, land use mix, street connectivity, residential density, intersections were not correlated with walking time. *(Correlation)*	random interview dialogues were 'transportation', 'sustainable', 'sociable', 'safe' and 'activity'. The elderly participants hoped that their neighborhoods could be well connected and provide them with the space needed to conduct social and physical activities, whereas the professionals were more focused on safety and sustainability.

Notes: E - Environmental factors; P – Personal factors; IQR - Interquartile Range; NR - Not Reported; SE – Standard Error; Rho – Correlation; β - Beta Coefficient.
Result highlighted in gray indicates no significant association between factor(s) and quantitative mobility outcome.

Appendix 4A: Details of the included articles

Author, year, country	**Total Sample size included in analysis** **% Female**	**Mean Age (SD)**	**Physical Factors**	**Mobility Outcome**	**Findings (Analysis type)**
Performance-based mobility outcomes and physical factors (n = 175)					
Aarden et al., 2019, Netherlands	391 48.6%	79.6 (6.7)	Grip strength; Comorbidities; BMI; Fatigue	Physical functioning (De Morton Mobility Index)	Grip strength (B = 0.35, $p < 0.01$) was associated with De Morton Mobility Index scores, but not BMI, comorbidity, or fatigue. *(Linear mixed models)*
Aranyavalai et al., 2020, Thailand	255 71.8%	68.7 (6.7)	Falls	Physical functioning (TUG) Walking steps (< 5000 steps/day)	There was an association between fall incidence and walking < 5000 steps/day [HR (95%CI) = 3.6 (1.76; 7.31)] and low functional mobility by Timed Up and Go ≥13.5 s [6.43 (2.65; 15.57)]. *(Cox's proportional hazard regression)*
Abe et al., 2010, Japan	1022 100%	78.7 (2.7)	Breathing (Normal ventilatory capacity; obstructive ventilatory impairment; restrictive ventilatory impairment; combined ventilatory impairment)	Gait speed (preferred, maximal) Physical functioning (TUG, Maximal TUG) Balance (one leg standing time with eyes open)	Compared to those with normal ventilatory capacity and obstructive ventilatory impairment, those with restrictive ventilatory impairment and combined ventilatory impairment had slower maximal and comfortable gait speeds ($p < 0.05$), took longer to complete the TUG and maximal TUG tests, and had lower one leg standing time ($p < 0.05$). *(ANOVA, Bonferroni post hoc test)*
Abe et al., 2014, Japan	53 39.6%	73.0 (3.0)	Muscle thickness (forearm ulna and radius)	Gait speed (preferred & maximal)	Maximum and preferred walking speeds were not significantly correlated with either forearm-radius or forearm-ulna MT in men and women ($p > 0.05$).

					(Pearson's correlations)
Adachi et al., 2015, Japan	149 51.0%	73.7 (4.6)	BMI; Hand grip strength; Skeletal muscle index; Lung function (FVC, FEV1, FEV1/FVC); Chronic conditions (arteriosclerosis & peripheral artery disease)	Walking time (SWT)	Men's performance on the shuttle walking test was predicted by FEV1 [12.80 (3.05; 53.70), p = 0.001], but not BMI, skeletal muscle index, FVC, having arteriosclerosis or peripheral artery disease. Women's performance on the shuttle test was not predicted by any physical factor. *(Logistic regression)*
Al-Zahrani et al., 2002, UK	83 71.1%	69.0 (7.3), healthy 71.0 (8.4), OA	Chronic conditions (OA)	Walking speed Gait parameters (stride length, mid-stance, mid-swing)	Compared to those with OA, those with OA had lower gait speed (0.55 m/s vs. 1.17 m/s, $p < 0.000$), shorter stride length (0.75m vs. 1.27m, $p < 0.000$), longer mid-stance (30.05% vs. 34.16%, $p < 0.000$), and longer mid-swing (84.03% vs. 80.06%, $p < 0.000$). *(Mann-Whitney U test)*
Alexander et al., 2014, USA	21 71.4%	82.7 (7.4), AMD 74.1 (6.6), no AMD	Vision impairment (low luminance questionnaire); Chronic conditions (AMD)	Gait speed	Compared to those with no AMD, the older adults with AMD walked significantly slower ($p = 0.03$) on the approach phase to the edge of the curb regardless of lighting condition. Lower low luminance questionnaire scores correlated with slower gait speed during curb ascent and descent in dim light ($r = 0.64$, $p < 0.05$) and following a sudden reduction of light ($r = 0.80$, $p < 0.05$). *(Two tailed t-test, ANOVA)*
Andersson et al., 2011, Switzerland	44 52.2%	68.9 (4.6), females	Breathing (VO2)	Walking distance (6MWT)	There was a significant correlation between VO2 and 6MWT distances ($r = 0.61$, $p < 0.05$). *(Correlations)*

		69.6 (4.4), males			
Assantachai et al., 2014, Thailand	742 74.9%	69.4 (6.1), Men 66.8 (5.2), Women	Quadriceps strength; lean body mass	Physical functioning (timed five-step test, timed five-chair stand test) Walking distance (6MWT)	Quadriceps strength (r = -0.21 to -0.39, p < 0.001) and lean body mass (r = -0.09 to -0.19, p < 0.001) were associated with the five-step test. Quadriceps strength (r = -0.19 to -0.40, p < 0.001) and lean body mass (r = -0.07 to -0.19, p < 0.01) were associated with the five-chair stand test. Quadriceps strength (r = 0.45 to 0.52, p < 0.001) and lean body mass (r = 0.23 to 0.30, p < 0.001) were associated with the 6-minute walk test. *(Pearson's correlations)*
Auvinet et al., 2003, France	53 62.3%	77.2 (6.5), non-fallers 80.7 (5.2), fallers	History of falls	Gait speed Gait parameters (stride frequency, stride length, stride symmetry, stride regularity)	Compared to fallers, non-fallers had significantly faster gait speed, stride frequency, stride length, stride symmetry, and regularity (p < 0.01). *(ANOVA)*
Bardin et al., 2012, Brazil	33 100%	69.0 (7.0)	History of falls	Physical functioning (TUG) Walking distance (ISWT) Balance (Berg Balance Scale)	Those who had a history of falls performed worse on the Berg Balance test (51 vs 55, p < 0.001). History of falls were associated with TUG performance [OR (95%CI) = 3.19 (1.10; 9.24), p = 0.03], but not ISWT performance (p = 0.057). *(Multiple logistic regression; t-test)*
Baudendistel et al., 2019, UK	30 53.0%	71.0 (6.0)	History of falls	Gait parameters (forward cadence, turning cadence, Number of steps in turn, forward velocity, time to complete turn, forward step	Increasing turning cadence (β = 0.58, p = .004) and decreasing forward cadence (β = −0.56, p = .005) were associated with a significant increase in falls. No other gait parameters variables were associated with history of falls. *(Linear regression)*

				time, forward step length)	
Bean et al., 2010, USA	117 68.0%	75.2 (6.7)	Cardiovascular system (rate pressure product); Muscle strength; Muscle power	Gait speed Physical functioning (SPPB)	Change in muscle power was associated with improvements in SPPB and gait speed following 16 weeks of training ($p < 0.01$), but not changes in muscle strength or rate pressure product. *(Multivariate logistic regression)*
Bean et al., 2008, USA	138 69.0%	75.4 (6.9)	Muscle strength (leg); muscle contraction (leg velocity); BMI	Physical functioning (SPPB - score > 9)	Balance [OR (95%CI) = 4.54 (1.11; 18.60)], leg strength [30.35 (5.48; 168.09)], leg velocity [22.86 (3.88; 134.75)] were associated with SPPB scores > 9. BMI was not associated with SPPB scores. *(Multivariate logistic models)*
Bean et al., 2003, USA	839 54.0%	74.2 (6.6)	Leg power; hip strength; knee strength	Gait speed Physical functioning (SPPB, stair climbing test, chair rise time test) Balance (tandem stances test from SPPB)	Leg power, hip strength, and knee strength were positively associated with SPPB scores, gait speed, and balance (all $p < 0.001$). Leg power, hip strength, and knee strength were all negatively associated with time to complete a stair climb or chair rise test (all $p < 0.001$). *(Multivariate linear regression)*
Brisson et al., 2018, Canada	37 100%	62.2 (5.5)	BMI; Quadriceps strength; Quadriceps power; Pain	Walking distance (6MWT) Physical functioning (stair ascent and descent time)	Two-year change in 6MWT scores were associated with pain [B (95%CI) = 1.53 (0.59; 2.46), $p = 0.002$] and BMI [-3.61 (-7.16; -0.06), $p = 0.046$], but not quadriceps strength ($p = 0.06$) and power ($p = 0.43$). Two-year change in stair ascent was associated with pain [-0.0277 (-0.0472; -0.0081), $p = 0.019$], but not BMI ($p = 0.308$), quadriceps strength ($p = 0.530$) and quadriceps power ($p = 0.540$).

					Neither pain ($p = 0.52$), quadriceps strength ($p = 0.24$), or quadriceps power ($p = 0.89$) were associated with stair descent. *(Multiple linear regression)*
Champagne et al., 2012, Canada	30 100%	69.4 (6.4), no CLBP 68.9 (6.6), CLBP	Chronic condition (CLBP)	Walking speed Physical functioning (TUG) Balance (one leg stance) Composite mobility (0 - 12, TUG + one leg stance + walking speed)	Compared to those with no CLBP, those with CLBP took longer to complete the TUG ($p = 0.012$), walked slower ($p = 0.001$), and had lower composite mobility scores ($p = 0.009$). One leg stance time did not differ between groups ($p = 0.740$). *(ANOVA)*
Chang et al., 2004, USA	62 71.0%	78.8 (2.8)	Muscle strength (grip, knee extension, hip flexion); total number of diseases; BMI	Walking time (400-meter walk test)	Muscle strength, BMI, and total number of diseases were not associated with being unable to complete the 400m walk test ($p > 0.05$). *(Logistic regression)*
Chien et al., 2013, Taiwan	102 18.6%	62.9 (2.2), no COPD 67.9 (1.5), moderate COPD 69.4 (1.8), severe COPD	Comorbidity (COPD); FEV1; Rib cage excursion at 3 mins; RV/TLC	Walking distance (6MWT)	Compared to those with no COPD (496m), those with moderate COPD (405m) or severe COPD (330m) walked shorter distances on the 6MWT ($p < 0.001$). Distance walked on the 6MWT was predicted by FEV1 [B (95%CI) = 0.80 (0.14; 1.45), $p = 0.02$], rib cage excursion at 3 mins [0.25 (0.12; 0.38), $p < 0.001$], and RV/TLC [-2.78 (-3.91; -1.65), $p < 0.001$]. *(ANOVA; stepwise multiple linear regression)*

Clark et al., 2014, USA	44 40.9%	NR (NR)	Muscle cross-sectional area (CSA); Intramuscular adipose tissue CSA; Subcutaneous adipose CSA; BMI	Gait speed	Among males and females, muscle CSA, intramuscular adipose CSA, and subcutaneous CSA were not associated with gait speed (p > 0.05). BMI was also not correlated with gait speed in males or females (p > 0.05). *(Multiple regression; Univariate correlation)*
Clermont et al., 2016, Canada	30 53.3%	66.1 (10.0), no knee OA 64.6 (6.8), knee OA	Chronic conditions (OA)	Gait speed Gait parameters (step count; stride time; stride time SD; stride time FSI; step time; step time SD)	Compared to those without OA, those with OA had lower gait speed (1.29 vs 1.45, p = 0.032), higher stride time (1058ms vs 1001ms, p = 0.031), and higher step time (530ms vs 500ms, p = 0.024). Step count, stride time SD, stride time FSI, and step time SD were not significantly different between groups (p > 0.05). *(t-tests)*
Cordeiro et al., 2009, Brazil	91 65.9%	74.4 (5.9)	Proprioception (proprioceptive sensitivity); Chronic conditions (orthostatic hypertension); Pain; History of falls; Dizziness; Visual acuity; Hearing acuity; BMI; Chronic conditions	Physical functioning (TUG) Balance (Berg Balance Scale)	Proprioception was a predictor of TUG time [B (SE) = 13.711 (2.388), p < 0.001] and balance [-7.222 (2.388), p = 0.003]. Orthostatic hypertension was a predictor of balance [2.339 (1.078), p = 0.033]. Pain was not associated with balance (p = 0.764) or TUG performance (p = 0.100). Dizziness was associated with worse balance performance (p = 0.005), but not TUG performance (p = 0.504). History of falls, vision, hearing, BMI, and Chronic conditions were not associated with TUG or balance performance (p > 0.05). *(ANOVA; t-tests; Pearson's correlations; linear regression)*
Craig et al., 2019, USA	40 50.0%	74.0 (6.7), fallers 73.0 (5.3),	History of falls	Balance (gait stability index)	Elderly fallers had lower gait stability index values across all speeds compared to elderly non-fallers (p < 0.05). *(ANOVA)*

		non-fallers			
Criminger & Swank, 2019, USA	31 21.6%	69.0 (8.2)	Disease severity (Unified Parkinson's Disease Rating Scale Motor Section III)	Physical functioning (TUG)	Disease severity, measured using the Unified Parkinson's Disease Rating Scale Motor Section III, was not significantly correlated with turn strategy during the TUGalone ($r = 0.122$), TUGmotor ($r = 0.027$), and TUGcognitive ($r = 0.027$) tasks ($p > 0.05$). *(Pearson's correlations, MANOVA)*
Cruz et al., 2015, Portugal	134 36.0%	72.6 (8.3)	FEV1, BMI, Oxygen use, Pain, Respiration functions, muscle power, muscle endurance	Physical functioning (TUG)	Those with functional balance impairment had lower FEV1% ($p = 0.013$), higher BMI ($p = 0.005$), and were more likely to use oxygen ($p = 0.015$) compared to those without impairment. Those with functional balance impairment had greater problems in the International Classification of Functioning, Disability and Health domains: "pain in body part" ($p = 0.009$), "respiration function" ($p = 0.011$), "muscle power functions" ($p = 0.001$), and "muscle endurance functions" ($p = 0.001$) compared to those without impairment. *(t-tests, Mann-Whitney U-tests, Chi-square)*
Cuoco et al., 2004, USA	48 85.4%	72.7 (0.8)	Lower extremity strength; Power (at 70% and 50% 1 repetition max)	Gait speed Physical functioning (stair climb test, chair rise test)	Lower extremity strength was associated with time taken to complete the stair climb [B (SE) = -0.001 (0.001), $p = 0.03$], chair rise [-0.004 (0.002), $p = 0.04$], but not habitual gait speed ($p = 0.07$). Leg power at 70% 1RM was associated with time taken to complete the stair climb [-0.006 (0.002), $p = 0.004$] and chair rise tests [-0.019 (0.008), $p = 0.02$], as well as gait speed [0.0008 (0.0001), $p = 0.001$]. Leg power at 40% 1RM was associated with time taken to complete the stair climb [-0.006 (0.002), $p = 0.01$] and chair rise tests [-0.025 (0.009), $p = 0.01$], as well as gait speed [0.001 (0.001), $p = 0.001$]. *(Linear regression)*

Curcio et al., 2016, Italy	337 49.3%	77.1 (6.9)	Body composition (BMI; waist circumference); Physical activity; Comorbidities; Frailty (Fried scale; Rockwood scale)	Physical functioning (Tinetti mobility test)	Among those who performed worse on the Tinetti mobility test, they had greater comorbidity scores ($p = 0.01$), less physical activity ($p = 0.001$), were frailer ($p = 0.001$), but were not significantly different in terms of BMI ($p = 0.249$) or waist circumference ($p = 0.456$). *(ANOVA)*
de Alencar Gomes et al., 2018, Brazil	67 73.1%	68.4 (8.0), glaucoma 69.3 (7.9), no glaucoma	Chronic condition/vision (glaucoma)	Gait speed Gait parameters (cadence, step length, base of support, swing time, stance time, double support time) Physical functioning (chair rise test, TUG) Balance (dynamic gait index)	Chair rise test, gait speed, cadence, step length, base of support, swing time, stance time, and double support time were not significantly different between cases and controls ($p > 0.05$). Compared to those with no glaucoma, those with glaucoma took significantly longer to complete the TUG ($p=0.002$) and scored lower on the Dynamic gait index balance scale ($p = 0.001$) *(ANOVA)*
de Kruijf et al., 2015, Netherlands	2304 54.8%	63.5 (7.5)	Pain (lower body pain; hip pain; knee pain; foot pain)	Gait parameters (rhythm [single support time], variability [step length SD], phases [single support phase], pace [step length], tandem, turning, base of support [stride width SD])	Lower body pain was associated with decreased rhythm [β (95%CI) = -0.19 (-0.33; -0.06), $p < 0.005$], phases [-0.20 (-0.34; -0.07), $p < 0.005$], pace [-0.19 (-0.31; -0.07), $p < 0.005$], and increased variability [0.16 (0.00; 0.31), $p < 0.05$]. Hip pain was associated with decreased gait phases [-0.19 (-0.32; -0.06), $p < 0.005$] and pace [-0.16 (-0.28; -0.03), $p < 0.05$]. Foot pain was associated with decreased gait phases [-0.14 (-0.28; 0.00), $p < 0.05$]. Knee pain was not associated with changes in gait domains.

					(Linear regression)
Del Din et al., 2019, UK	342 52.9%	70.4 (6.9)	Chronic conditions (Parkinson's); History of falls	Walking time (volume of walking bouts) Gait parameters (step time; stance time, swing time, step length variability, step velocity variability)	Those with a history of falls walked with shorter and less variable walking bouts (p < 0.05). Volume of walking bouts (e.g., total walking time per day, % of walking time per day, total number of steps and bouts per day) was not related to fall history. Compared to controls, those with Parkinson's had lower step times, stance times, swing times, and greater step velocity variability (p < 0.0083). There was not a significant difference between controls and those with Parkinson's for step length variability. *(Linear modelling)*
Demura et al., 2014, USA	181 100%	76.1 (5.7)	Pain (knees - one, both, none); Vision acuity problems; Muscle strength (knee extension)	Gait speed Gait parameters (cadence; stance time; swing time; double support time; step length; step width)	Those with superior muscle strength had greater walking speeds (p = 0.01) and longer step lengths (p = 0.01) than those with middle or inferior muscle strength. Compared to those without vision acuity issues, those with vision issues had significantly lower cadence (p = 0.04), longer stance times (p = 0.02), and longer double support times (p = 0.04). Compared to those with pain in both knees, those with no pain had significantly higher gait speed (p = 0.03). Compared to those with no pain or pain in one knee, those with pain in both knees had longer stance times (p = 0.01) and longer double support times (p = 0.01). *(ANCOVA; Tukey Honestly Significant Difference method)*
Der Wiel et al., 2002, Netherlands	589 66.0%	85.0 (0.0)	Grip strength, Vision (visual acuity), Pain (in lower	Walking time (6-meter walking test - inability to complete is classified as	Poor grip strength [OR (95%CI) = 4.6 (2.4; 9.1)] and vision [1.8 (1.1; 2.9)] were associated with walking disability.

			extremity or back)	walking disability)	Pain in lower extremity or back was not associated with walking disability. *(Multivariate logistic regression)*
Dos Santos et al., 2017, Brazil	116 60.0%	83.3 (2.7)	Obesity; Chronic conditions (Sarcopenia)	Physical functioning [SPPB - reduced mobility (score below 25 percentile) and no reduced mobility]	There was no difference in obesity (p = 0.627) or sarcopenic obesity (p = 0.394) between those with reduced mobility and those without. Those with sarcopenia were more likely to have reduced mobility than those without (33.3% vs 12.6%, p = 0.020). Sarcopenia was associated with reduced mobility [OR (95%CI) = 3.44 (1.12; 10.52), p = 0.031]. *(Chi-square; Logistic regression)*
Duffell et al., 2017, UK	35 57.1%	66.8 (5.6), healthy 67.6 (3.6), OA	Chronic conditions (OA)	Gait speed Gait parameters (stride length; stance width)	Compared to healthy controls, those with OA had lower speed (1.02 m/s vs. 1.09m/s, p < 0.001) and stride length (1.22m vs 1.24m, p < 0.05). There was no significance in stance width (p > 0.05). *(MANOVA)*
Dyer et al., 2002, UK	73 63.0%	76.1 (NR), chronic airflow limitati on 75.8 (NR), controls	Breathing (FEV1, VC)	Walking distance (SWT)	FEV1 and SWT were weakly associated (r = 0.31, p = 0.05). Vital capacity and SWT were associated (r = 0.42, p = 0.01). *(Pearson's correlations)*
Elbaz et al., 2005, France	2572 65.6%	73.3 (4.7)	Cardiovascular system (Carotid atheroscleroti c plaques; common carotid artery intima-media thickness [CCA-IMT];	Gait speed (maximal)	CCA-IMT was negatively associated with maximal walking speed (p < 0.0001). Carotid atherosclerotic plaques were negatively associated with maximal walking speed (p = 0.03). Slower walkers were more likely to have hypertension (p < 0.001), higher BMIs (p < 0.001), have hypercholesterolemia (p = 0.03), and had a history of falls (p = 0.007). There was no significant difference in gait speed between those with and without diabetes (p = 0.13).

			hypertension); Comorbidities (diabetes; hypercholesterolemia); Body composition (BMI); History of falls		*(ANCOVA)*
Estrada et al., 2007, USA	189 100%	67.5 (4.8)	Muscle mass (Appendicular skeletal muscle (ASM); Appendicular fat mass (AFM))	Walking time (time on treadmill; 8-foot walk test) Walking distance (6MWT) Gait speed Physical functioning (chair rise time) Balance (single leg stance)	Total ASM/Height^2 ratio was correlated with time on the treadmill ($r = 0.17$, $p < 0.05$), but not any other mobility outcome ($p > 0.05$). Total ASM/Weight was correlated with time on the treadmill ($r = 0.57$, $p < 0.01$), 6MWT ($r = 0.37$, $p < 0.01$), gait speed ($r = 0.34$, $p < 0.01$), 8-foot walk time ($r = -0.28$, $p < 0.01$), single leg stance ($r = 0.26$, $p < 0.01$), but not chair rises ($p > 0.05$). Total AFM/Height2 ratio was correlated with time on treadmill ($r = -0.42$, $p < 0.01$), 6MWT ($r = -0.30$, $p < 0.01$), gait speed ($r = -0.25$, $p < 0.01$), 8-foot walk time ($r = 0.21$, $p < 0.05$), single leg stance ($r = -0.20$, $p < 0.01$), but not chair rise time ($p > 0.05$). Total AFM/Weight ratio was correlated with time on treadmill ($r = -0.40$, $p < 0.01$), 6MWT ($r = -0.26$, $p < 0.01$), gait speed ($r = -0.27$, $p < 0.01$), 8-foot walk time ($r = 0.19$, $p < 0.05$), single leg stance ($r = -0.18$, $p < 0.01$), but not chair rise time ($p > 0.05$). *(Univariate correlations)*
Fragala et al., 2016, USA, Iceland	6766 56.0%	76.6 (5.4), Men-AGES cohort 78.4 (2.8), Men-ABC: cohort	Grip strength; Leg strength	Gait speed (gait speed <0.8m/s is considered slow)	In the AGES cohort, for men, weak grip strength [OR (95%CI) = 3.43 (2.68; 4.32)] and weak leg strength [3.59 (2.63; 4.89)] were associated with slow gait speed. For women, weak grip strength [3.08 (2.55; 3.73)] and weak leg strength [3.30 (2.64; 4.12)] were associated with slow gait speed. These findings were also replicated in the ABC cohort. *(Logistic regression)*

		76.4 (5.6), Women- AGES cohort 78.0 (2.8), Women- ABC cohort			
Fragoso et al., 2014, USA	1635 67.2%	78.9 (5.2)	Breathing (Reduced ventilatory capacity; Respiratory muscle weakness); Dyspnea severity (Borg >2 (moderate-to-severe); Borg 0.5-2 (mild))	Gait speed (gait speed of <0.8m/s, was considered slow) Physical functioning (SPPB score (≤7 is moderate-to-severe mobility impairment)	Reduced respiratory ventilatory capacity was associated with slow gait speed [OR (95%CI) = 1.41 (1.03; 1.92)], but not mobility impairment. Respiratory muscle weakness was associated with mobility impairment [1.42 (1.03; 1.95)], but not slow gait speed. Mild dyspnea was not associated with slow gait speed or mobility impairment. Moderate-to-severe dyspnea was associated with slow gait speed [1.70 (1.22; 2.38)], but not mobility impairment. *(Logistic regression)*
Francis et al., 2019, USA	159 84.5%	60.4 (5.3)	Lower extremity strength	Gait speed (habitual, maximal and extended gait speed (over 900m) Physical functioning (chair rise time test X 5, chair rise test in 30 seconds)	Lower extremity strength was correlated with habitual gait speed (r = 0.360, p = 0.003), maximal gait speed (r = 0.329, p = 0.008), chair rise time x5 (r = - 0.297, p < 0.001), extended gait speed (r = -0.537, p < 0.001), and chair rise time (r = 0.226, p = 0.031). *(Pearson's correlations)*
Fukaya et al., 2019, UK	17 NR	73.4 (9.5)	Range of motion (hip, knee, ankle)	Gait parameters (initial contact, loading response, midstance	The hip joint was significantly abducted, and the knee joint was significantly in the varus position during the initial contact. Significantly greater knee joint varus was found during the loading

				terminal stance, & pre-swing)	response in the established KOA group. During the terminal stance, the hip joint was significantly in the abduction position, and the knee joint was significantly in the varus position in the established KOA group. In the established, KOA group, the knee abductor moment was observed significantly during the loading response, midstance, and terminal stance periods. *(t-tests)*
Giannouli et al., 2019, Germany	154 62.0%	72.3 (5.9), wave 1 69.5 (4.9), wave 2	Muscle strength (leg, grip strength)	Active- and Gait-time (AGT); Steps; Life-space area; Maximum area range	Among the pooled cohort, leg strength was associated with AGT ($\beta = 0.201$, $p < 0.05$) and number of steps ($\beta = 0.232$, $p < 0.05$). Grip strength was associated with life-space area ($\beta = 0.297$, $p < 0.01$) and maximum area range ($\beta = 0.244$, $p < 0.05$). *(Multiple linear regression)*
Gouveia et al., 2019, Portugal	802 50.0%	69.8 (5.6)	BMI; Physical activity; Lower Body strength; Lower Body flexibility; Anerobic walking endurance	Gait velocity Gait parameters (cadence, stride length, gait stability ratio) Balance (Fullerton Advance balance scale)	Balance was associated with physical activity ($\beta = 0.09$, $p < 0.05$), lower body strength ($\beta = 0.20$, $p < 0.001$), lower body flexibility ($\beta = 0.10$, $p < 0.01$), and anerobic endurance ($\beta = 0.35$, $p < 0.001$), but not BMI. Gait velocity was associated with physical activity ($\beta = 0.13$, $p < 0.001$), lower body strength ($\beta = 0.10$, $p < 0.01$), and anerobic endurance ($\beta = 0.54$, $p < 0.001$), but not lower body flexibility or BMI. Cadence was associated with physical activity ($\beta = 0.10$, $p < 0.05$), lower body strength ($\beta = 0.16$, $p < 0.01$), and anerobic endurance ($\beta = 0.38$, $p < 0.001$), but not lower body flexibility or BMI. Stride length was associated with physical activity ($\beta = 0.11$, $p < 0.001$) and anerobic endurance ($\beta = 0.52$, $p < 0.01$), but not lower body flexibility,

					lower body strength or BMI. GSR was associated with physical activity (β = -0.11, p < 0.001), and anerobic endurance (β = -0.55, p < 0.001), but not lower body flexibility, lower body strength or BMI. *(Hierarchical regression analyses)*
Greendale et al., 2000, USA	762 52.6%	74.3 (NR)	Fracture status (no fracture, wrist fracture, combined fracture)	Gait speed (maximal) Physical functioning (chair stand test) Balance (single leg stand, turning 360 degrees circle, timed taps, tandem stand)	Compared to having a wrist fracture or no fracture, having a combined fracture was associated with greater reduction in balance (p = 0.014), worsened ability to turn 360 degrees (p = 0.032), worsened walking speed (p < 0.001), taking longer to complete chair stands (p = 0.004) tandem stands (p = 0.002), and timed taps (p = 0.009), but not single leg stands (p = 0.180). *(ANCOVA)*
Grosicki et al., 2020, USA	925 53.1%	74.0 (6.0), men 72.0 (8.0), women	Grip strength; body composition (total body fat; arm lean mass; weight; BMI)	Gait speed (slow speed < 0.8 m/s)	Among men and women with mobility limitations, poor grip strength/BMI, maximal grip strength, and grip strength/weight were positive predictors of slow gait speed (p < 0.05). Among women only, poor grip strength/total body fat and grip strength/arm lean mass were positive predictors of slow gait speed (p < 0.05). *(Logistic regression)*
Gulley et al., 2020, USA	253 51.0%	78.5 (NR)	Falls	Gait parameters (stride length, stride length variability, stride velocity, swing phase (percent), swing time variability, and double	Participants had significantly slower stride velocity (57.81 vs 83.26 cm/s), shorter stride length (74.76 vs 101.81 cm,), lower swing (30.1 vs 32.41 %), higher double support (39.79 vs 35.19 %), and more swing (30.09 vs 32.41 %) and stride length variability (31.86 vs 6.35 %) during turns compared with straights. Higher swing percent in both turns [HR (95%Cl) = (0.92 (0.87; 0.97), p < 0.05] and straights [0.89 (0.84; 0.96), p < 0.05] was

				support phase (percent))	associated with reduced risk of falls. Higher double support percent during both turns [1.04 (1.01; 1.07), $p < 0.05$] and straights [1.06 (1.02; 1.09), $p < 0.05$] was associated with increased risk of falls. More swing variability during turns [1.03 (1.00; 1.06), $p < 0.05$] but not straights, was associated with increased risk of falls. *(Cox proportional hazards models)*
HajGhanbari et al., 2013, Canada	26 46.0%	70.4 (9.3)	Pain severity (McGill Pain Questionnaire)	Walking distance (6MWT)	The McGill Pain Questionnaire pain severity was negatively correlated with the 6MWT ($r = -0.41$, $p < 0.05$). Those with severe pain (based on the MPQ), walked a total shorter distance (- 115 +/- 57 m, $p < 0.01$). *(Spearman's correlations)*
Hassan et al., 2002, USA	32 56.3%	79.7 (5.3), AMD 77.1 (6.7), controls	Chronic conditions/vision (AMD)	Gait speed	The average preferred walking speed of the AMD group was not significantly different from that of the normally sighted group ($p = 0.35$). *(Mann-Whitney U test)*
Hassinen et al., 2005, Finland	146 45.9%	72.1 (1.3)	Waist circumference; BMI; Grip strength; Weekly exercise	Walking time (10-meter walk test) Walking steps (number of steps in 10-meter walk test) Balance (standing feet side by side, in tandem position, on the right foot and left foot).	Walking time was correlated with grip strength ($r = -0.307$, $p < 0.001$), BMI ($r = 0.330$, $p < 0.001$), waist circumference ($r = 0.237$, $p < 0.01$), and weekly exercise ($r = -0.252$, $p < 0.01$). Balance was correlated with grip strength ($r = 0.244$, $p < 0.01$), BMI ($r = -0.287$, $p < 0.001$), waist circumference ($r = -0.260$, $p < 0.01$), and weekly exercise ($r = 0.206$, $p < 0.05$). Number of steps was correlated with grip strength ($r = -0.609$, $p < 0.001$), BMI ($r = 0.313$, $p < 0.001$), but not waist circumference or weekly exercise ($p > 0.05$). *(Pearson's correlations)*

Hayashida et al., 2014, Japan	318 65.0%	75.5 (5.5), men 74.8 (6.0), women	Knee extension strength; leg muscle mass; Appendicular muscle mass	Gait speed (maximal)	Knee extension strength was associated with maximum walking speed in men (r = 0.38, p < 0.01) and women (r = 0.45, p < 0.01). Leg muscle mass and appendicular muscle mass were not associated with gait speed. *(Correlations)*
Herman et al., 2005, USA	37 65.0%	76.0 (NR)	Muscle power (triceps power 40% 1RM; triceps power 70% 1RM; double leg press power 40% 1RM; double leg press power 70% 1RM)	Walking time (4-meter walk test) Physical functioning (stair climb time, SPPB)	Stair climb time was associated with triceps power 40% 1RM [B (SD) = -0.001 (0.004), p = 0.02], triceps power 70% 1RM [-0.001 (0.0005), p = 0.05], and double leg press power 70% 1RM [-0.0005 (0.0002), p = 0.03]. SPPB scores were associated with triceps power 40% 1RM [-0.0008 (0.0004), p = 0.04], triceps power 70% 1RM [-0.001 (0.0004), p = 0.002], double leg press power 40% 1RM [-0.0006 (0.0002), p = 0.004], and double leg press power 70% 1RM [-0.0005 (0.0002), p = 0.007]. 4m walk time was associated with triceps power 40% 1RM [B (SD) = -0.0006 (0.0002), p = 0.03], triceps power 70% 1RM [-0.001 (0.0004), p = 0.002], and double leg press power 70% 1RM [-0.0003 (0.0001), p = 0.04]. *(Separate multivariate regression analyses)*
Hill et al., 2021, UK	21 43.0%	69.9 (4.3)	Muscle thickness (right vastus lateralis [RVL], left vastus lateralis [LVL], right gastrocnemius medialis [RGM], left gastrocnemius medialis [LGM]); Muscle quality (RVL, LVL, RGM, LGM)	Physical functioning (TUG, five times sit-to-stand test)	Muscle thickness of all measured muscles were correlated with time taken to complete five sit-to-stand test (r = -0.473 to -0.596, p < 0.05). Muscle thickness of the RVL (r = -0.492, p < 0.05), LVL (r = -0.480, p < 0.05), and RGM (r = - 0.432, p < 0.05), but not LGM (p > 0.05) were correlated with TUG time. Muscle quality of all measured muscles were correlated with time taken to complete five STS transitions (r = 0.481 to 0.635, p < 0.05) and TUG time (r = 0.459 to 0.518, p < 0.05). *(Pearson's correlations)*

Hillman et al., 2012, Australia	26 50.0%	71.0 (8.0)	Muscle strength (quadriceps, grip); BMI; Total lean mass; Peripheral lean mass; Central lean mass; Leg lean mass; Arm lean mass; Total fat mass; Peripheral fat mass; Central fat mass; Disease severity (GOLD severity; FEV1; BODE; Dyspnoea MMRC)	Walking distance (6MWT)	GOLD severity (r = -0.6, p = 0.003), FEV1 (r = 0.7, p = 0.0002), BODE index (r = -0.9, p = 0.0000), dyspnoea MMRC (r = -0.7, p = 0.0001), grip strength (r = 0.4, p = 0.03), total lean mass (r = 0.4, p = 0.03), peripheral lean mass (r = 0.4, p = 0.02), leg lean mass (r = 0.4, p = 0.03) and arm lean mass (r = 0.4, p = 0.02) were associated with 6MWD. Quadriceps strength, BMI, central lean mass, total fat mass, peripheral fat mass, and central fat mass were not associated with 6MWT (p > 0.05). *(Pearson's correlations)*
Hollman et al., 2013, USA	69 50.0%	65.5 (2.6)	Coordination (finger-to-nose; finger to opposition; mass grasp; pronation-supination; heel on shin); BMI; Mass; Height	Gait speed (preferred, maximum)	Preferred walking speed was associated with pronation-supination [β = -0.378, p = 0.001], but not height (p = 0.221). Fast waking speed was associated with finger-to-nose [β = -0.322, p = 0.003] and height [β = 0.431, p = 0.012]. No other physical factors were included in the hierarchical regression. *(Hierarchical regression)*
Ingemarsson et al., 2003 Sweden	167 69.0%	80.9 (9.5)	Height; Grip strength; Breathing (peak expiratory flow); Bone mineral density (BMD)	Walking time (10-meter walk test at 1 year)	Walking time at 1 year was correlated with grip strength (r = -0.30, p = 0.0007), and peak expiratory flow (r = -0.25, p = 0.01), but not height (p = 0.10), or bone mineral density (p = 0.056). *(Spearman's correlations)*

Inzitari et al., 2008, USA	387 65.1%	78.7 (3.8)	Cardiovascular system (coronary artery calcium)	Gait speed Physical functioning (chair stands) Balance (standing tandem stance)	Greater coronary artery calcium was associated with lower gait speed in women (p = 0.001), but not chair stand time or standing balance in women (p > 0.05). Coronary artery calcium was not associated with gait speed, chair stand time, or balance in men (p > 0.05). *(General linear models)*
James et al., 2016, USA	164 73.0%	86.0 (4.7)	Coordination (Phase Coordination Index)	Gait speed Physical functioning (SPPB, repeated chair stands) Balance (standing with the feet touching side-by-side, semi-tandem stands, full tandem stands)	Coordination was significantly associated with SPPB score [B (SE) = -0.346 (0.078), p < 0.001], gait speed [-1.643 (0.572), p = 0.005], chair rise score [-0.159 (0.046), p = 0.001], and balance score [-0.126 (0.038), p = 0.001]. *(Multivariable linear regression)*
Jeon et al., 2017, Korea	101 86.0%	81.2 (5.2), repeated falls 77.6 (5.6), one-time falls 71.9 (8.6), non-fallers	History of falls	Gait speed Gait parameters (cadence, gait cycle, step time, step length and stride length) Balance (static balance [single leg stance test], dynamic balance [TUG])	Compared to those in the non-fall group, those in the repeated fall group had shorter step lengths (p = 0.005), shorter stride (p = 0.030), longer step times (p = 0.038), longer gait cycles (p = 0.034), slower gait speed (p < 0.001), and lower cadence (p = 0.005). Compared to those in the repeated fall group and one-time fall group, those in the non-fall group had greater dynamic (p < 0.001), and static (p = 0.001) balance. *(Chi-square, ANOVA)*
Jerome et al., 2016, USA	406 51.0%	68.4 (5.6)	Adiposity (% fat mass)	Walking time (400-meter walk at baseline, and change at 21-51 months)	For both those aged 60-69 and 70-79, percent fat mass was associated with walking endurance (both β = 2.0, p < 0.001). For those aged 60-69, percent fat mass was associated with change in walking endurance upon follow up (β = 0.5, p = 0.04),

					however, this association was not replicated in those aged 70-79 ($p = 0.74$). *(Regression)*
Kang et al., 2020, USA	41 95.0%	72.6 (5.6), diabetics 77.9 (8.2), non-diabetics	Chronic conditions (diabetic peripheral neuropathy)	Gait speed Gait parameters (number of steps to steady-state gait, distance to steady-state gait, mediolateral body sway)	Compared to those with no diabetic peripheral neuropathy, those with diabetic peripheral neuropathy took a greater number of steps to reach steady-state gait (4.0 vs 2.4, $p < 0.001$), travelled a farther distance to reach steady-state gait (2.13m vs 1.25m, $p = 0.008$), had a lower gait speed (0.99m/s vs 1.11m/s, $p = 0.018$), and had a greater mediolateral body sway (7.01 degrees vs 4.46 degrees, $p = 0.001$). *(ANCOVA)*
Katzman et al., 2011, USA	3108 100%	68.2 (6.1)	Grip strength	Physical functioning (TUG)	Grip strength (per SD) was associated with TUG performance [β (95%CI) = -0.22 (-0.32; - 0.13), $p < 0.0001$]. *(Multiple linear regression)*
Kawabata et al., 2021, USA	50 88.0%	70.6 (6.1)	History of falls	Physical functioning (SPPB)	Compared to non-fallers, fallers scored lower on the SPPB ($p = 0.0002$). *(Student's t-test)*
Kito et al., 2010, Japan	38 100%	61.9 (8.1), mild knee OA 71.3 (6.8), moderate knee OA	Knee adduction moment impulse	Gait speed	Knee adduction moment impulse in stance duration was associated with gait speed (β = - 0.30, $p = 0.049$) *(Forward stepwise regression)*
Ko et al., 2010, USA	164 53.7%	68.9 (1.4), normal BMI 67.1 (1.0),	Body composition metrics (BMI)	Gait speed (preferred, maximal) Gait parameters (stride width	During the preferred speed walking task, an increase in BMI was associated with a decrease in gait speed ($p < 0.001$) and an increase in stride width ($p < 0.001$). During the maximum speed walking task, an increase in BMI was associated with a decrease in gait speed ($p = 0.047$) and an increase in stride width ($p = 0.048$).

		overweight BMI 68.8 (1.5), obese BMI		[preferred, maximal])	*(Generalized linear models)*
Ko et al., 2010, USA	18 78.0%	68.7 (7.5), diabetic 72.3 (10.9), non-diabetic	Chronic conditions (diabetes)	Gait speed Gait parameters (cadence, step length, step time)	Compared to non-diabetics, those who were diabetic had slower walking speeds (0.94 m/s vs 1.17 m/s), lower cadences (103.16 steps/min vs 116.44 steps/min), and longer step times (0.59 s vs 0.52 s) ($p < 0.05$). There was no difference between groups for step length ($p > 0.05$). *(MANOVA)*
Ko et al., 2012, USA	190 48.9%	67.1 (0.5), old-age 84.2 (0.9), oldest-age	Muscle power (maximum knee extensor strength)	Gait speed Gait parameters (stride length, stride width)	Gait speed ($\beta = 0.103$, $p < 0.001$) and stride length ($\beta = 0.046$, $p = 0.003$) were associated with maximum knee extensor strength. Stride width was not associated with maximum knee extensor strength ($p = 0.466$). *(Linear regression)*
Kulmala et al., 2012, Finland	434 100%	69.2 (0.3), impaired vision 68.1 (0.3), good vision	Vision impairment	Gait speed (Maximal) Balance (standing [Good Balance system])	Maximal walking speed [OR (95%CI) = 1.34 (1.13; 1.59), $p = 0.001$] and standing balance [1.16 (1.00; 1.35), $p = 0.049$] were associated with vision impairment. *(Logistic regression)*
Kwon et al., 2018, Korea	78 73.7%	74.8 (5.7), faller 74.5 (5.0), non-faller	History of falls	Gait speed Gait parameters (step time, step length, single support cycle, double support cycle, variability of	Compared to fallers, non-fallers had greater gait speed ($p = 0.035$), lower double support cycle ($p = 0.003$), lower variability of step time ($p = 0.015$), and greater step length ($p = 0.040$). Single support cycle ($p = 0.186$), step time ($p = 0.325$), and variability of step length ($p = 0.918$) were not associated with fall history. *(t-tests)*

				step time, variability of step length)	
Kyrdalen et al., 2019, USA	108 62.0%	NR (NR)	History of falls (one and multiple); Impaired vision; Chronic conditions; BMI (underweight; overweight);	Gait speed (gait speed of <1.0m/s, was considered slow)	Low gait speed was significantly associated with a history of multiple falls [OR (95%CI) = 3.70 (1.18; 11.65)], but not one fall (p = 0.480). Impaired vision (p = 0.283), being underweight (p = 0.853), being overweight (p = 0.334) and Chronic conditions (p = 0.521) were not associated with low gait speed. *(Logistic regression analyses)*
LaRoche et al., 2017, USA	36 58.3%	76.0 (7.6)	Muscle power	Walking time (400-meter walk) Physical functioning (stair ascent time, chair raise time)	Knee extensor power asymmetry was unrelated to 400-m walk time (r = 0.16, p = 0.180), stair ascent time (r = 0.22, p = 0.094), or chair rise time (r = 0.03, p = 0.437), whereas weak and strong leg powers were equally associated with 400-m time (r = − 0.62, p < 0.001; r = − 0.62, p < 0.001), stair ascent time (r = − 0.55, p < 0.001; r = − 0.57, p < 0.001), and chair rise time (r = − 0.28, p = 0.048; r = − 0.31, p = 0.032), respectively *(Pearson's correlations)*
Leat & Lovie-Kitchin, 2008, Australia	35 NR	NR (NR)	Vision (useful field of view [UFOV] conditions 1-4)	Gait speed (standard, preferred, percent preferred (percent))	Percent preferred walking speed was not associated with any physical factors. Preferred walking speed was associated with UFV4 (β = -0.340, p = 0.01). Standard walking speed was associated with UFV3 (β = -0.512, p < 0.000). *(Multiple linear regression)*
Lee et al., 2013, USA	19 57.9%	70.7 (2.7), controls 72.1 (4.1), knee pain	Knee pain	Gait speed Gait parameters (stride time, stride length, stride width, stance phase rate)	Compared to those controls, those with knee pain had no significant differences in gait speed, stride length, stride times, stance phases, and stride widths (p > 0.05). *(Independent t-test)*

		72.1 (2.2), uses walker			
Lee et al., 2019, Korea	435 47.0%	75.8 (4.0)	Limb Asymmetry Index (LAsI): low, intermediate, and high asymmetric groups; history of falls; BMI; lean mass of legs	Gait speed Physical functioning (TUG, SPPB)	Limb asymmetry index (β = -0.104, p = 0.01) and lean mass of both legs (β = 0.099, p = 0.03) were associated with gait speed. BMI was not associated with gait speed (p = 0.21). Compared to non-fallers, fallers had lower gait speeds (1.07 m/s vs 1.13 m/s, p = 0.04), took longer to complete the TUG (10.43s vs 9.84s, p = 0.03), but did not differ in SPPB score (p = 0.07). *(Multiple linear regression; t-tests; Mann-Whitney U test)*
Leone et al., 2017, Canada	22 73.0%	70.4 (5.8)	Respiratory system (VO2)	Gait speed (6MWT, 10-meter SWT)	VO2 peak was positively correlated to walking speed during both the 6MWT (R2 = 0.83, p < 0.001), and the SWT (R2 = 0.81, p < 0.001). *(Correlations)*
Liao et al., 2017, Taiwan	461 47.6%	65.5 (NR), men 62.9 (NR), women	Cardiovascular system (heart rate variability [standard deviation of normal-to-normal intervals (SDNN), root mean square of successive differences at rest (rMSSD), and high-frequency (HF) power])	Gait speed Balance (single-leg stance) Physical functioning (TUG, timed chair rise)	Among men, SDNN was associated with balance (β = 0.045, p < 0.001), gait speed (β = 0.39, p < 0.001), and timed chair raises (β = 0.67, p < 0.001), rMSSD was associated with gait speed (β = 0.26, p < 0.01), and HF was associated with balance (β = 0.61, p < 0.001), gait speed (β = 0.33, p < 0.001), and time chair rises (β = 0.29, p < 0.05). Among women, SDNN was associated with balance (β = 0.68, p < 0.001), and gait speed (β = 0.34, p < 0.05), rMSSD was associated with timed chair rises (β = 0.51, p < 0.05), and HF was associated with balance (β = 0.93, p < 0.001), gait speed (β = 0.32, p < 0.01), TUG (β = -0.13, p < 0.05), and timed chair rise (β = 0.67, p < 0.05). *(Stepwise linear regression)*

Lindell et al., 2020, Sweden	662 61.0%	79.0 (NR)	Dizziness	Gait speed (preferred, maximal)	Among women, those with dizziness had slower self-selected (1.02 m/s vs 1.13 m/s, $p < 0.001$) and maximal (1.34 m/s vs 1.52 m/s, $p < 0.001$) gait speeds than those without dizziness. Among men, those with dizziness had slower self-selected (1.04 m/s vs 1.14 m/s, $p < 0.001$) and maximal (1.49 m/s vs 1.65 m/s, $p < 0.01$) gait speeds than those without dizziness. *(t-tests)*
Lindemann et al., 2016, Germany	68 100%	77.6 (5.0)	Thigh muscle volume; Quadriceps strength; Muscle power; Handgrip strength	Gait speed (preferred, maximal)	Gait speed (habitual) was weakly correlated with thigh muscle volume ($r = 0.256$), muscle power ($r = 0.147$), quadriceps strength ($r = 0.172$), and handgrip strength ($r = 0.142$). Gait speed (maximum) was weakly correlated with thigh muscle volume ($r = 0.291$), quadriceps strength ($r = 0.370$), and handgrip strength ($r = 0.344$), and moderately correlated with muscle power ($r = 0.500$). *(Pearson's correlations)*
Liu-Ambrose et al., 2002, Canada	93 100%	69.4 (3.2)	Pain (back); Comorbidity (OA); Physical activity; Fracture	Gait speed (figure-of-eight test) Balance (Equitest computerized dynamic posturography platform)	Pain ($\beta = -0.43$) and having OA ($\beta = -0.23$) were predictors of balance. Pain was a predictor of mobility (gait speed) ($\beta = -0.38$). Physical activity and fracture were not correlated with balance or mobility (gait speed). *(Forward stepwise regression models; Pearson correlations)*
Lu et al., 2019, Germany	308 64.0%	68.3 (6.1)	Body composition (Height; Weight; Waist circumference; BMI; hip circumference)	Physical functioning (TUG)	Among females, time to complete the TUG was correlated with height ($r = -0.19$, $p < 0.01$), but not weight, waist circumference, hip circumference, or BMI ($p > 0.05$). Among males, time to complete the TUG was correlated with height ($r = -0.20$, $p < 0.05$), but not weight, waist circumference, hip circumference, or BMI ($p > 0.05$). *(Spearman's rank correlation)*

MacGilchrist et al., 2010, UK	69 39.0%	67.0 (8.2)	History of falls	Gait speed Gait parameters (double support left, double support right, step length left, step length right, step time left, step time right)	Gait speed (p < 0.001), step length L (p < 0.001) and step length R (p < 0.001) were significantly lower among fallers compared to non-fallers. Double support L (p = 0.004), double support R (p = 0.004), step time L (p = 0.026), and step time R (p = 0.020) were significantly longer among fallers compared to non-fallers. *(ANOVA; t-tests)*
Mahendran et al., 2018, Australia	29 31.0%	71.0 (14.0)	Physical activity (measured through PASE - physical activity scale for the elderly); Fatigue (measured through the Fatigue severity scale)	Walking steps (average number of steps/day, walking intensity (defined as >80 steps/minute) Walking time (total time in minutes per day spent in >300 steps) Collectively called - Walking activity measured at at 1, 3, and 6-months post hospital discharge using accelerometer)	No physical factors were associated with walking activity at 1 month. At 3 months, physical activity was associated with frequency of walking (β = 0.55, p = 0.004), volume of walking (β = 0.47, p = 0.007), and intensity of walking (β = 0.46, p = 0.002). At 6 months, physical activity was associated with intensity of walking (β = 0.53, p < 0.001). *(Step-wise multiple regression)*
Mahmoudian et al., 2017, Belgium	66 100%	63.5 (8.2), control 67.6 (4.9), early OA	Chronic conditions (OA)	Gait speed (baseline, at 2 years) Gait parameters (stance time [baseline, at 2 years])	Walking speed was significantly lower after the 2-year follow up among those with early and established OA (p = 0.028). There was no significant difference in walking speed at baseline (p = 0.656) or stance time at baseline (p = 0.747) or after 2 years (p = 0.939). *(ANOVA)*

		67.0 (4.7), established OA			
Mantel et al., 2019, USA	60 68.3%	75.2 (8.6)	BMI	Gait speed (preferred, maximum)	BMI was associated with comfortable gait speed (β = -0.27, p < 0.01) and fast gait speed (β = -0.25, p < 0.001). *(Hierarchal linear regression)*
Mänty et al., 2012, Denmark	292 55.3%	75.0 (NR)	Fatigue, muscle strength (knee extension; body extension; grip)	Gait speed (baseline, and change at 5 years)	Among women, fatigue [β (SE) = -0.027 (0.008), p < 0.001], and body extension strength [0.115 (0.017), p < 0.001] were associated with baseline gait speed, while knee extension strength and grip strength were not (p > 0.05). Among men, fatigue [-0.039 (0.010), p < 0.001], and body extension strength [0.162 (0.027), p < 0.001] were associated with baseline gait speed, while knee extension strength and grip strength were not (p > 0.05). Among women, body extension strength [0.055 (0.023), p = 0.020] was associated change in gait speed upon follow up, while knee extension strength, fatigue, and grip strength were not (p > 0.05). Among men, fatigue [-0.035 (0.012), p = 0.005] was associated change in gait speed upon follow up, while knee extension strength, body extension strength, and grip strength were not (p > 0.05). *(Linear regression)*
Marcus et al., 2012, USA	109 70.6%	74.1 (6.8)	BMI; muscle strength; Intramuscular adipose tissue (IMAT); Quadriceps lean tissue	Walking distance (6MWT) Physical functioning (stair ascent, stair descent, TUG)	The 6MWT was associated with muscle strength [B (95%CI) = 0.27 (0.14; 0.76), p = 0.005], IMAT [-0.31 (-9.1; -2.2), p = 0.002], and lean muscle mass [0.28 (0.44; 2.44), p = 0.005]. The ascending stair task was associated with muscle strength [-0.55 (-0.04; -0.02), p = 0.001], and IMAT [0.47 (0.16; 0.36), p = 0.001]. Stair descending was associated with muscle strength [-0.49 (-0.04; - 0.02), p = 0.001], and IMAT [0.45 (0.16; 0.39), p = 0.001]. TUG performance was associated with muscle strength

					[-0.42 (-0.03; -0.01), p = 0.001], and IMAT [0.34 (0.07; 0.28), p = 0.001]. BMI was not associated with any mobility outcome (p > 0.05). *(Hierarchical regression)*
Marques et al., 2011, Portugal	126 72.0%	69.3 (6.0)	Appendicular lean mass index (aLMI); appendicular fat mass index (aFMI); BMI; exercise (moderate to vigorous physical activity); fat mass	Gait speed (<50th percentile walkers vs >50th percentile walkers) Walking distance (6MWT)	aLMI (β = 0.416, p < 0.01), and BMI (β = -0.326, p < 0.01) were predictors of 6MWT. Compared to fast walkers, slow walkers exercised less (p < 0.001). There were no differences in BMI (p = 0.112), fat mass (p = 0.213), aFMI (p = 0.723), or aLMI (p = 0.907). *(Multiple stepwise linear regression; t-test; Mann-Whitney U tests)*
Marsh et al., 2003, USA	480 51.0%	71.8 (5.0)	Pain; BMI; Chronic conditions (hypertension, CVD, diabetes, COPD); Knee strength	Balance (center of pressure data when leaning backwards and forwards)	Those with lower quartiles of balance had greater prevalence of diabetes (p < 0.001), higher BMIs (p < 0.01), greater knee pain (p < 0.05), and lower knee muscle strength (p < 0.001. There was no difference in hypertension, CVD or COPD prevalence between balance quartiles. *(Descriptive statistics)*
Martinikorena et al., 2016, Spain	24 75.0%	93.1 (3.6)	Muscle power (30%; 60%; leg power 1RPM)	Gait speed Gait parameters (symmetry)	Muscle power was not associated with gait speed or gait symmetry (p > 0.05). *(Pearson's correlations)*
Masaki et al., 2016, Japan	35 100%	72.9 (7.4)	Muscle thickness of lumbar erector spinae muscle	Gait speed (maximal)	Only the muscle thickness of the erector spinae was associated with maximal walking speed [β (95%CI) = 0.43 (0.09; 0.60), p < 0.01]. There were no physical factors associated with usual walking speed in the stepwise regression. *(Stepwise regression)*
Matsushita et al., 2017, USA	5262 57.4%	75.3 (5.0)	Cardiovascular system (Ankle Brachial Index [ABI] to	Gait speed Physical functioning	Compared to having a normal ABI, having a lower ABI was associated with longer chair stand times (p < 0.05), shorter semi-tandem and tandem balance times

			capture peripheral artery disease)	(chair stand test) Balance (tandem stands; semi-tandem; side-by-side)	($p < 0.05$), and slower gait speed ($p < 0.05$), but not side-by-side balance times ($p > 0.05$). *(Multivariable logistic regression)*
McGibbon et al., 2001, USA	93 64.5%	70.7 (8.7)	Trunk ROM	Gait speed	Low-back ROM and gait speed were correlated ($r = 0.267$, $p = 0.010$). *(Correlations)*
McGough et al., 2013, USA	31 93.0%	83.6 (7.0)	History of falls	Gait speed Gait parameters (cadence, stride velocity, swing time variability, stride length variability, cycle double support %, step width) Physical functioning (SPPB) Balance (modified Berg Balance scale)	Compared to non-fallers, those with a history of falls had lower scores on the BBS ($p = 0.02$), lower cadence ($p = 0.047$), and lower stride length variability ($p = 0.035$). There was no difference between fallers and non-fallers in SPPB scores, gait speed, stride velocity, swing time variability, cycle double support %, and step width ($p > 0.05$). *(Bivariate correlations; Mann-Whitney Test)*
Mendes et al., 2018, USA	1117 64.6%	75.0 (11.0), females 73.0 (10.0), males	Height; Triceps skinfold thickness; Mid-arm muscle circumference; Waist circumference; Calf circumference	Gait speed (gait speed of <0.8m/s was considered slow)	Among women, being in the lowest tertile of height [OR (95%CI) = 2.04 (1.35; 3.05), $p < 0.001$], being in the highest tertile of waist circumference [2.72 (1.74; 4.24), $p < 0.001$], and being in the lowest tertile of calf circumference [1.87 (1.19; 2.97), $p < 0.01$] were predictors of low gait speed, but mid-arm muscle circumference and triceps skinfold thickness were unrelated ($p > 0.05$). Among men, being in the lowest tertile of height [1.99 (1.23; 3.23), $p < 0.01$], being in the lowest

					tertile of mid-arm muscle circumference [3.02 (1.76; 5.17), p < 0.001], being in the highest tertile of waist circumference [2.38 (1.39; 4.06), p < 0.01], and being in the lowest tertile of calf circumference [2.39 (1.30; 4.40), p < 0.01] were predictors of low gait speed, but triceps skinfold thickness was unrelated (p > 0.05). *(Logistic regression)*
Menz et al., 2003, Australia	30 73.3%	79.0 (3.0)	Lower limb strength (quadriceps; ankle dorsiflexion)	Gait speed (level, irregular) Gait parameters (step length [level, irregular])	Quadriceps strength was associated with level (r = 0.41, p < 0.05) and irregular velocity (r = 0.42, p < 0.05) and level (r =0.56, p < 0.01) and irregular step length (r = 0.55, p < 0.01). Ankle dorsiflexion strength was associated with level velocity (r = 0.39, p < 0.05) and level (r = 0.52, p < 0.01) and irregular (r = 0.51, p < 0.01) step length. Ankle dorsiflexion was not associated with irregular velocity (p > 0.05). *(Pearson's correlations)*
Menz et al., 2004, Australia	30 26.7%	73.9 (9.0)	Chronic condition (diabetic peripheral neuropathy)	Gait velocity Gait parameters (cadence, step length, step time variability)	Compared to those with no diabetic peripheral neuropathy, those with diabetic peripheral neuropathy had lower gait velocity (p < 0.01), smaller cadences (p < 0.01), and shorter step lengths (p < 0.01) on both level and irregular surfaces. Those with diabetic peripheral neuropathy had greater step time variability on the irregular surface (p < 0.05), but not on the level surface (p > 0.05). *(ANOVA)*
Menz et al., 2013, USA	1544 57.6%	71.0 (10.9), men 71.1 (11.9), women	Pain (in the foot); Obesity	Physical functioning (SPPB [mobility limitations defined as scores 0-9])	Among men, foot pain [OR (95%CI) = 2.00 (1.14; 3.50), p = 0.016] predicted mobility limitations, but not obesity (p = 0.447). Among women, foot pain [1.59 (1.03; 2.46), p = 0.037] predicted mobility limitations, but not obesity (p = 0.097). *(Multivariable logistic regression)*

Mickle et al., 2011, Australia	312 49.0%	71.7 (6.2), foot pain 71.1 (7.0), no pain	Foot pain	Gait speed Gait parameters (stride length, step length, step width, stance time, swing time, double support time, single support time) Balance (postural sway [on floor, on foam])	Compared to those without pain, those with foot pain had slower walking speeds, shorter stride lengths, and shorter step lengths ($p < 0.05$). Step width, stance time, swing time, double support time, single support time, and balance were not associated with foot pain ($p > 0.05$). *(ANCOVA)*
Minematsu et al., 2016, Japan	3549 50.6%	NR (NR)	BMI	Walking time (10m walking test) Gait parameters (maximum one-step length to height ratio) Balance (one leg standing time with open eyes)	BMI was associated with 10m gait time ($\beta = 0.072$, $p < 0.001$), one leg standing time ($\beta = -0.154$, $p < 0.001$), and maximum one-step length to height ratio ($\beta = -0.078$, $p < 0.001$). *(Linear regression)*
Minematsu et al., 2018, Japan	589 57.7%	73.7 (5.3), men 73.0 (5.2), women	Muscle strength (hand grip; knee extension; knee flexion)	Walking time (10m walk test) Physical functioning (TUG; chair raise time; floor stand up time) Balance (one-leg standing time)	Hand grip strength was negatively associated with time to walk 10m, time to complete the TUG, and time to complete the chair raise test ($p < 0.05$). Hand grip strength was positively associated with one-leg standing time ($p < 0.05$). Knee extension strength was negatively associated with time to complete the chair raise test ($p < 0.05$). Knee flexion strength was negatively associated with time to walk 10m, time to complete the TUG, and time to complete the chair raise test ($p < 0.05$). *(Linear regression)*
Misu et al., 2014, Japan	120 57.4%	73.2 (4.2)	Toe flexor strength	Gait speed (preferred, maximal)	Toe flexor strength was not associated with walking speed, cadence, swing time, or stride length ($p > 0.05$) during usual walking speed. During fast-paced walking, toe flexor strength was associated with

				Gait parameters (preferred and maximal - cadence, swing time, stride length)	walking speed (β = 0.22, p = 0.049), swing time (β = 0.34, p = 0.009), stride length (β = 0.22, p = 0.011), but not cadence (p = 0.623). *(Multivariable regression)*
Miyazaki et al., 2013, Japan	124 0%	73.0 (7.2)	Lumbar lordosis angle (LLA); knee extensor strength	Gait speed (maximal) Walking distance (6MWT) Walking time (10-meter obstacle walk) Physical functioning (TUG)	LLA (β = -0.53, p = 0.01) and knee strength (0.60, p = 0.01) were associated with maximal walking speed. LLA (0.40, p = 0.01) and knee strength (-0.55, p = 0.01) were associated with time to complete 10-m obstacle walking. LLA (0.31, p = 0.05) and muscle strength (-0.60, p = 0.01) were associated with time to complete the TUG. LLA (-0.35, p = 0.01) and muscle strength (0.61, p = 0.01) were associated with distance walked during the 6MWT. *(Multiple linear regression)*
Muchna et al., 2018, USA	117 79.5%	79.1 (8.5)	Pain (in the foot); Chronic conditions (Peripheral neuropathy); Foot deformity; 2+ complications	Gait speed Gait parameters (stride length, double support) Walking steps (total per day) Balance (ankle sway eyes open)	Compared to those with no foot problems, those with foot pain, peripheral neuropathy, or 2+ foot problems had slower gait speeds (p < 0.05), shorter stride lengths (p < 0.05), longer double support cycles (p < 0.05), and walked fewer steps per day (p < 0.05). Balance was unimpacted by physical factors. Only ankle sway with eyes open was for those with foot deformity was significantly less than those without foot issues (p = 0.038). *(t-tests)*
Nagano et al., 2003, Japan	247 59.1%	80.0 (NR)	Knee pain	Gait speed Gait parameters (stride length, step length, step width, time of stride, time of single stance, time of swing,	Stride length was lower among those with knee pain compared to those without (p = 0.018). Time of double stance (p = 0.008) and time to complete the TUG test (p = 0.0076) was longer in those with knee pain compared to those without. Step length, step width, time of stride, time of swingle stance, time of swing, and gait speed were not associated with knee pain (p > 0.05).

				time of double stance) Physical functioning (TUG)	*(t-tests)*
Nakamura et al., 2004, Japan	38 0%	69.8 (6.7)	Respiratory system (FVC, FEV1, FEV1/FVC; Maximal inspiratory pressure [MIP]; maximal expiratory pressure [MEP]); Muscle strength (grip strength); Muscle endurance (arm curl, time kept in squat position)	Walking distance (6MWT)	FVC ($r = 0.59$, $p < 0.05$), FEV1 ($r = 0.58$, $p < 0.05$), FEV1/FVC ($r = 0.40$, $p < 0.05$), MIP ($r = 0.41$, $p < 0.05$), MEP ($r = 0.40$, $p < 0.05$), grip strength ($r = 0.52$, $p < 0.05$), arm curl ($r = 0.37$, $p < 0.05$), and keeping in a half squat position ($r = 0.46$, $p < 0.05$) were all correlated with 6MWD. *(Correlations)*
Nakao et al., 2006, Japan	30 100%	73.6 (5.5)	BMI; functional balance; knee extension force, abdominal muscle force (Kraus-Weber test); thigh muscle mass	Walking distance (6MWT) Walking time (10-meter obstacle walk)	BMI was associated with 6MWT distance ($\beta = 0.38$, $p = 0.02$), but not 10-m obstacle walking time. The Kraus-Weber test was associated with 6MWT distance (0.29, $p = 0.03$), but not 10-m obstacle walking. Functional balance was associated with 6MWT distance (-0.42, $p = 0.01$), but not 10-m obstacle walking. Thigh muscle mass was not associated with 6MWT or 10-m obstacle walking. Knee extension force was associated with 6MWT distance (0.43, $p = 0.01$), but not 10-m obstacle walking. *(Multiple regression)*
Nevisipour et al., 2019, USA	16 81.0%	60.8 (11.1)	History of falls	Walking time (10meter walk test - preferred and maximal)	Balance ($p = 0.11$), 5STS ($p = 0.82$), 10m walk at a comfortable pace ($p = 0.81$), and fast 10m walk ($p = 0.97$) were not significantly different between fallers and non-fallers.

				Balance (Berg Balance scores) Physical functioning (5STS)	*(Independent t-test)*
Ng et al., 2014, China	85 70.6%	72.5 (7.2)	Duration of diabetes, BMI, Muscle strength (peak torque of dorsiflexors, peak torque of plantar flexors), Stiffness of ankle dorsiflexion (through weight-bearing lunge test [WBLT]), Proprioception (of ankle joint using active ankle joint repositioning test)	Physical functioning (TUG)	Duration of diabetes ($p = 0.366$), peak torque of dorsiflexors ($p = 0.233$), and WLBT distance ($p = 0.396$) were not associated with TUG performance. BMI ($\beta = 0.235$, $p = 0.009$), peak torque of plantar flexors ($\beta = -0.296$, $p = 0.027$), and active ankle joint repositioning error (degree) ($\beta = 0.252$, $p = 0.005$) were associated with time to complete the TUG test. *(Multivariate linear regression)*
Nikaido et al., 2019, Netherlands	63 35.0%	77.9 (5.5)	Number of falls	Gait velocity Gait parameters (step length, step time CV)	Number of falls was associated with step time CV ($p = 0.004$), but not gait velocity ($p = 0.190$) or step length ($p = 0.102$). *(Multiple regression)*
Ogaya et al., 2016, Japan	91 100%	73.1 (6.0)	Weight	Gait parameters (mean continuous relative phase (mCRP), stance, swing)	Weight was associated with early stance foot-shank mCRP ($r = -0.26$, $p < 0.05$), but not mid-stance, late-stance, or swing foot-shank mCRP, or early stance, mid-stance, late-stance, or swing shank-thigh mCRP ($p > 0.05$). *(Pearson's correlations)*

Opina et al., 2019, USA	177 73.0%	69.2 (3.5)	Breathing reserve (BR)	Gait speed Walking time (400-meter walk test) Physical functioning (SPPB)	Breathing reserve was associated with 400m walk time (β = 1.03, p = 0.006) and usual gait speed (β = - 0.002, p = 0.05), but not SPPB performance (p = 0.67). *(Linear regression)*
Orwoll et al., 2018, USA	2741 0%	78.8 (5.0)	History of falls	Gait speed Balance (narrow walk) Physical functioning (chair stands test)	Number of falls was associated with gait speed (p < 0.001), having narrow walk (p = 0.002) and chair stands (p = 0.004). *(Chi-square tests)*
Ostchega et al., 2004, USA	1499 49.4%	NR (NR)	Muscle strength (knee extensors)	Walking time (6-meter timed walk)	Among men, mean peak torque was associated with timed walk performance [β (SE) = 0.0016 (0.0002), p < 0.001]. Among women, mean peak torque was also associated with timed walk performance [0.0033 (0.0005), p < 0.001]. *(Weighted stepwise regression)*
Pellicer-Garcia et al., 2020, Spain	213 79.3%	78.0 (7.0)	History of falls; Chronic condition (urinary incontinence)	Balance (Tinetti's Gait and Balance Assessment Tool)	Recurrent falls (p = 0.152) and urinary incontinence (p = 0.172) were not significantly difference between those who scored >=25 on the Tinetti scale, and those who scored =<24. *(Chi-square and independent t-test)*
Pojednic et al., 2012, USA	54 NR	73.7 (3.5), older healthy 77.9 (4.3), older	Contraction velocity; Torque; Weight	Physical functioning (stair climb, multiple chair rises)	Among older healthy adults, no physical factor was associated with chair raises or stair climbs (p > 0.05). Among mobility limited older adults, contraction velocity was associated with multiple chair rises [B (SE) = -5.12 (1.19), p < 0.05] and stair climbs [-0.904 (0.39), p < 0.05]. *(Linear regression)*

		mobility limited			
Poole et al., 2007, Australia	45 100%	71.4 (1.1)	Pain (neck pain)	Walking time (10-meter walk test) Gait parameters (cadence, stride length, gait cycle [with or without head turns])	Significant differences were found between groups for both the time it took to complete the test ($p = 0.02$) and the cadence (steps per second) ($p = 0.04$) when walking with head turns. The neck pain group took a longer time to complete the walk and used slower steps. The neck pain group also had a significantly longer gait cycle duration when walking both with ($p = 0.00$) and without head turns ($p = 0.04$). *(ANOVA, MANOVA)*
Porta et al., 2018, Italy	125 57.6%	75.7 (13.9)	Handgrip strength	Physical functioning (TUG)	Handgrip strength was associated with time to complete all components of the TUG ($r = -0.216$ to -4.64, $p < 0.05$). *(Pearson's correlations)*
Puthoff et al., 2008, USA	30 83.0%	77.3 (7.0)	Muscle strength; muscle power (peak; at 40% 1-RM: at 90% 1-RM)	Gait speed (average per day) Walking steps (per day) Walking distance (per day)	When stepwise multiple regression analysis was carried out, only one independent variable, peak power, was significant for the three models assessing total steps, distance walked, and gait speed. *(Stepwise multiple regression)*
Reid et al., 2008, USA	57 54.4%	74.2 (7.0)	Leg strength; Bone mineral density; Total lean leg muscle mass; Total body fat; Weight	Physical functioning (SPPB [mobility disability defined as scores <8])	Total lean leg muscle mass [B (SE) = -0.75 (0.34), $p = 0.02$] and leg strength [-0.008 (0.004), $p = 0.02$] were associated with mobility disability (as assessed through the SPPB). Bone mineral density, body weight, and body fat were not associated ($p > 0.05$). *(Multiple logistic regression)*
Reid et al., 2014, USA	48 50.0%	74.1 (3.7), healthy 77.2 (4.4),	BMI; Muscle cross-sectional area; Peak power;	Physical functioning (SPPB [mobility limitations defined as scores <8])	There was no significant difference in BMI ($p = 0.07$), peak power ($p = 0.91$), contraction velocity ($p = 0.42$) or muscle cross sectional area ($p = 0.08$) between those with mobility limitations and those without.

		older adults with limited mobility	Contraction velocity		*(Linear regression)*
Rodríguez-Molinero et al., 2019, Spain	205 57.3%	75.8 (7.0)	History of falls (recurrent)	Gait parameters (normalized stride length, ratio width to length)	Recurrent falls were associated with normalized stride length (B = - 8.65, p = 0.001) and ratio width to length (B = 0.93, p = 0.011). *(Poisson regression)*
Roig et al., 2010, Canada	42 47.6%	67.4 (8.6), no COPD 71.2 (8.1), COPD	Comorbidity (COPD); Muscle strength (knee extensor, concentric/eccentric/isometric; knee flexor concentric/eccentric)	Walking distance (6MWT) Physical functioning (stair climb power test, TUG)	Compared to the control group, those with COPD performed worse on the Stair Climb Power Test (378.2 W vs 266.2 W, p < 0.001), TUG test (7.7s vs 9.5s, p = 0.002), and 6MWT (554.9m vs 394.6m, p < 0.001). The Stair Climb Power Test was associated with knee extensor muscle (concentric) torque (r = 0.74, p < 0.01), knee extensor muscle (eccentric) torque (r =0.84, p < 0.01), knee extensor muscle (isometric) torque (r = 0.70, p < 0.01), knee flexor muscle (concentric) torque (r = 0.48, p < 0.01), and knee flexor muscle (eccentric) torque (r = 0.57, p < 0.01). *(Regression; Pearson's correlations)*
Roig et al., 2011, Canada	42 47.6%	67.4 (8.6), no COPD 71.2 (8.1), COPD	Respiratory system (COPD); intramuscular fat	Gait speed Walking distance (6MWT) Physical functioning (sit-to-stand tests)	In people with COPD, knee extensors intramuscular fat showed non-significant trends suggestive of a moderate association between increased intramuscular fat and lower gait speed (r = −0.41, p = 0.07) and sit-to-stand tests (r = 0.43, p = 0.06). In contrast, the association of knee extensors intramuscular fat and mobility in the healthy group was not apparent. Compared to healthy controls, those with COPD took longer to complete the sit-to-stand test (p < 0.001), had a slower gait speed (p < 0.001), and travelled shorter distances on the 6MWT (p < 0.001).

					(Regression, Correlations)
Rosano et al., 2011, USA	643 57.0%	73.6 (NR)	Cardiovascular system (hypertension [recently diagnosed; previous or controlled; previous or uncontrolled])	Gait speed	Compared to having normal blood pressure, having recently diagnosed hypertension (B= -0.081, $p < 0.001$), previous or controlled hypertension (B = -0.074, $p < 0.001$), and previous or uncontrolled hypertension (B = -0.052, $p = 0.01$) was associated with lower gait speed. *(Longitudinal mixed-models)*
Rouxel et al., 2017, UK	34675 54.1%	NR (NR)	Physical activity levels (low, mod, high)	Gait speed	Compared to being sedentary, having low ($\beta = 0.05$), moderate (0.10), or high (0.12) levels of physical activity were associated with gait speed ($p < 0.05$). *(Growth curve models)*
Said et al., 2015, Malaysia	44 100%	69.9 (5.6)	BMI, Lower limb strength, lower limb endurance	Physical functioning (TUG) Balance (FSST)	Among those with supinated foot posture, BMI, lower limb strength, and lower limb endurance, were not associated with balance or TUG time ($p > 0.05$). Among those with neutral foot postures, lower limb strength ($r = 0.804$, $p < 0.01$) and endurance ($r = -0.573$, $p < 0.05$), but not BMI ($p > 0.05$), were associated with TUG scores. No factor was associated with balance. Among those with pronated foot posture, lower limb strength ($r = 0.551$, $p < 0.05$) and endurance ($r = -0.669$, $p < 0.01$), but not BMI ($p > 0.05$), were associated with TUG scores. No factor was associated with balance. *(Spearman's correlations)*
Saito et al., 2019, Japan	221 100%	73.4 (6.0)	Muscle elasticity (gastrocnemius ; rectus femoris) and thickness (gastrocnemius	Gait speed (maximal) Physical functioning (TUG) Balance (single leg stands, FSST)	TUG was correlated with strain ratio of the medial head of the gastrocnemius ($r = 0.481$, $p < 0.001$) and rectus femoris ($r = 0.471$, $p < 0.001$). Maximum gait speed was correlated with strain ratio of the medial head of the gastrocnemius ($r = -0.387$, $p < 0.001$) and rectus femoris ($r = -0.489$, $p < 0.001$). The FSST was correlated with strain ratio of the medial head of the gastrocnemius ($r = 0.401$, $p <$

			; rectus femoris)		0.001) and rectus femoris (r = 0.422, p < 0.001). Single leg standing was not correlated with muscle strain of either muscle (p > 0.05). Muscle thickness was not correlated with any mobility outcome (p > 0.05). *(Pearson and Spearman correlations)*
Sakari et al., 2010, Finland	184 65.8%	75.0 (NR)	Knee extension strength; visual acuity; range of motion limitation in knees and hips	Walking speed (maximal) Balance (step mounting test)	Among men, knee extension strength (β = 0.60), visual acuity (0.18), and range of motion limitation (-0.32) were related to mobility performance at baseline. Among women, knee extension strength (0.58), visual acuity (0.17), and range of motion limitation (-0.23) were related to mobility performance at baseline. *(Linear regression)*
Sayers et al., 2005, USA	67 61.2%	81.0 (0.5); women 80.4 (0.7), men	Contraction velocity; leg strength	Gait speed Physical functioning (SPPB)	Contraction velocity (β = 0.483, p < 0.001) and leg strength (β = 0.296, p = 0.005) were associated with gait speed. Contraction velocity (β = 0.312, p = 0.001) and leg strength (β = 0.405, p < 0.001) were associated with SPPB performance. *(Forward-selection regression)*
Schootemeijer et al., 2020, Netherlands	279 69.5%	70.1 (NR)	Fall risk	Walking speed Walking time (time spent walking measured by accelerometer) Gait parameter (gait quality - accelerations in the vertical, mediolateral and anteroposterior directions lasting for at least 10 seconds)	Those in the very-low fall risk group and the low fall risk group walked for longer periods of time each day than those in the moderate and high-risk groups (p < 0.008). Those in the very-low fall risk group and the low fall risk group had higher gait speeds than those in the high-risk group (p < 0.008). Gait quality did not significantly differ between fall risk groups. *(Linear regression)*

Schooten et al., 2019, Netherlands	163 NR	77.5 (7.5)	Falls	Gait speed Gait parameters (stride frequency, gait quality - accelerations in the vertical, mediolateral and anteroposterior directions lasting for at least 10 seconds)	Falls were not associated with gait quality score ($p = 0.64$), walking speed ($p = 0.39$) or stride frequency ($p = 0.51$). *(ANOVA)*
Scott et al., 2009, Australia	982 51.0%	62.0 (7.0)	Leg strength; muscle quality; total body fat; trunk fat mass	Walking steps (per day)	Walking steps were negatively associated with total body fat ($\beta = -0.54$, $p < 0.001$) and trunk fat mass ($\beta = -0.28$, $p < 0.001$). In women only, a significant positive association between walking steps and both leg strength ($\beta = 0.71$, $p = 0.016$) and leg muscle quality ($\beta = 0.08$, $p = 0.001$) was observed. *(Correlations)*
Scott et al., 2020, USA	1326 0%	75.8 (NR)	Change in appendicular lean mass (ALM) and total fat mass (FM) from year 2 to year 5	Gait speed	Change in appendicular lean mass/fat mass ratio was associated with change in gait speed (per SD ALM/LM increase: B (95%CI) = 0.015 (0.001; 0.029), $p < 0.05$). *(Multivariable linear regression)*
Serrano-Checa et al., 2020, Spain	271 100%	69.2 (5.7)	BMI; Waist circumference	Gait speed Physical functioning (TUG) Walking time (3-meter tandem walk)	BMI was correlated with TUG test time ($r = 0.202$, $p < 0.01$) and 3m tandem walk time ($r = 0.178$, $p < 0.01$), but not gait speed ($p > 0.05$). Waist circumference was correlated with gait speed ($r = -0.220$, $p < 0.01$), TUG test time ($r = 0.171$, $p < 0.01$), and 3m tandem walk time ($r = 0.179$, $p < 0.01$). *(Pearson's correlations)*

Shahtahmassebi et al., 2017, Australia	64 59.4%	69.8 (7.5)	BMI; Muscle thickness (rectus abdominis cross-sectional area); Lumbar multifidus L5/S1; Muscle strength (trunk extension; trunk lateral flexion; composite)	Walking distance (6MWT) Physical functioning (30-second chair stand test; sitting and rising test; TUG) Balance (BBS)	6MWT was associated with rectus abdominus cross-sectional area (β = -0.27, p = 0.05). Sitting and rising test performance was associated with rectus abdominus cross-sectional area (β = 0.33, p < 0.001) and composite trunk strength (β = 0.34, p < 0.001). 30-second chair stand test time, TUG time, and BBS performance were not associated with any physical factor. *(Multiple linear regression)*
Shimada et al., 2010, Japan	832 100%	78.6 (2.7)	BMI; muscle strength (Maximal voluntary contraction of the knee extensor and ankle plantar flexor in dominant (stronger) leg measured via a hand-held dynamometer)	Gait speed Physical functioning (TUG) Balance (one legged stance)	The TUG is significantly correlated with maximal voluntary contraction of the knee (r = -0.399, p < 0.01) and ankle (r = -0.228, p < 0.01) for all participants, but not BMI. Walking speed was significantly correlated with maximal voluntary contraction of the knee (r = 0.349, p < 0.01) and ankle (r = 0.191, p < 0.01), but not BMI. Balance (one legged stance) was significantly correlated with maximal voluntary contraction of the knee (r = 0.212, p < 0.01) and ankle (r = 0.164, p < 0.01), and BMI (r = -0.114, p < 0.01). *(Correlations)*
Shimada et al., 2010, Japan	848 76.8%	80.0 (NR)	History of falls	Gait speed Gait parameters (stride length, cadence, step width)	History of falls was associated with gait speed [OR (95%CI) = 0.97 (0.94; 1.00), p < 0.05] and cadence [1.06 (1.02; 1.10), p < 0.01], but not stride length or stride width (p > 0.05). *(Multiple logistic regression)*
Shuman et al., 2020, USA	303 83.2%	80.9 (7.7)	Falls	Gait speed Walking distance (6MWT)	For every 0.05 m/s increase in gait speed from baseline to follow up, there was an 11% (p < .0001) reduction in falls in the following year, for every 0.05 m/s increase in gait speed from baseline to follow up, there was an 11% (p < .0001) reduction in falls in the following year,

					For every 20 m increase in distance walked, there was an 11% (p = .0003) reduction in falls in the following year. There was a 51% (p < .0001) adjusted reduction in falls in those who increased 6MWD by at least 20 m compared to those whose 6MWD did not change or declined. *(Generalized Estimating Equations)*
Sillanpää et al., 2014, UK, France, Netherlands, Estonia, Finland	135 54.8%	75.0 (3.6), men 74.4 (3.1), women	Muscle strength (handgrip); Muscle power (lower extremity power); Respiratory system (FVC; FEV1; FEF50)	Walking distance (6MWT) Physical functioning (TUG)	6MWT distance was only associated with muscle power (B = 0.477, p = 0.001). TUG time was only associated with muscle power (B = - 0.586, p < 0.001). Muscle strength or breathing were not associated with mobility outcomes. *(Path models)*
Skoffer et al., 2015, Denmark	59 61.0%	70.4 (6.8)	Concentric extension peak torque; Concentric flexion peak torque; Isometric extension peak torque; Isometric flexion peak torque (affected leg); Isometric extension peak torque; isometric flexion peak torque (non-affected leg)	Physical functioning (TUG, chair stand test) Walking time (10-meter walk test) Walking distance (6MWT)	In the affected leg, concentric extension peak torque was positively associated with number of repetitions on the chair stand test and negatively associated with time taken on the TUG and 10m walk tests (p < 0.01). There was no association with distance walked during the 6MWT (p > 0.05). Concentric flexion peak torque was positively associated with the chair stand repetitions and 6 min walk test, and negatively associated with time taken on the TUG and 10m walk tests (p < 0.01). Isometric extension peak torque was positively associated with chair stand reps and negatively associated with time taken to complete the 10m walking test. Isometric flexion peak torque was associated with chair stand reps (p < 0.01). In the unaffected leg, isometric extension peak torque was associated with chair stand reps and time taken on the TG. Isometric flexion peak torque was associated with no performance measure. *(Linear regression)*

Spruit et al., 2010, Netherlands, USA, UK	1795 63.0%	63.0 (7.0)	Respiratory system (FEV1; inspiratory capacity)	Walking distance (6MWT)	Compared to those who walked <350m during the 6MWT, those who walked >=350m had higher FEV1 ($p < 0.001$), and greater inspiratory capacity ($p < 0.001$). *(ANOVA)*
Staples et al., 2020, USA	111 78.4%	77.1 (3.8), female 74.9 (7.2), male	Grip strength; History of falls	Physical functioning (TUG) Walking time (10-meter walk test)	Grip strength was a predictor of 10MWT time ($\beta = 0.265$, $p = 0.004$) and TUG average ($\beta = -0.188$, $p = 0.038$). History of falls over the past 6 months was not correlated with TUG or 10MWT performance. *(Regression; Spearman's correlations)*
Steiner et al., 2005, UK	85 37.6%	68.0 (8.4)	BMI; Breathing (FEV1); Muscle strength (quadriceps; handgrip); whole body lean mass; whole body fat mass; lower limb lean mass	Walking distance (ISWT, ESWT)	ISWT was associated with FEV1 [B (95%CI) = 2.5 (1.1; 3.9), $p = 0.001$] and quadriceps strength [0.41 (0.21; 0.60), $p < 0.001$]. ESWT was associated with FEV1 [3.5 (1.6; 5.3), $p < 0.001$]. *(Forward multivariable linear regression)*
Suh et al., 2019, USA	195 84%	72.6 (6.1)	Pain; Muscle strength (peak torque of surgical knee and non surgical knee)	Gait speed Walking distance (6MWT)	Pain ($\beta = -0.15$, $p = 0.03$), peak torque of the surgical knee ($\beta = 0.16$, $p = 0.04$), and peak torque of the nonsurgical knee ($\beta = 0.27$, $p < 0.001$) were associated with gait speed. Pain ($\beta = -0.13$, $p = 0.03$), peak torque of the surgical knee ($\beta = 0.15$, $p = 0.04$), and peak torque of the nonsurgical knee ($\beta = 0.38$, $p < 0.001$) were associated with gait endurance (assessed using the 6MWT). *(Linear regression)*
Suri et al., 2009, USA	70 67.1%	75.9 (7.3)	Muscle strength (trunk extension; trunk flexion;	Physical functioning (SPPB)	SPPB was associated with trunk extension strength ($B = 0.004$, $p = 0.01$), trunk extension endurance ($B = 0.34$, $p = 0.02$), and leg strength ($B = 0.001$, $p = 0.003$), but not trunk flexion strength or flexion endurance.

			leg press strength); muscle endurance (trunk extension; trunk flexion)	Balance (BBS; Unipedal Stance Test)	BBS was associated with trunk extension strength (B = 0.01, p = 0.03), trunk extension endurance (B = 1.26, p = 0.007, and leg strength (B = 0.003, p = 0.01), but not trunk flexion strength or flexion endurance. The Unipedal Stance test was associated with trunk extension strength (B= 0.02, p = 0.03), but not trunk flexion strength, flexion endurance, extension endurance, or leg strength. *(Multivariate linear models)*
Tanimoto et al., 2012, Japan	1158 68.6%	74.4 (6.4), men 73.9 (6.3), women	Sarcopenia (classified as low muscle mass, plus low muscle strength or low physical performance)	Gait speed	Among men, those with sarcopenia had significantly lower gait speed than those classified as normal (1.18 vs 1.53, p < 0.001). Among women, those with sarcopenia had significantly lower gait speed than those classified as normal (1.08 vs 1.44, p < 0.001) *(ANOVA)*
Taylor et al., 2015, Ireland	20 NR	76.8 (4.4), fallers 70.9 (6.6), non-fallers	History of falls	Walking time Walking steps (both measured using accelerometer)	The faller group, on average, spent significantly less time walking (non-fallers; mean (sd) 78.13 (170.1) vs fallers 68.89 (94.7)). The faller group, on average, significantly spent a smaller number of steps (non-fallers 137.15 (325,0) vs fallers (117.06 (176.4)). *(Descriptive statistics)*
Thaweewannakij et al., 2016, Hong Kong	90 65.5%	77.6 (2.2), non-faller 79.1 (4.1), single-faller	History of falls	Gait speed (10-meter walk test) Physical functioning (TUG, five times sit to stand transitions) Walking distance (6MWT)	Compared to non-fallers and single fallers, multiple-fallers had slower gait speeds on the 10MWT (p < 0.001), took longer to complete the TUG (p < 0.001), and took longer to complete five Sit-to-Stand transitions (p < 0.001). Compared to non-fallers, single-fallers and multiple-fallers travelled shorter distances on the 6MWT (p < 0.001). *(ANOVA; Chi-Square)*

		79.5 (4.2), multi-faller			
Thingstad et al., 2015, Norway	249 75.0%	82.6 (6.0)	Fracture type (intra and extra-capsular fractures); grip strength; pain	Gait speed Gait parameters (double support, walk ratio, SD step velocity, single support asymmetry)	Extracapsular fractures were associated with double support (β = 0.160, p = 0.008), single support asymmetry (0.199, p = 0.002), and gait speed (-0.190, p = 0.001), but not SD step velocity or walk ratio (p > 0.05). Grip strength was associated with double support (-0.267, p = 0.003), walk ratio (0.296, p = 0.001), and gait speed (0.374, p < 0.001), but not single support asymmetry or SD step velocity (p > 0.05). Pain level was not associated with any gait parameter. *(Multiple linear regression)*
Tsonga et al., 2015, Greece	68 83.8%	73.0 (5.3)	History of falls	Physical functioning (TUG)	History of falls was not associated with performance on the TUG test (p = 0.603). *(t-tests)*
Tudorache et al., 2017, Romania	62 0%	67.8 (0.8)	Respiratory system (FVC, FEV1, FEV1/FVC)	Walking distance (6MWT)	FVC (p = 0.930), FEV1 (p = 0.373), and FEV1/FVC (p = 0.792) were not correlated with 6MWD. *(Correlations)*
Tudorache et al., 2015, Romania	61 NR	63.0 (4.0), no COPD 63.0 (5.0), stable COPD 63.0 (3.0), acute exacerbated COPD	Comorbidity (COPD)	Physical functioning (TUG) Walking distance (6MWT) Balance (single leg stance, Berg Balance test)	Compared to controls, stable and acute exacerbation COPD groups performed worse on the 6MWT (p < 0.001), single leg stand (p < 0.001), TUG (p < 0.001), and Berg Balance test (p < 0.001). *(Kruskal-Wallis test)*

Uritani et al., 2016, Japan	665 71.7%	67.2 (4.5)	Weight; Isometric knee extension strength; Toe grip strength	Physical functioning (TUG)	Among men, weight (β = 0.296, p < 0.001), knee strength (β = -0.357, p < 0.001), and toe grip strength (β = -0.166, p = 0.018) were associated with TUG time. Among women, weight (β = 0.188, p < 0.001), knee strength (β = -0.187, p < 0.001), and toe grip strength (β = -0.130, p = 0.004) were associated with TUG time. *(Multiple regression)*
Valtonen et al., 2015, Finland	56 50.0%	65.7 (6.2)	Muscle strength; pain	Gait speed (maximal) Physical functioning (stair ascension time)	Pain [β = -0.298, p = 0.020] and flexor power of the ipsilateral knee [0.811, p < 0.001] were associated with maximal gait speed. Asymmetrical extensor power deficit [0.235, p = 0.002], extensor power of the contralateral knee [-0.404, p = 0.027], extensor power of the ipsilateral knee [-0.355, p = 0.044], flexor power of the contralateral knee [-0.337, p =0.045[, flexor power of the ipsilateral knee [-0.512, p = 0.010], and pain [0.295, p =0.006] were associated with stair ascension time. *(Linear regression)*
Valtonen et al., 2009, Finland	48 60.4%	65.2 (6.2), men 67.7 (5.5), women	Muscle strength (extension power deficit; flexion power of non-operated knee)	Physical functioning (stair ascending and descending time)	Extension power deficit [β = 0.379, p = 0.006] and flexion power of the non-operated knee [-0.423, p = 0.021] were associated with stair-ascending time. Extension power deficit [β = 0.425, p = 0.003] and flexion power of the non-operated knee [-0.369, p = 0.043] were associated with stair-descending time. *(Multivariate linear regression)*
Van Andel et al., 2019, USA	106 73.0%	71.4 (5.6)	History of falls	Physical functioning (TUG)	There was no significant difference in time to complete the TUG between fallers and non-fallers (9.0s vs 9.3s). *(Descriptive statistics)*
Van der Esch et al., 2006, Netherlands	86 76.0%	63.6 (9.1)	Muscle strength; joint laxity	Walking time (100-meter walk test)	Muscle strength was associated with shorter times on the walking test [B (SE) = -72.73 (12.89), p = 0.000]. Laxity was not associated with walking time (p = 0.549). Muscle strength x laxity was

					associated with short walking times [-12.24 (3.79), p = 0.002]. *(Linear regression)*
Van der Esch et al., 2007, Netherlands	63 76.0%	60.0 (7.5)	Muscle strength; proprioception	Walking time (100-meter walk test) Physical functioning (Get Up & Go Test [GUG])	Muscle strength was associated with shorter times on the 100m walk test [B (SE) = -68.13 (8.90), p = 0.000] and the GUG [-13.99 (1.70), p = 0.000). Proprioception was associated with shorter times on the GUG [-0.513 (0.24), p = 0.039), but not the 100m walk test (p = 0.225). Muscle strength x proprioception was associated with reduced times on the walking test [-11.61 (3.10), p = 0.000] and the GUG [-3.05 (0.59), p = 0.000]. *(Linear regression)*
Van Schooten et al., 2019, USA	204 56.4%	79.8 (5.0)	History of falls	Walking time (6-meter walk test)	A history of falls was not associated with walking time [β (SE) = -0.08 (0.10), p = 0.433]. *(Linear mixed model)*
Vilaca et al., 2013, Brazil	77 100%	70.3 (4.0), 1st tertile 6MWT 70.0 (4.7), 2nd tertile 6MWT 68.6 (4.3), 3rd tertile 6MWT	BMI; Fat mass, percentage fat; Muscle mass; Lean mass; Right arm muscle mass; Leg muscle mass; Arm muscle quality; Leg muscle quality; Hand grip strength; Knee extension strength	Walking distance (6MWT)	Those who performed worse on the 6MWT had greater BMI (p = 0.01), greater fat mass (p = 0.01), greater % fat (p = 0.01), lower hand grip strength (p = 0.01), lower knee extension strength (p = 0.01), lower arm muscle quality (p = 0.01), and lower leg muscle quality (p = 0.01). There were no differences in muscle mass, lean mass, right arm muscle mass, or leg muscle mass (p > 0.05). *(ANOVA)*
Vincent et al., 2013, USA	55 65.5%	7.0 (6.6), overweig ht	Body composition metrics (Obesity)	Gait speed Walking steps (per day)	Those who were severely obese has significantly less steps per day than those who were overweight (p = 0.02). Walking time, chair raise time, stair climb time, gait speed, cadence, and stride length

		67.7 (6.9), moderately obese 65.7 (6.4), severely obese		Walking time (graded treadmill walking exercise test) Gait parameters (cadence, stride length, base of support, single support time, double support time) Physical functioning (chair raises, stair climb)	were not associated with obesity ($p > 0.05$). Single support time was lower among those who were severely obese compared to those in the overweight group ($p = 0.0001$). Compared to those in the overweight group, those in the severely overweight group had significantly high double support time ($p = 0.0001$). *(ANOVA)*
Volpato et al., 2008, Italy	836 55.6%	73.7 (NR)	Cardiovascular system (HDL-C levels)	Gait speed (normal; maximal)	Compared to the those with the lowest tertile of HDL-C levels, those with the middle or higher tertiles had no significant difference in normal or maximal gait speed ($p > 0.05$). *(Multivariate linear regression)*
Vongsirinavarat et al., 2020, Thailand	130 NR	69.0 (6.5)	Chronic conditions (diabetes); Lower extremity muscle strength	Physical functioning (TUG) Balance (Modified Clinical Test of Sensory Interaction in Balance [mCTSIB])	Those with diabetes had worse balance as measured by the mCTSIB ($p < 0.001$). There were no differences in TUG performance between those with or without diabetes. However, those with diabetes who failed 3 conditions of the mCTSIB took longer to complete the TUG than non-diabetics without balance issues (14.84s vs 9.83s, $p < 0.05$). Compared to diabetics who had no issues with balance, diabetics who failed 2 or 3 conditions of the mCTSIB had significantly lower extremity muscle strength ($p < 0.05$). *(ANOVA, ANCOVA)*
Wages et al., 2020, USA	89 67.4%	74.9 (6.7)	Body composition (appendicular lean mass;	Gait speed Physical functioning	Body composition was associated with stair climb power ($p < 0.001$) and time to complete a complex functional task ($p = 0.018$). Muscle strength was

			BMI); Muscle strength	(stair climb; 5x chair rise; complex functional test)	associated with gait speed ($p < 0.001$) and time to complete 5x chair rises ($p < 0.001$). *(Multifactorial linear regression)*
Walsh et al., 2014, Australia	85 42.0%	68.0 (8.6), 6MWD responders 66.7 (9.7), 6MWD non-responders	Quadriceps strength	Walking distance (6MWT)	Quadriceps strength was associated with increasing walking >= 61.9m on the 6MWD [OR (95%CI) = 0.958 (0.924; 0.992), p = 0.016] *(Multivariate logistic regression)*
Wang et al., 2016, China	1092 53.9%	68.9 (5.9), faller 67.0 (5.9), non faller	History of falls	Gait speed Physical functioning (TUG)	Compared to non-fallers, those who had a history of falls had slower gait speeds ($p < 0.05$) and took longer to complete the TUG ($p < 0.05$). *(ANOVA)*
Watsford et al., 2006, Australia	72 50.0%	NR (NR)	Breathing (maximum inspiratory pressure; maximum expiratory pressure; pressure for greatest completed 2 min stage of incremental inspiratory muscle endurance test (PEND))	Gait speed	Among males, maximum expiratory pressure ($r = 0.35$, $p < 0.05$) and PEND ($r = 0.40$, $p < 0.05$), but not maximum inspiratory pressure ($p > 0.05$), was correlated with average walking speed. Among females, PEND ($r = 0.35$, $p < 0.05$), but not maximum inspiratory pressure ($p > 0.05$) or maximum expiratory pressure ($p > 0.05$), were correlated with average walking speed. *(Partial correlation analysis)*

Weaver et al., 2006, USA	744 63.6%	82.1 (4.6), no pain 82.1 (4.5), mild pain 82.1 (4.2), moderate pain 80.6 (3.4), severe pain	Pain	Physical functioning (SPPB)	Increasing levels of pain were associated with lower SPPB scores (no pain: 7.4 (2.9); mild pain: 6.7 (2.9); moderate pain: 5.9 (2.9); severe pain: 5.5 (2.8), $p < 0.001$). *(ANOVA)*
Winter et al., 2010, Germany	120 50.0%	NR (NR)	Chronic conditions (knee OA; hip OA; lumbar spinal stenosis); Height; Weight; BMI	Gait parameters (gait cycles - per day and per hour, minutes spent per day above 50 gait cycles per minute)	Compared to controls, those with knee OA walked fewer gait cycles per day ($p = 0.001$) and per hour ($p = 0.007$), and had fewer minutes spent above 50 gait cycles per minute ($p = 0.001$). Compared to controls, those with hip OA walked fewer gait cycles per day ($p = 0.001$) and per hour ($p = 0.004$), and had fewer minutes spent above 50 gait cycles per minute ($p = 0.006$). Compared to controls, those with lumbar spinal stenosis walked fewer gait cycles per day ($p = 0.001$) and per hour ($p = 0.001$), and had fewer minutes spent above 50 gait cycles per minute ($p = 0.001$). Height, weight, and BMI were not correlated with gait cycles (per day or per hour) or number of minutes spent above 50 gait cycles per minute ($p > 0.05$). *(Mann-Whitney U-test; Spearman's correlations)*
Wiśniowska-Szurlej et al., 2019, Poland	209 55.0%	74.6 (8.1)	Handgrip strength; BMI	Gait speed Physical functioning (TUG,	Handgrip strength was associated with the time to complete the TUG ($\beta = -0.47$, $p < 0.001$), time to complete the 10MWT (to assess gait speed) ($\beta = -$

				chair stands test) Balance (Berg Balance test)	0.45, p = 0.001), time to complete five chair stands (β = -0.35, p = 0.010), and balance (β = 0.53, p = 0.002). BMI was not associated with performance on the TUG (p = 0.825), 10MWT (p = 0.482), chair stands (p = 0.640), or balance (p = 0.734). *(Linear regression)*
Yalla et al., 2014, USA	30 76.7%	73.0 (6.5)	Ankle foot orthoses (AFO)	Physical functioning (TUG)	The AFO did not significantly impact TUG completion times (P = 0.359, 95%CI = 0.121 to -0.779). *(Multiple linear regression)*
Yamada et al., 2012, Japan	231 76.6%	78.3 (6.8),	History of falls; Height; Weight	Physical functioning (TUG)	Height (p = 0.620) and weight (p = 0.492) were not associated with TUG performance at baseline. History of falls were predictive of worsening performance on the TUG at follow up in the lowest tertile TUG performers (p = 0.04), but not the middle (p = 0.11) or highest (p = 0.47) tertiles. *(ANOVA)*
Yamagata et al., 2019, Japan	24 NR	76.6 (4.1)	History of falls	Gait speed Gait parameters (step length and width, cadence, swing time and stride length ratio)	Non-fallers had longer step length [mean (SD) 55.9cm (5.0), p = 0.04] than fallers [51.60cm (5.1)]. There was no significant difference between fallers and non-fallers in their walking speed, step width, cadence, swing time and stride length ratio *(t-test)*
Yokoyama et al., 2020, Japan	947 34.0%	75.9 (6.6), males 77.2 (7.0), females	Grip strength	Gait speed Physical functioning (timed chair stand speed, SPPB) Balance (feet side-by-side,	Among males, as grip strength decreased, gait speed decreased (p < 0.001), balance worsened (p < 0.001), 5STS time increased (p < 0.001), SPPB scores decreased (p < 0.001), and overall proportion of low physical performance individuals increased (p < 0.001). Among females, as grip strength decreased, 5STS time increased (p < 0.05), however, gait speed, balance, SPPB scores, and overall proportion of low

				semi-tandem, and tandem positions)	physical performance individuals did not change (p > 0.05). *(Student's t-tests; Mann-Whitney U tests)*
Ziebert et al., 2019, UK	158 100%	75.9 (6.5)	Vertebral fracture characteristics (number, severity, location) or occiput-to-wall distance (OWD)	Physical functioning (TUG, five times sit to stand, step test) Walking time (4-meter walk test)	OWD was independently associated with TUG [B (95%CI) = 0.25 (0.12; 0.38), p < 0.001], five times sit-to-stand [B (95%CI) = 0.29 (0.07; 0.50), p = 0.01], four-meter walk [B (95%CI) = 0.08 (0.03; 0.12), p < 0.001], and step test [B (95%CI) = -0.33 (-0.47; -0.19), p < 0.001] in the adjusted model. OWD was significantly associated with physical performance measures but fracture characteristics (number, severity, location) were not. *(Multivariate linear regression)*
Zukowski et al., 2021, USA	29 75.9%	77.0 (8.4)	History of falls	Gait speed Physical performance (TUG) Balance (FSST, dynamic gait index) Gait parameters (stride velocity, stride length CV, stride duration CV)	Compared to non-fallers, fallers had slower gait speeds (1.08 m/s vs 1.30 m/s, p = 0.01), took longer to complete the TUG (0.7s vs 7.9s, p = 0.003), took longer to complete the four square step test (12.8s vs 8.9s, p = 0.01), had worse dynamic gait scores (19.5 vs 23, p = 0.001), and had lower stride velocity (1.21m/s vs 1.25m/s, p < 0.05). There was no difference in stride length CV or stride duration CV between fallers and non-fallers. *(t-tests)*
Self-reported mobility outcomes and physical factors (n = 42)					
Bean et al., 2013, USA	430 67.7%	76.6 (7.0)	Leg strength; Leg velocity; Trunk extensor endurance; Ankle ROM; Leg strength asymmetry; Knee flexion ROM	LLFDI	Leg strength [B (SE) = 1.22 (0.28), p < 0.001], leg velocity [6.74 (2.72), p = 0.01], ankle ROM [2.70 (1.38), p = 0.05], and trunk extensor muscle endurance [2.71 (0.75), p < 0.001] were associated with basic LLFDI function. Leg strength [B (SE) = 2.04 (0.31), p < 0.001], leg velocity [5.91 (2.96), p = 0.04], knee flexion ROM [0.25 (0.006), p < 0.001], leg strength asymmetry [-4.51 (2.10), p = 0.03] and trunk extensor muscle endurance [3.57 (0.80), p < 0.001] were associated with advanced LLFDI function.

					(Multivariable regression)
Berlin et al., 2006, USA	1712 60.0%	78.9 (4.0)	Fall history	Walking (number of blocks walked outside the home in the past week)	History of falls in the last year (p = 0.185) was not associated with walking ability. *(ANCOVA)*
Bohannon et al., 2008, USA	687 50.5%	NR (NR)	Muscle strength (knee extension force); adiposity (BMI)	Mobility limitation (difficulty with 5 mobility activities [bed transfer, chair stand up, walking between rooms, climbing 10 steps, walking 1/4 mile])	Muscle strength [B (SE) = -0.004 (0.001), p = 0.000], and BMI [0.083 (0.013), p = 0.000] were associated with overall mobility difficulty. Muscle strength [-0.001 (0.000), p = 0.000] and BMI [0.023 (0.004), p = 0.000] were associated with any mobility difficulty. *(Linear regression)*
Brown et al., 2003, USA	902 69.0%	NR (NR)	Impaired muscular strength; limited cardiovascular endurance; decreased range of motion (ROM); dizziness; pain	Walking (walking and community ambulation ability)	45% of participants indicated that 'Inadequate cardiovascular endurance limits my ability walk.' 25% of all respondents indicated that pain interfered with ambulation. Reductions in strength; losses in range of motion; limitations due to pain, and balance problems increased in frequency with advancing age. *(Descriptive statistics)*
Carbone et al., 2013, USA	2639 53.1%	73.5 (2.8), no assistiv e walking device 74.7 (2.9), assistiv e	Pain (knee/hip); fracture history; number of falls; BMI; isokinetic quadriceps strength; Exercise (inactive vs	Mobility assistive device use	In the multivariate regression, incident use of an assistive walking device was predicted by poor quadriceps strength [OR (95%CI) = 2.50 (1.70; 3.66)], history of fracture [1.58 (1.10; 2.28)], being inactive [1.53 (1.08; 2.21)], having hip pain [1.53 (1.02; 2.31)], and having knee pain [1.98 (1.39; 2.82)]. *(Univariate and multivariate logistic regression)*

		walking device	exerciser/active lifestyle)		
Cawthon et al., 2019, USA	1382 0%	84.2 (NR)	Body composition (muscle mass/body mass; appendicular lean mass)	Mobility limitation (difficulty walking 2-3 blocks or climbing 10 steps)	Incident mobility limitations were positively associated with lower muscle mass/body mass ratio ($p < 0.001$), and negatively associated with lower appendicular lean mass ($p = 0.022$). *(Logistic regression)*
Chaudhry et al., 2010, USA	5888 57.6%	NR (NR)	Muscle strength; physical capacity; vision; hearing, number of chronic diseases; BMI	Mobility limitation (difficulty walking 1/2 mile or unable to climb 10 stairs)	Having a BMI >= 30 kg/m2 was associated with greater incident mobility disability [HR (95%CI) = 1.59 (1.38; 1.82), $p < 0.001$]. Muscle strength [1.17 (1.02; 1.34), $p = 0.03$], physical capacity [2.24 (1.95; 2.57), $p < 0.001$], vision [1.23 (1.05; 1.46), $p = 0.01$], and hearing [1.26 (1.00; 1.58), $p = 0.047$] were associated with greater incident mobility disability. Compared to having no chronic conditions, having one [2.06 (1.76; 2.40)], two [2.80 (2.36; 3.31)], or three [4.20 (3.44; 5.14)] was associated with greater incident mobility disability. *(Multivariable Cox hazards regressions)*
Everson-Rose et al., 2017, USA	6484 52.7%	62.0 (10.2)	Body composition (BMI); Physical activity; Cardiovascular system (SBP; DBP; cholesterol; heart rate; coronary artery calcium; carotid intima-medial thickness [IMT]; ABI);	Walking pace	At baseline, slower walkers were more likely to exercise less ($p < 0.0001$), have higher BMIs ($p < 0.0001$), have higher SBP ($p < 0.0001$), have diabetes ($p < 0.0001$), have higher heart rates ($p < 0.0001$), but had no differences in DBP ($p = 0.17$) or cholesterol ($p = 0.34$). IMT ($p = 0.39$) and coronary artery calcium ($p = 0.52$) were not associated with self-reported walking pace. ABI was associated with self-reported walking pace [B (95%CI) = 0.043 (0.027; 0.059), $p < 0.001$]. *(Descriptive statistics; Linear GEE models)*

			Comorbidities (diabetes)		
Hairi et al., 2013, Malaysia	765 NR	NR (NR)	Vision impairment	Mobility limitation (difficulty managing stairs)	Among those living alone, compared to those with normal vision, those with vision impairments were more likely to have difficulty managing stairs [OR (95%CI) = 5.04 (2.27; 10.62)]. A similar impact of vision impairment was found among those who lived with others [3.10 (1.52; 6.80)]. *(Ordinal regression)*
Houston et al., 2009, USA	2845 50.6%	73.6 (NR)	BMI	Mobility limitation (difficulty walking 1/4 of a mile or climbing 10 steps)	Among men, compared to being normal weight, being overweight [HR (95%CI) = 1.24 (1.02; 1.52)] and obese [1.61 (1.28; 2.02)] is associated with incident mobility limitation. Among women, compared to being normal weight, being overweight [HR (95%CI) = 1.40 (1.16; 1.70)] and obese [2.14 (1.75; 2.62)] is associated with incident mobility limitation. *(Cox proportional hazards regression)*
Ilves et al., 2019, Germany	407 62.0%	76.9 (6.3)	Pain intensity (chronic pain grade)	RAND-36 physical functioning questionnaire (0 to 100)	Pain intensity was associated with change in physical functioning at the 18-month follow up [B (95%CI) = -0.08 (-0.14; -0.01)]. *(Longitudinal generalized estimating equations)*
Iversen et al., 2001, USA	43 65.0%	72.4 (10.3)	Pain	Walking (capacity to walk >2 blocks, >15.2m but <2 blocks, or <15.2m)	Increasing leg pain with prolonged standing (p = 0.0001), walking uphill (p = 0.004), and walking downhill (p = 0.0016) were all moderately correlated with scores on the self-reported walking capacity scale. *(Logistic regression; Spearman rank correlations)*
Jia et al., 2019, USA	164597 58.2%	76.3 (6.8)	History of falls	Mobility limitations (difficulty with balance or walking in the past 12 months)	Reporting a balance/walking problem [OR (95%CI) = 1.7 (1.6; 1.8)] and having difficulty with walking [1.2 (1.1; 1.2)] were independent predictors of falls among older adults. *(Logistic regression)*

Jung et al., 2016, Japan	283 100%	72.2 (5.0)	BMI; muscle strength	Mobility limitations (difficulty walking 1/2 mile or climbing 10 stairs without rest)	Compared to having a normal BMI, having an obese BMI was not associated with mobility limitations [OR (95%CI) = 1.53 (0.86; 2.73), p > 0.05]. Compared to having high muscle strength, having low muscle strength was associated with mobility limitation [2.05 (1.08; 3.91), p < 0.05]. *(Multivariate logistic regression)*
King et al., 2018, USA	18490 60.0%	68.0 (NR)	BMI	Mobility limitations (difficulty walking or standing in the past 3 months)	Compared to being normal weight, being underweight [OR (95%CI) = 1.53 (1.16–2.02), p < 0.01], overweight [1.24 (1.12–1.37), p < 0.01], Obesity class I [2.08 (1.82–2.39), p < 0.01], Obesity class II [2.93 (2.26–3.79), p < 0.01], and Obesity class III [5.32 (3.34–8.49), p < 0.01] was associated with greater self-reported walking difficulties. *(Logistic regression)*
Kuo et al., 2006, USA	1753 46.2%	70.2 (7.5)	Muscle power (knee extensor)	Mobility limitations (difficulty walking 1/4 mile or climbing 10 stairs)	Knee extensor power was associated with reduced lower limb mobility disability [OR (95%CI) = 0.66 (0.53; 0.83), p < 0.001]. *(Logistic regression)*
Kuspinar et al., 2020, Canada	12646 49.9%	73.1 (5.7)	Muscle strength (grip); BMI; Pain; Fatigue; Vision	Life space index	Life space index was associated with grip strength [1.08 (0.52; 1.64), p < 0.001], being underweight [-5.2 (-10.17; -0.23), p < 0.05], being overweight [0.96 (0.13; 1.78), p < 0.05], presence of pain [-1.05 (-1.81; -0.29), p < 0.01], presence of fatigue [-1.99 (-3.68; -0.31), p < 0.05], and poor vision [-2.08 (-3.53; -0.63), p < 0.01]. Life space index was not associated with being obese (p > 0.05). *(Multivariable regression)*
Lee et al., 2005, USA	2932 NR	NR (NR)	Body composition (weight change)	Mobility limitations (difficulty walking 1/4 mile or walking 10 steps without rest)	For those with a BMI <25, compared to having a stable weight, experiencing weight loss during follow-up was associated with incident mobility limitations [HR (95%CI) = 2.03 (1.46;2.82)]. For those with a BMI between 25-29.9, compared to having a stable weight, experiencing weight loss [1.51 (1.13;2.01)] or weight fluctuation [1.49 (1.09; 2.02)] was associated with incident mobility

					difficulty. Among those with a BMI between 30-34.9 or a BMI >35, weight changes were not associated with incident mobility limitations (p > 0.05). *(Cox proportional-hazards models)*
Lindh-Rengifo et al., 2021, Sweden	148 33.1%	67.9 (8.9)	Postural stability (measured through the Unified Parkinson's Disease Rating Scale III); Bothered by pain; Fatigue	Walking (Walk-12G questionnaire)	Fatigue (p = 0.076), postural instability (p = 0.070), and being bothered by pain (p = 0.058) were not associated with Walk-12G scores at the 3-year follow up. *(Multivariate linear regression)*
Lo et al., 2014, USA	970 50.6%	76.2 (7.1), incident falls 74.3 (6.2), no Falls	History of falls	LSA scores	Compared to no falls, having any falls was associated with reduced life space (B = -3.6, p < 0.001). *(Multivariate linear regression)*
Mccluskey et al., 2011, Australia	96 77.1%	78.2 (5.3)	History of falls	Use of transportation	Those with falls in the last month were less likely to use a bus for outings (p = 0.02). *(Chi-square)*
Meyer et al., 2014, USA	6112 59.0%	74.7 (5.1)	General poor physical health (History of falls; Chronic conditions; Physical activity)	Personal mobility (a composite score of ability to walk one blocks, several blocks, jog one mile, sit for 2 hours, climb stairs, etc) Community mobility (ability to drive, drive in the past	Poor physical health was associated with community mobility ($\beta = -0.30$, $p < 0.05$) and personal mobility ($\beta = -0.85$, $p < 0.05$). *(Correlations; structural equation models)*

				month, car availability and limiting driving to only nearby place or do not drive long distances)	
Miyakoshi et al., 2010, Japan	672 64.3%	69.4 (NR)	BMI; Upper lumbar kyphosis angle; Upper spinal inclination; Flexed lumbar kyphosis angle; Extended lumbar kyphosis angle; Extended spinal inclination	Walking (unable to walk >30 min due to LBP)	BMI (p = 0.2517), upper spinal inclination (p = 0.7373), flexed lumbar kyphosis angle (p = 0.5597), and extended lumbar kyphosis angle (p = 0.8192) were not associated with mobility disturbance. Upper lumbar kyphosis angle [OR (95%CI) = 1.044 (1.001; 1.088), p = 0.0442] and extended spinal inclination [1.064 (1.028; 1.101), p = 0.0005] were associated with mobility disturbance. *(Multivariate Logistic regression)*
Parc et al., 2012, France	20 25.0%	75.0 (NR)	Vision (visual impairment, severity of glaucoma, binocular visual fields)	Driving habits (highways driving, night driving, meeting the French driving requirement)	The driving habits of glaucoma patients were analyzed, and visual acuity and binocular visual fields were compared to French and European legal driving criteria. Thirteen patients (65%) with glaucoma were still driving on highways, and five (25%) at night. Seven patients (35%) were below French legal minimum visual acuity or visual field criteria. Glaucoma patients appear to self-regulate their driving habits by avoiding potentially difficult driving situations. *(Descriptive statistics)*
Papachristou et al., 2017, UK	1198 0%	78.0 (4.4)	Frailty; Grip strength; Body composition (weight loss); Physical	Mobility limitations (difficulty walking 400 yards or going up and down stairs)	Being physically inactive or less active in comparison to other men, having difficulty or being unable to grip with hands, reporting low energy, and being frail or pre-frail were associated with greater incident mobility limitations (p < 0.05).

			activity; Fatigue		Weight loss was not associated with mobility limitations (p > 0.05). *(Cox proportional hazard models)*
Peres et al., 2017, France	8491 68.7%	73.3 (5.3)	Vision (no impairment; only distance; only near; both)	Rosow and Breslau scale	For the cross-sectional analyses, compared to having no vision impairment, having near visual impairment [OR (95%CI) = 1.7 (1.4; 2.1)] or both near and distance impairment [2.3 (1.5; 3.5)] were associated with mobility limitations, but not distance impairment only. For the longitudinal analyses, compared to having no vision impairment, having only near, only distance, or both forms of impairment were not associated with mobility limitations. *(Multivariate logistic regressions)*
Protas et al., 2007, USA	10 33.3%	74.1 (3.7)	Breathing (VO2; minute ventilation)	Mobility assistive device use (self-reported)	Those with Merry walkers and Wheeled walkers had greater VO2 (p < 0.016). Those with Merry walkers had greater minute ventilation (p < 0.016). *(ANOVA)*
Raggi et al., 2018, Finland, Poland, Spain	3902 54.6%	65.1 (9.8)	Vision; hearing; Pain; Chronic conditions (arthritis, stroke, angina, diabetes, asthma), Waist circumference risk; Physical activity	General mobility (a composite score of ability to stand for long periods of time, climb one flight of stairs without rest, vigorous activities, sitting for long periods, stooping, kneeling or crouching, picking up things with fingers, extending arms above shoulder level, walking	Mobility scores was associated with waist circumference (β = - 2.37, p < 0.001), low physical activity (compared to high activity levels, -5.61, p < 0.001), arthritis (-3.80, p < 0.001), stroke (-7.44, p < 0.001), angina (-2.71, p < 0.05), diabetes (-2.08, p < 0.01), asthma (-3.05, p < 0.01), pain (-1.69, p < 0.05), mild (-2.60, p < 0.01), moderate (-7.22, p < 0.001), and severe (-5.79, p < 0.001) vision problems, and moderate (-3.85, p < 0.001) hearing problems. *(Hierarchical regression)*

				100m, walking a long distance, carrying things, moving around inside home, getting up from lying down, standing up from sitting down, getting where you want to go, using public or private transit, getting out of your home)	
Ross et al., 2009, Australia	5206 36.2%, Drivers 71.2%, Nondrivers	74.1 (5.7), drivers 78.9 (6.9), Nondrivers	Vision; Number of medical conditions	Driving status	Compared to not having impaired visual acuity, having visual impairment was associated with reduced driving [OR (95%CI) = 0.48 (0.39; 0.59), p < 0.001]. Total number of medical conditions was associated with reduced driving [0.87 (0.79; 0.96), p = 0.006]. *(Logistic regression)*
Schmidt et al., 2018, USA	430 67.0%	76.9 (6.6), symptomatic lumbar spinal stenosis (SLSS) 77.1(7.2), without SLSS	Leg strength; ankle ROM; Knee extension ROM; Knee flexion ROM; Trunk extensor muscle endurance	LLFDI	Among those with SLSS, trunk extensor muscle endurance (B = 0.06, p = 0.03) and leg strength (1.58, p = 0.01) are associated with basic mobility scores after 2 years of follow up. Trunk extensor muscle endurance (B = 0.09, p < 0.001) and knee flexion ROM (0.37, p < 0.001) are associated with advanced mobility scores after 2 years of follow up. Among those without SLSS, trunk extensor muscle endurance (0.05, p < 0.001), leg strength (1.21, p < 0.001), knee flexion ROM (0.12, p = 0.02), and ankle ROM (3.15, p = 0.04) are associated with basic mobility scores after 2 years of follow up. Trunk extensor muscle endurance (0.06, p < 0.001), leg strength (2.17, p < 0.001), and knee flexion ROM (0.23, p < 0.001) are associated with advanced mobility scores after 2 years of follow up.

					(Multivariable linear regression)
Skalicky et al., 2016, UK	200 42.5%	70.4 (9.6), Glaucoma only 76.4 (8.5), Glaucoma and low-risk AMD 82.2 (7.1), Glaucoma and high-risk AMD	Vision (AMD)	Mobility limitations (vision-related activity limitation tasks - walking on uneven ground, walking after dark, walking on steps/stairs (from Glaucoma Activity Limitation - 9))	Those with age-related macular degeneration experienced more difficulty walking on uneven ground (differential item functioning = 0.88, p = 0.0022) and walking on stairs/steps (0.63, p = 0.0299). Age-related macular degeneration was not associated with walking after dark (-0.37, p = 0.1975). *(Multivariate linear regression)*
Subhi et al., 2017, UK	50 42.0%	NR (NR) Median (IQR) 64 (55-71)	Distance visual acuity	Mobility limitation (Independent Mobility Questionnaire (IMQ))	The IMQ was correlated with distance visual acuity (R-squared = 0.31, p < 0.001). *(Spearman's rho bivariate correlations)*
Suwannarat et al., 2015, Thailand	343 62.0%	73.1 (5.6)	Comorbidity; Pain (musculoskeletal); Physical activity (inactive vs active)	Mobility assistive device use	Musculoskeletal pain [B (SE) = 1.05 (1.21), p = 0.035] was a predictor of using a walking device, but lack of exercise (p = 0.481) and comorbidity (p = 0.620) were not. *(Multivariate logistic regression)*
Swenor et al., 2015, USA	1862 38.7%	NR (NR)	Vision (visual acuity)	Mobility limitation (walking limitation [difficulty walking 1/4 mile], stair climbing	After 1 year of follow-up, only visual acuity impairment was associated with incident persistent walking limitation (HR (95%Cl) = 1.8; (1.1; 3.0) and stair climbing limitation (2.0 (1.1; 3.6). However, this association was not observed at the 3- and 5-year follow-up points. *(Cox proportional hazard models)*

				limitation [difficulty climbing 10 steps])	
Talkowski et al., 2008, USA	2269 59.6%	79.2 (4.1)	History of falls	Walking (blocks walked over past week)	Having a fall within the last year (p = 0.28) was not associated with blocks walked. *(Multivariate linear regression)*
Ullrich et al., 2019, Germany	118 76.3%	82.3 (6.0)	Number of comorbidities; BMI; Physical activity (number of steps)	LSA	LSA scores were associated with number of steps (β = 0.265, p < 0.01), but not BMI or number of comorbidities. *(Multivariable regression)*
Viljanen et al., 2012, Finland	434 100%	68.2 (3.1), no incident walking difficulty 68.6 (3.7), incident walking difficulty	Comorbidities (number of chronic conditions; diabetes; rheumatoid arthritis); Body composition (BMI); Vision; Hearing; Cardiovascular system (CVD)	Mobility limitations (difficulty walking 2km)	Incident walking difficulty after 3 years of follow up was associated with number of chronic conditions (OR 1.43, p = 0.003), BMI (OR 1.17, p < 0.001), cardiovascular disease (OR 2.21, p = 0.013), diabetes (OR 9.18, p < 0.001), and rheumatoid arthritis (p = 0.026), but not vision (p = 0.051) or hearing (p = 0.260). *(Logistic regression)*
Visser et al., 2005, USA	2631 51.1%	73.9 (2.9), white men 73.4 (2.8), black men 73.5 (2.8), white women	Mid-Thigh Muscle Cross-Sectional Area; Knee Extensor Strength; Mid-Thigh Muscle Tissue Attenuation	Mobility limitations (difficulty walking 1/4 mile and climbing 10 steps without rest)	Among men (p trend = 0.006) and women (p trend = 0.002), having smaller mid-thigh muscle cross sectional area was associated with greater incident mobility limitations. Among men (p trend = 0.0002) and women (p trend = 0.0001), having smaller knee extensor strength was associated with greater incident mobility limitations. Among men (p trend = 0.0002) and women (p trend = 0.002), having smaller mid-thigh muscle tissue attenuation was associated with greater incident mobility limitations. *(Cox's proportional hazards)*

		73.3 (2.9), black women			
Ward et al., 2016, USA	391 66.8%	76.5 (7.1)	Leg strength; Leg velocity; Trunk extensor endurance; Knee flexion range of motion	LLFDI	Decline in basic function was not associated with any neuromuscular impairment ($p > 0.05$). Persistently poor basic function was associated with leg strength [OR (95%CI) = 2.13 (1.11; 4.10)], leg velocity [2.35 (1.21; 4.58)], trunk extensor endurance [1.83 (1.01; 3.32)], and knee flexion range of motion [2.07 (1.17; 3.66)]. Decline in advanced function was associated with leg strength [1.72 (1.10; 2.70)], trunk extensor endurance [1.83 (1.13; 2.95)], and knee flexion range of motion [2.03 (1.24; 3.35)]. Persistently poor advanced function was associated with leg strength [3.45 (1.72; 6.95)], trunk extensor endurance [2.98 (1.56; 5.70)], and knee flexion range of motion [2.10 (1.06; 3.81)]. *(Logistic regression)*
West et al., 2005, USA	2143 59.2%	NR (NR)	Vision (visual acuity impairment; contrast sensitivity impairment; visual field impairment)	Mobility limitations (difficulty walking 1 block or climbing 10 stairs)	Incident walking disability was associated with visual field impairment [1.67 (1.15-2.44)], but not contrast sensitivity impairment [1.11 (0.71-1.71)] and visual acuity impairment [1.50 (0.75-3.01)]. Incident stair climbing disability was associated with visual field impairment [1.91 (1.36-2.68)], but not visual acuity impairment [1.59 (0.79-3.19)] or contrast sensitivity impairment [0.80 (0.53-1.28)]. *(Multiple logistic regression)*
West et al., 2003, USA	629 49.5%	72.6 (8.3), no driving restriction	Hearing; Comorbidity (arthritis; stroke); Vision (spatial vision; binocularity)	Driving restriction	Arthritis and stroke were more prevalent among those with driving restrictions ($p < 0.05$) than those without restrictions. Those with driving restrictions were more likely to have failing hearing than those without restrictions ($p < 0.05$). *(Chi-square; logistic regression models)*

		76.1 (8.1), vision-related restriction 75.1 (8.5), non vision-related restriction			
Zhu et al., 2018, China	28671 59.9%	67.6 (4.1), men 62.5 (4.2), women	BMI; Waist to hip ratio	Mobility limitations (self-reported walking independently)	Compared to normal BMI, being overweight [OR (95%CI) = 1.36 (1.25; 1.47)] and obese [2.45 (2.14; 2.82)] at baseline was associated with self-reported independent walking difficulties. Compared to having a 1st quartile WHR, having a 2nd quartile [1.22 (1.08; 1.36)], 3rd quartile [1.36 (1.51; 1.86)], and 4th quartile [1.68 (1.51; 1.86)] was associated with being unable to walk independently. *(Logistic regression)*
Performance-based and self-reported outcomes and physical factors (n = 22)					
Cordes et al., 2017, Netherlands	46 37.0%	60.2 (7.7)	Vision (visually impaired)	Mobility scooter driving test (street crossing without zebra; zebra crossing; cycle lane; lateral position; safe choice of speed; fluency of driving; Keeping distance; head movement; anticipation; time; defensive driving;	Compared to normal-sighted participants, those who were visually impaired had fewer years of driving experience ($p < 0.001$). Compared to controls, those with visual impairments performed worse on several driving test subscales (street crossing without zebra; cycle lane; lateral position; safe choice of speed; fluency of driving; keeping distance; head movement; anticipation; timing; confidence; general safety, $p < 0.05$), but not defensive driving ($p = 0.109$) or zebra crossing ($p = 0.120$). *(Kruskal-Wallis test)*

				confidence; general safety) Driving experience (years)	
Deshpande et al., 2017, Canada	60 41.7%	70.5 (4.7), diabetes 74.6 (5.4), no diabetes	Comorbidity (diabetes)	Physical functioning (TUG) Balance (functional balance [FISCIT-4 score], standing balance [mCRSIB]) Mobility limitations (inability to walk 1/4 mile without rest or walk up a flight of stairs unsupported)	There was no difference in mobility disability ($p = 0.778$), TUG ($p = 0.551$) or functional balance ($p = 0.512$) between those with or without T2D. Those with T2D had worse standing balance (failed Condition 4, eyes closed on compliant surface on mCTSIB) than those without diabetes (51.4% vs 24.0% failed, $p = 0.020$). *(ANCOVA)*
Eggermont et al., 2014, USA	634 64.0%	78.0 (5.0)	Pain (distribution; severity; interference)	SPPB Mobility limitations (difficulty walking 1/4 mile or climbing 10 steps)	Compared to having no pain, having multisite pain (RR 2.95) and widespread pain (RR 3.57) were associated with incident mobility difficulty. Compared to having no pain, having one pain site (RR 1.34) or widespread pain (RR 1.47) was associated with 1-point declines in SPPB scores. Compared to having the lowest quartile of pain, having 3rd quartile pain (RR 2.0) was associated with mobility difficulty upon follow up. 1-point declines in SPPB scores were not associated with pain severity. Compared to having the lowest quartile of pain interference scores, having 3rd quartile (RR 2.01) and 4th quartile (RR 2.46) scores is associated with incident mobility difficulty. Compared to having the lowest quartile pain interference score,

					only 4th quartile scores were associated with 1-point decline in SPPB scores (RR 1.32). *(Poisson regression)*
Fisher et al., 2016, USA	6654 53.7%	63.4 (NR)	Sensory impairment (vision, hearing)	Gait speed (impaired ≤ 0.8m/s) Mobility limitation (self-reported inability to walk 0.25 miles or walk up ten steps)	Compared to having no sensory impairments, in individuals without arthritis, having 1-3 sensory impairments was associated with greater risk of poor lower extremity mobility (ORs 2.07-8.72, $p < 0.001$). In those without arthritis, compared to those with no sensory impairments, having 2-3 impairments was associated with impaired gait speed (ORs 1.91-3.06, $p < 0.001$). Compared to having no sensory impairments, in individuals with arthritis, having 1-3 sensory impairments was associated with greater risk of poor lower extremity mobility (ORs 2.69-14.81, $p < 0.001$). In those with arthritis, compared to those with no sensory impairments, having 1-3 impairments was associated with impaired gait speed (ORs 1.84-5.07, $p < 0.001$). *(Multivariate logistic regression)*
Garcia et al., 2017, Brazil	60 50.0%	67.0 (5.9)	Chronic conditions (COPD); Peripheral strength; Dyspnea severity; Exercise (moderate-to-vigorous physical activity)	Walking steps (per day) LSA scores	Compared to controls, those with COPD had fewer daily steps ($p = 0.04$) and scored lower on the LSA ($p = 0.02$). Among those with COPD, LSA scores were correlated with dyspnea severity ($r = 0.44$, $p < 0.001$), peripheral strength ($r = 0.42$, $p < 0.001$), and exercise ($r = 0.43$, $p = 0.01$). *(Pearson's correlations; Mann-Whitney test; t-tests)*
Hicks et al., 2012, Italy	934 55.1%	73.3 (6.4), men 74.4 (6.8), women	Knee strength; leg power; Grip strength	Gait speed Mobility limitation (self-reported difficulty in walking 1km or	Among men, those with incident mobility disability during follow up had lower knee strength ($p < 0.001$), lower leg power ($p < 0.001$), and lower grip strength ($p < 0.001$). Among women, those with incident mobility disability during follow up had lower knee strength ($p = 0.002$), lower leg power ($p = 0.004$), and lower grip strength ($p = 0.02$).

				climbing a flight of stairs)	Men with knee extension strength <19.2 kg and grip strength < 39.0 kg (the "high-risk" group) had declines in gait speed of 0.24 m/s, which was 0.20 m/s (SE = 0.03) worse than those with knee extension strength ≥19.2 kg (p < 0.001). Women with Year 3 knee extension strength <18.0 kg had declines in gait speed of 0.06 m/s (Figure 2B), which was 0.08 m/s (SE = 0.04) worse than those with knee extension strength ≥18.0 kg (p = 0.04). *(Classification and regression tree (CART) analysis)*
Makris et al., 2016, USA	430 68.0%	76.8 (7.0)	Pain (back pain); trunk extensor muscle endurance (TEE); Leg strength; Coordination; ROM (knee; ankle)	Gait speed Balance (standing feet side-by-side, semi-tandem, and tandem) Physical functioning (chair stand test) LLFDI	Compared with participants without back pain, those with back pain had poorer performance in gait speed (p = 0.05) and chair stands (p < 0.01) and worse basic lower extremity function (p < 0.01), but no difference in balance (p = 0.49). Among those without back pain, gait speed was associated with TEE [B (SE) = 0.06 (0.01), p < 0.01] and ankle ROM [0.08 (0.03), p < 0.01]. Balance was associated with leg strength [0.07 (0.03), p = 0.01]. Chair stands were associated with leg strength [0.09 (0.03), p < 0.01], coordination [0.11 (0.03), p < 0.01] and knee ROM [0.03 (0.01), p = 0.01]. Basic lower extremity function was associated with TEE [2.87 (0.99), p < 0.01], leg strength [0.90 (0.35) p = 0.01] and coordination [0.65 (0.29), p = 0.03]. Among those with back pain, gait speed was not associated with a physical factor. Standing balance was associated with TEE [0.28 (0.12), p = 0.02] and ankle ROM [0.62 (0.27), p = 0.02]. Chair stands were associated with TEE [0.31 (0.13), p = 0.02], leg strength [0.17 (0.05), p < 0.01], coordination [0.09 (0.04), p = 0.01], and knee ROM [0.04 (0.02), p = 0.04]. Basic lower extremity function was associated with leg strength [1.25 (0.46), p = 0.01].

					(Regression)
McDermott et al., 2000, USA	933 100%	77.4 (7.3), ABI <0.90 75.5 (6.9), ABI 0.90 to 1.50	Cardiovascular system (Ankle Brachial Index [ABI] to capture peripheral artery disease)	Gait speed (self-selected; maximal) Physical functioning (chair stands; Summary Performance Score) Balance (standing) Mobility limitations (difficulty walking quarter mile; difficulty walking up 10 steps; number city blocks walked per week; number flights of stairs climbed per week)	Increased ABI was associated with reduced odds of having difficulty walking 1/4 mile ($p = 0.001$), and higher number of city blocks walked per week ($p = 0.026$), but not difficulty walking up 10 steps without resting or number of stair flights climbed per week ($p > 0.05$). Increased ABI was associated with higher maximal gait speed ($p = 0.016$), faster chair stand tests ($p = 0.024$), better balance ($p = 0.016$), and better scores on the summary performance ($p = 0.008$), but not self-selected walking speed ($p > 0.05$). *(Multiple regression analyses)*
McDermott et al., 2010, USA	623 44.3%	71.8 (8.4), PAD 69.3 (8.1), non-PAD	Cardiovascular system (PAD [pain and exertion rest; atypical exertional leg pain; leg pain; sometimes asymptomatic; always asymptomatic;	Walking distance (6MWT) Mobility limitations (difficulty walking 2-3 blocks or climbing 10 steps)	Compared to those without PAD, those with PAD walked shorter distances on the 6MWT ($p < 0.001$). Compared to those without PAD, having PAD and pain on exertion and rest ($p < 0.001$) and having always asymptomatic PAD ($p = 0.002$) was associated with greater incident mobility difficulty. *(General linear models; Cox regression)*

			intermittent claudication])		
Medina-Mirapeix et al., 2018, Spain	110 10.0%	70.0 (5.7)	Breathing (FEV1; per 1 L decrease)	Walking distance (6MWT) Physical functioning (SPPB) Mobility limitations (self-reported mobility questionnaire assessing stooping, crouching, or kneeling; standing in place for 15 min or longer; getting up from a stooping, crouching, or kneeling position; sitting for long periods; standing up after sitting in a chair; ushing objects like a living room chair; moving or carrying light objects under 10 lb or 4.54 kg; moving or carrying heavy objects over 10 lb; walking alone	Decreases in FEV1 were significantly associated with lower 6MWT distances [mean change (95%CI) = -82.86 (-116.62; -49.11), p = 0.000] and SPPB scores [-1.11 (-1.98; -0.24), p = 0.01]. Decreases in FEV1 were also associated with self-reported mobility scores [13.24 (0.15; 26.33), p = 0.047]. *(Linear regression)*

				up and down a flight of stairs; and walking two to three neighbourhood blocks)	
Pek et al., 2020, Singapore	229 72.6%	67.2 (7.4)	Physical frailty (Modified Fried scale)	Physical functioning (SPPB) LSA scores	SPPB performance was not associated with physical frailty (p = 0.192). However, total LSA scores were associated with physical frailty [OR (95%CI) = 2.19 (1.26; 3.81), p = 0.005]. *(Logistic regression)*
Pirrie et al., 2020, Canada	595 81.3%	72.2 (9.2)	History of falls; Physical activity (daily); BMI; Chronic conditions (heart disease, hypertension, high cholesterol, diabetes, stroke history); Pain/discomfort issues	Physical functioning (TUG [complete in =<14 seconds or >14 seconds]) EQ-5D-3L	Having self-reported mobility issues assessed via the EQ-5D-3L were associated with having a fall in the previous year [OR (95%CI) = 1.75 (1.11; 2.75), p < 0.05]. Being physically active daily, having heart disease, hypertension, high cholesterol, diabetes, stroke history, and BMI were not associated with completion of the TUG >14 seconds (p > 0.05). Having issues with pain/discomfort was associated with completion of the TUG >14 seconds [4.56 (1.31; 15.92), p < 0.05]. *(Binary logistic regression)*
Puthoff et al., 2007, USA	30 83.3%	77.3 (7.0)	Muscle strength; Muscle power	Walking distance (6MWT) Physical functioning (SPPB) LLFDI	Strength [B (SE) = 12.84 (3.08), p = 0.000] and peak power [21.39 (4.20), p = 0.000] were associated with the 6MWT distance. Strength [B (SE) = 0.91 (0.25), p = 0.001] and peak power [1.27 (0.33), p = 0.001] were associated with LLFDI functional limitation component scores. Strength [B (SE) = 0.32 (0.10), p = 0.003] and peak power [0.46 (0.15), p = 0.004] were associated with total SPPB scores. *(Regression)*

Rantanen et al., 2001, USA	758 100%	79.5 (0.58), became walking disabled 76.3 (0.34), survived without walking disability 79.3 (0.79), died without walking disability	Strength (knee-extension)	Gait speed Mobility limitations (inability to walk 1/4 of a mile)	Strength was a significant predictors of new walking disability. The relative risk (RR) of onset of severe walking disability was more than five times greater in the group with poorest balance and strength (RR 5.12, 95% confidence limit [95% CI] 2.68-9.80) compared with the group with best balance and strength. Among those who had poorest balance and best strength, the RR of severe walking disability was 3.08 (95% CI 1.33-7.14). Among those with best balance and poorest strength, the RR was 0.97 (95% CI 0.49-1.93), as compared with the reference group. *(Cox proportional hazards)*
Roshanravan et al., 2017, USA	1963 49.0%	75.5 (2.8)	Muscle strength (measured as Isokinetic work, Isometric torque, fatigue index)	Gait speed Mobility limitations (difficulty or being unable to walk 1/4 mile or climb 10 steps without resting; described as persistent severe lower extremity limitation (PSLL)	Usual 20-meter gait speed was strongly correlated with muscle strength measurements [Isokinetic work (r = 0.35, p < 0.001); Isometric torque (r = 0.19); Isokinetic torque (r = 0.25) and fatigue index (p = -0.01)] Restricting analyses to 1,610 participants who had normal gait speed (>1 m/s), fully adjusted hazard ratios for PSLL per 1-unit *SD* lower isokinetic work were 1.24 (95% CI 1.06, 1.44) among men and 1.17 (95% CI 0.95, 1.44) among women. Isokinetic work, and isometric torque were associated with PSSL, but Isokinetic fatigue index was not. *(Cox proportion hazards)*

Sameulsson et al., 2020, USA	348 49.0%	NR (NR) Median (IQR) = 77 (IQR 68-84)	Falls	Balance (Swedish Postural Assessment Scale for Stroke patients, tandem standing) Mobility assistive device use (wheelchair, walking aid)	Compared to having a SwePASS score >=31 (which measures posture), having a score between 25-30 [OR (95%CI) = 2.41 (1.21; 4.80), p = 0.0012] or a score =<24 [5.85 (2.84; 12.02), p < 0.0001] was associated with risk of recurrent falls. Having poor tandem stance/losing balance was associated with risk of recurrent falls [2.72 (1.57; 4.71), p = 0.004]. Using a walking aid [2.51 (1.45; 4.36), p = 0.0010], but not a wheelchair (p = 0.18) was associated with risk of recurrent falls. *(Multivariable logistic regression; univariate logistic regression)*
Sertel et al., 2017, Turkey	149 60.0%	71.6 (8.0)	BMI (normal; overweight; obese)	Balance (Berg Balance scale, tandem tests [left and right]) Physical functioning (TUG) Rivermead Mobility Index (RMI)	BMI was not associated with balance (p = 0.06), the Rivermead Mobility Index (p = 0.07) or the TUG test (p = 0.55). Those with a higher BMI performed worse on the right (p = 0.01) and left (p = 0.01) tandem tests. *(ANOVA)*
Simonsick et al., 2018, USA	878 50.8%	72.7 (8.1), no pain 71.2 (8.2), mild pain 69.4 (7.2), severe pain	Pain (lumbopelvic)	Gait speed Walking time (400-meter fast walk test) Walking (self-reported capabilities walking 1/4 of a mile and 1 mile [scored 0-9])	Compared to those without lumbopelvic pain, those with persistent pain had self-reported walking ability (p < 0.001) upon follow up. There were no differences in usual gait speed (p = 0.51) or 400m walk time (p = 0.45). *(Linear models)*
Thakral et al., 2014, USA	680 63.0%	78.0 (NR)	Joint stiffness	Gait speed (assessed using the SPPB)	Multisite muscle stiffness was associated with a greater risk of developing new or worsening mobility difficulty [RR (95%CI) = 1.64 (1.01; 2.67)]. Muscle stiffness was not associated with

				Physical function (SPPB, chair stands) Balance (assessed using the SPPB) Mobility limitations (difficulty walking 1/4 mile or climbing stairs without help)	composite SPPB score (p = 0.09) or chair stands (p = 0.51), however, those with stiffness had slower gait speeds (p = 0.05) and worse balance (p = 0.01). *(Generalized linear models and longitudinal models)*
Thrane et al., 2007, Norway	974 57.5%	77.5 (2.3)	History of falls	Physical functioning (TUG) Mobility limitations (number of health-related mobility problems [problems with indoor mobility, outdoor mobility, social activities, using public transport and shopping])	The odds ratios for fallers being in the upper quartile of TUG test times were 2.1 (95%CI 1.4; 3.3) in men and 1.0 (95%CI 0.7;1.4) in women. Among men, history of falls was related to number of health-related mobility problems [OR (95%CI) = 1.3 (1.1; 1.7)]. Among men, history of falls was also associated with health-related mobility problems [1.2 (1.0; 1.3)]. *(Logistic regression)*
Viljanen et al., 2009, Finland	434 100%	68.0 (3.2), good hearing 69.5 (3.5), poor hearing	Hearing	Gait speed (maximal) Walking distance (6MWT) Walking (capabilities walking 2km without rest)	Those with good hearing had similar max gait speed than those with poor hearing (1.8 (0.3) vs 1.7 (0.3), p = 0.07) and were less likely to have major difficulties walking 2km (p = 0.02). Walking endurance (via 6MWT) was not associated with hearing (p = 0.06). During the follow-up, new major difficulties in walking 2 km developed for 33 participants: 19 (12.5%) of participants with and 14 (6.0%) without hearing impairment (p = 0.04). *(Wald tests)*

Zhou et al., 2018, China	1290 57.4%	68.2 (6.5)	History of falls	Balance (composite of static balance, postural control ability, and dynamic balance tests) Mobility assistive device use (walking aids)	Walking aid use [IRR (95%CI) = 2.29 (1.12; 4.69), p = 0.02] and impaired balance [1.05 (1.00; 1.10), p = 0.04] were associated with the number of falls over the past 12 months. *(Multivariate negative binomial regression)*

Notes:
AMD – Age-related Macular Degeneration; ANOVA – Analysis of Variance; BMI - Body Mass Index; CLBP - Chronic Low Back Pain; COPD - Chronic Obstructive Pulmonary Disease; CV - Coefficient of Variation; ESWT - Endurance Shuttle Walk Test; EQ- 5D- 3L – EuroQoL-Five-Dimension Scale-Mobility Domain (3 Level version); FEV - Forced Expiratory Volume; FSST – Four Square Step Test; FVC – Force Vital Capacity; HR – Hazard Ratio; IRR - Incident Rate Ratio; ISWT – Incremental Shuttle Walk Test; LLFDI - Late Life Function and Disability Instrument; LSA – Life Space Assessment; MANOVA - Multivariate Analysis of Variance; OA – Osteoarthritis; OR - Odds Ratio; r – Correlation Coefficient; RV – Residual Volume; SD – Standard Deviation; SE - Standard Error; SPPB – Short Physical Performance Battery; SWT - Shuttle Walk Test; TLC - Total Lung Volume; TUG – Time Up and Go Test; UK - United Kingdom; USA - United Stated of America; VO2 – the amount of oxygen your body uses; 5MWT – Five-Minute Walk Test; 5STS - Five Sit-to-Stand Test; 6MWT - Six-Minute Walk Test; 10MWT – 10Meter Walk Test; 95%Cl – 95% Confidence Interval.

Findings were copied verbatim from each manuscript.

Result highlighted in gray indicates no significant association between physical factor(s) and mobility outcome.

Appendix 6A – Feedback Summaries and Steering Committee Decision Notes

A. ROUND 2 SUMMARY FEEDBACK

Dear Dr... (name of the participants).

Thank you for participating in the Round 1 of this modified e-Delphi survey that aims to prioritize and reach consensus on the factors for each mobility determinant [cognitive, financial, environmental, personal, physical, psychological, social] that are critical to assess as part of the **C**omprehensive **M**obility **D**ischarge **A**ssessment **F**ramework (CMDAF) when older adults are discharged from hospital-to-home.

We look forward to your participation in Round 2.

Summary of Round 1

- 16 out of 84 factors reached consensus in Round 1, thus you will not be rating these 16 factors in Round 2.
- Experts suggested 28 additional factors.
- The Steering Committee, comprised of an older adult, a family caregiver, and investigators with research and clinical background in physiotherapy, gerontology, occupational therapy, nursing met and discussed the additional factors.
- After extensive discussion and careful consideration:
    - The following additional factors have been included in Round 2:
        - **governmental/institutional support**
        - **discharge goals and expectations**
        - **history of recent readmission to hospital**
        - **ability to walk 400m or a city block**
        - **ability to dual-task**
        - **ability to climb stairs/steps**
        - **baseline physical function before admission**
    - One physical factor – *frequency of exercise or physical activity* – has been modified to include current and previous physical activity levels across the life course in Round 2.

The table A below provides an overview of the suggested factors that were not included in Round 2 and a brief explanation(s). You have the opportunity to respond to the explanation(s) and the decisions at the end of the Round 2 survey.

Table A: Suggested factors and Steering Committee explanations for not adding in Round 2

Determinants	Suggested factor	Explanation(s) for not adding the suggested factor in Round 2.
Cognitive factors	Functional cognition **Definition -** "The ability to use and integrate thinking and performance skills to accomplish complex everyday activities" **(Giles et al., 2017, p. 1)**	Elements of Functional Cognition are captured within the "**Executive Function" factor**, defined as a set of mental skills that allow people to plan, decide, find solutions to problems, and control themselves from acting without thinking. It is understood that Executive Function as "the conductor of all cognitive skills" allows a person to do all types of daily and life tasks.

Environmental factors	• Social amenities available to the patient
	• Nature and design of the home - staircase, ramps, and rails
	• Security situation around the neighborhood
		• Social amenities available to the patient are captured within the "**access to recreational facilities and access to destination**" factors.
		  • Access to recreational facilities is defined as how many communities fitness or recreation centers are close by, how much does it cost to attend, and how easy it is to get there, for example, how far it is to walk, take public transit, or drive
		  • Access to destination is defined as: how many shops, services, senior centers are close by, how much does it cost to attend the senior centers, how easy it is to get there, and how far it is to walk, take public transit, or drive
		
		• Nature and design of home are captured in the "**discharge living environment**" factor, defined as what kind of house is the person discharged to and could be home, apartment, retirement home, and this includes the arrangement and design. **Discharge living environment reached consensus in Round 1.**
		
		• Security situations around the neighborhood are captured in the "**neighborhood crime safety" factor**, defined as how safe is the community based on the number of people around and how unfriendly people are.

Psychological factors	• Insight - Do they understand the risk (I believe risk associated with discharge)	• Insight is linked to various cognitive factors (e.g., executive functioning or global cognition) or psychological factors (e.g., fear of falling or re-injury). Clinicians can develop an

	• Spiritual well being	understanding of patients' insight during conversations, assessment and treatment sessions (clinician and patient interactions) of generic insight as it relates to the risk of discharge, as well as through assessment of cognitive and psychological factors. • Spiritual well-being is important to the overall health and well-being of the older adult, but the critical relationship to mobility/discharge is not clear.
Social factor	• Autonomy - can they make decisions for themselves (This may have been captured in social factors, interdependency, etc.)	• Autonomy e.g., possession of freedom of choice, perception of independence is related to **"Self-Efficacy"**, defined as the belief someone has in carrying out and completing a task. **Self-efficicay** is a core personal resource for the perception of autonomy. The **Self-efficacy factor has reached a consensus in Round 1.**
Physical factors	• Heart conditions • Access to a personal motor vehicle or motorized devices - battery-powered wheelchair • Presence of disabilities and/or deformities challenging movement • Ability to get to the bathroom independently • Independence in personal activities of daily living	• Heart conditions are captured under the **"number and type of chronic conditions"** factor • Access to a personal motor vehicle is captured under the **"use of mobility aid" factor, which has reached a consensus.** • Presence of disabilities and/or deformities challenging movement is captured in specific impairments factors such as "hearing and visual impairment." • Ability to get to the bathroom independently and independence in personal activities of daily living are captured in the **"self-care activities of daily living" factor, which has reached a consensus in Round 1.**

Instructions for Round 2.

- Your rating in Round 1 is highlighted in yellow for each factor, and the percentage of people rating is shown above each row. This information is provided for each factor within each determinant.
- You will re-rate factors from Round 1 and will rate additional included suggested factors within each determinant.
- For each factor, rate the factors that are critical to assess as a part of a CMDAF when older adults are discharged from hospital to home using a 9-point Scale: Not Important (1 – 3), Important but Not Critical (4 – 6), and Critical (7 – 9); with the option of selecting "unable to score."
- You will also provide your rationale(s) for your re-ratings factors within each determinant in the open-ended comment section(s).

This Round will be open for three weeks, and it will take approximately 30 mins to complete. However, you can save and return to complete the survey.

B. ROUND 3 SUMMARY FEEDBACK

Dear [name of the participants]

Thank you for participating in the Round 2 of this modified e-Delphi survey that aims to prioritize and reach consensus on the factors for each mobility determinant [cognitive, financial, environmental, personal, physical, psychological, social] that are critical to assess as part of the **C**omprehensive **M**obility **D**ischarge **A**ssessment **F**ramework (CMDAF) when older adults are discharged from hospital-to-home.

We look forward to your participation in Round 3.

Summary of Round 2

- 20 out of 75 factors reached consensus in Round 2 thus you will not be rating these 20 factors in Round 3.
- The Steering Committee, comprised of an older adult, a family caregiver, and investigators with research and clinical background in physiotherapy, gerontology, occupational therapy, nursing met and discussed factors that have reached consensus and those that have not.

Instructions for Round 3.

- Your rating in Round 2 is highlighted in yellow for each factor, and the percentage of people rating is shown above each row. This information is provided for each factor within each determinant.
- You will re-rate factors from Round 2.
- For each factor, rate the factors that are critical to assess as a part of a CMDAF when older adults are discharged from hospital to home using a 9-point Scale: Not Important (1 – 3), Important but Not Critical (4 – 6), and Critical (7 – 9); with the option of selecting "unable to score."
- You will also provide your rationale(s) for your re-ratings factors within each determinant in the open-ended comment section(s).

This Round will be open **for three weeks**, and it will take approximately 30 mins to complete. However, you can save and return to complete the survey.

Thank you for taking the time to complete the survey.

C. FINAL STEERING COMMITTEE MEETING SUMMARY

Dear [Name of the panel member]

Thank you for participating in the Round 3 of this modified e-Delphi survey that aims to prioritize and reach consensus on the factors for each mobility determinant [cognitive, financial, environmental, personal, physical, psychological, social] that are critical to assess as part of the **C**omprehensive **M**obility **D**ischarge **A**ssessment **F**ramework (CMDAF) when older adults are discharged from hospital-to-home.

Summary of Round 3 and Steering Committee Meeting Summary

- 5 out of 55 factors re-rated in Round 3 reached consensus
- A total of 41 out of 91 factors reached consensus at the end of Round 3.
- The Steering Committee Members (SCM) discussed 13 factors that reached consensus in at least one of the stakeholders' groups. Table B below shows the factors, their definitions and the stakeholders' group in which the factors reached a consensus.

Table B: 13 factors that reached consensus in at least one of the stakeholders' groups

Factors	Definitions	Stakeholders group in which the factor reached a consensus
Environmental factors (n=6)		
Crime related safety	How safe is the community based on the number of people around and how unfriendly people are	Older adults and caregivers
Access to rest areas	How many rest areas such as benches, or public washrooms are there in the community, and how much does it cost to use	Older adults and researchers
Access to recreational facilities	How many community fitness or recreation centers are close by, how much does it cost to attend, and how easy it is to get there (how far it is to walk, take public transit, or drive)	Older adults

Weather	Refers to temperatures, seasons (e.g summer/winter conditions), and others (e.g., wind, fog, rain)	Older adults
Government or institutional support	Government or institutional support system entails services that provide benefits, structured programs and operations with systems at local, regional or national, or international levels governed and regulated by policies ensuring older adults' mobility in the community	Clinicians
Social capital	The connections, shared values and understandings in society that enable people to trust each other and work together	Caregivers
Personal factors (n=1)		
Smoking and Alcohol consumption		Caregivers and clinicians
Physical factors (n=5)		
Ability to walk 400m or city block		Older adults
Ability to dual task	The ability to perform two tasks at the same time, for instance walking and having a conversation	Older adults
Range of motion	The ability of a joint to move in the expected directions	Caregivers and clinicians
Proprioception	The ability to sense the body in space, where it is located, and the movement of the body	Clinicians
Current and previous physical activity level across life course	Physical activity levels at younger ages and at old age	Clinicians
Psychological factors (n=1)		
Anxiety	A feeling that causes people to worry and can cause their heart rate to increase or make them breathe faster.	Researchers

- See Table C for SCM comments and decisions regarding whether to include or exclude each factor,

Table C: 13 factors that reached consensus in at least one of the stakeholders' groups

Factors	Steering Committee Comments	Decision
Environmental factors (n=6)		
Crime related safety	• This factor could be important and "not critical" for clinicians and researchers because it is beyond their control during discharge. For instance, clinicians & researchers may be thinking about how they can solve this issue, even if it was noted as a critical factor to assess as part of a comprehensive mobility discharge assessment framework when discharging older adults' homes. • Older adults and caregivers stated that it was critical for them because they are the ones that experienced it.	Consider
Access to rest areas	• SCM believes that this is critical for outdoor mobility; however, it may not be critical to assess during hospital discharge amidst other competing demands of the discharge process. • It is critical for older adults because they may want to use the washroom or rest on a bench during walks after discharge from the hospital. • Safety, as mentioned above, can be related to access to rest areas. If older adults feel unsafe walking around in the community, they will not even think of rest areas around the neighbourhood. Even if an older adult decides to walk, they may not feel safe resting while walking.	Consider
Access to recreational facilities	• All SCM believe that this might be important but not critical to assess. • Older adults discharged from the hospitals are often fragile and have limited functional mobility. Therefore, clinicians,	Consider

	researchers and family caregivers rated it important but not critical. • However, older adults believed it is critical for clinicians to assess this during discharge	
Weather	• We do not have any power over the weather. • SCM agree that weather is also linked to accessibility and safety. Older adults could walk indoors even if there is bad weather. There are walking programs in shopping malls during winter seasons but do older adults have access via transportation or subsidized rate to get to the shopping malls. Moreover, older adults have more pressing needs upon discharge when compared to how weather affects their mobility.	Do not include
Government or institutional support	• Should clinicians ask if government support (e.g., subsidized transport rate or home care) is available to enhance mobility upon discharge? Yes, however, it may be important but not critical during discharge. • This factor is also linked to accessibility.	Include
Social capital	• This factor is also linked to safety if we can trust each other in the community.	Do not include
Personal factors (n=1)		
Smoking and Alcohol consumption	• It is critical to talk about it but maybe not during discharge. It is generally a grey area. • It can easily be assessed if the person admitted often goes for a smoke. • Personal factors are very individual and can vary from person to person. • The family caregivers and clinicians agreed it is critical to assess. Maybe they rated based on the safety of the older adults. However, the older adults themselves disagree with evaluating smoking and alcohol behaviour consumption as part of a comprehensive discharge assessment framework for older adults during hospital-to-home discharge.	Do not include

Physical factors (n=5)		
Ability to walk 400m or city block	• Not critical, maybe important for community mobility	Do not include
Ability to dual task	• May provide an insight on performance after acute illness state, but not critical during discharge	Do not include
Range of motion	• This factor is not critical to assess as part of the comprehensive mobility discharge assessment framework because older adults can function with a limited range of motion. For instance, an older adult can use a walker to get around if his hip joint is restricted. • Can we delay discharge if a range of motion is restricted? Maybe in some joints, range of motion could be important during discharge but may not be critical.	Do not include
Proprioception	• There was no discussion, SCM unanimously agree that it is not critical.	Do not include
Current and previous physical activity level across life course	• It is important during discharge but not critical. It is more predictive or explanatory, as previous physical activity levels can predict mobility recovery if limited during discharge.	Do not include
Psychological factors (n=1)		
Anxiety	• There was no discussion, SCM unanimously agree that it is not critical.	Do not include

- **New emerging factor category**

The SCM agreed that factors such as crime-related safety, access to rest areas, and recreational facilities should be considered to be include in the CMDAF. After several deliberation, and to give voice to the older adults, the SCM agreed that these three factors can be merged and called "**Safety, accessibility and availability.**"

- **Conclusion**

We added two environmental factors: "**Safety, Accessibility and Availability**" and "**Governmental and Institutional Support system**" in the final list of factors to be assessed as part of a comprehensive mobility discharge assessment framework when older adults are being discharged home from the hospital. We have a total of 43 factors at the end of the consensus and Steering Committee Meetings.

Appendix 6B – The 91 factors, their definitions and rating per round.

Definition of mobility factors

Name	Plain definition	Domain Name
Attention	The ability to focus on something while ignoring other things	Cognitive determinant factors
Executive function	A set of mental skills that allows people to plan, decide, find solutions to problems, and control themselves from acting without thinking	Cognitive determinant factors
Language	Refers to sound, signs, symbols and gestures that can be used to communicate ideas, thoughts and emotions from one person to another	Cognitive determinant factors
Memory	The ability to remember things about past events or knowledge	Cognitive determinant factors
Visuospatial function	How people understand what they see and how it relates to where they are, for example, using a map to get from one place to another, walking through doorways rather than bumping into the door frames, judging how far away a car is and how fast it is moving	Cognitive determinant factors
Processing speed	The time needed to take in information, make sense of it and begin to respond	Cognitive determinant factors
Global cognition	Refers to the way people think, judge, learn, understand, remember, and see things	Cognitive determinant factors

Street characteristics	How streets look, how well the streets are connected to one another and where the streetlights are located	Environmental determinant factors
Discharge environment (living environment)	What kind of house is the person discharged to, and could be home, appartment, retirement home	Environmental determinant factors
Residential characteristics	The number of people, houses, public parks in an area, and the location of houses	Environmental determinant factors
Land use mix	How land is used within a community, for example how much land is used for homes, shops, and offices	Environmental determinant factors
Sidewalk characteristics	How the sidewalks look, for example, are there any cracks or bumps; how big the sidewalks are, how close the sidewalks are to the road	Environmental determinant factors
Crime-related safety	How safe is the community based on the number of people around and how unfriendly people are	Environmental determinant factors
Traffic-related safety	How safe it is to cross the roads in the community, based on crosswalks, stop signs, stoplights and the timing of stoplights, and the speed limit for cars	Environmental determinant factors
Access to recreational facilities	How many community fitness or recreation centers are close by, how much does it cost to attend, and how easy it is to get there, for example how far it is to walk, take public transit, or drive	Environmental determinant factors
Access to destinations	How many shops, services, senior centers are close by, how much does it cost to attend the senior centers, how easy it is to get there, and how far it is to walk, take public transit, or drive	Environmental determinant factors

Access to rest areas	How many rest areas such as benches, or public washrooms are there in the community, and how much does it cost to use	Environmental determinant factors
Access to public transit	How easy it is to take public transit, including how many routes, how far away bus stops are and the cost of a ticket	Environmental determinant factors
Weather	Refers to temperatures, seasons (e.g summer/winter conditions), and others (e.g., wind, fog, rain)	Environmental determinant factors
Natural scenery	Refers to green open areas, water, trees, flowers and trails in the community	Environmental determinant factors
Environmental quality	Refers to air quality (air pollution)	Environmental determinant factors
Social factors	The number of people and the amount of interaction between people in the community	Environmental determinant factors
Social attitude	How people feel about older people in our community and actions towards them	Environmental determinant factors
Social capital	The connections, shared values and understandings in society that enable people to trust each other and work together	Environmental determinant factors
Social cohesion	How strong relationships are in the community that encourage people to provide help and support to each other, for example, if someone returns a lost item or gives a stranger directions	Environmental determinant factors
Government and Institutional support	Entails services that provide benefits, structured programs and operations with systems at local, regional or national, or international levels governed and regulated by policies ensuring older adults' mobility in the community	Environmental determinant factors

Personal income	The total amount of money a person receives from all sources (e.g work salary, government benefits, investments)	Financial determinant factors
Household income	The total amount of money all people who are related and unrelated, who are 16 years or older, living in the same house receive	Financial determinant factors
Family income	The total amount of money all people who are related by birth, marriage or adoption, who are 16 years or older, living in the same house receive	Financial determinant factors
Age		Personal determinant factors
Gender	Societal norms and expectations for how society thinks men and women should act and what they should do	Personal determinant factors
Sex	The sex (male or female) at birth and on your birth certificate	Personal determinant factors
Culture	The way of life of groups of people including their customs, activities, beliefs, and values	Personal determinant factors
Ethnicity	How a group of people identify based on their family origins and their culture and cultural traditions such as Arab, French, Caribbean, African	Personal determinant factors
Race	How a group of people identify based on their skin colour, facial shape and hair (e.g., White/Caucasian, Brown, Black)	Personal determinant factors
Educational level		Personal determinant factors
Occupation		Personal determinant factors
Marital status		Personal determinant factors
Religion		Personal determinant factors
History of recent readmission to hospital		Personal determinant factors
Smoking and alcohol consumption		Personal determinant factors

Muscle strength	The amount of tension a muscle develops to move or lift an object, for example. How strong or weak a muscle is.	Physical determinant factors
Muscle power	How fast the muscle can work, for example how fast can we stand up and sit down within a small timeframe	Physical determinant factors
Muscle endurance	How long a muscle can work	Physical determinant factors
Muscle coordination	How the muscles work together to move	Physical determinant factors
Range of motion	The ability of a joint to move in all its directions	Physical determinant factors
Body composition	A description of how much of the body is muscle or fat	Physical determinant factors
Proprioception	The ability to sense the body in space, where it is located, the movement of the body	Physical determinant factors
Sensation	The ability to feel touch, pain, temperature, vibration	Physical determinant factors
Pain		Physical determinant factors
History of falls		Physical determinant factors
Balance		Physical determinant factors
Fatigue	Always feeling tired	Physical determinant factors
Vision		Physical determinant factors
Number and type of of comorbidities	The number and type of chronic conditions (e.g., high blood pressure, diabetes, arthritis)	Physical determinant factors
Gait speed	The time it takes to walk a distance	Physical determinant factors
Respiratory system	The lungs and tissues that help people breathe, and how we breath	Physical determinant factors
Speech impairment	Cannot speak	Physical determinant factors
Hearing		Physical determinant factors
Dizziness	a feeling of faint	Physical determinant factors
Frequency of exercise/physical activity		Physical determinant factors
Self care activities of daily living	Refers to bathing, dressing and undressing, feeding self, using the toilet, and taking medication	Physical determinant factors

Instrumental activities of daily living	Things you do everyday to take care of yourself and your home, and they include managing finances (paying bills), driving or planning other means of transport or do grocery shopping and prepare food	Physical determinant factors
Frailty	People who are frail usually have 3 out of the following five symptoms: muscle loss, weakness a feeling of fatigue, slow walking speed, and low levels of physical activity.	Physical determinant factors
Baseline physical function before admission		Physical determinant factors
Ability to climb stairs		Physical determinant factors
Ability to dual task	Performing two or more task while walking	Physical determinant factors
Ability to walk 400m or a city block		Physical determinant factors
Use of mobility aid	The mobility assistive devices included scooter, powered and manual wheelchairs, walking aids (cane, walker, crutches).	Physical determinant factors
Depression	A feeling of sadness and loss of interest, which stops someone from doing normal activities	Psychological determinant factors
Self efficacy	The belief someone have in the abilities to carry out and complete a task.	Psychological determinant factors
Motivation	The reasons people act or behave in a specific way	Psychological determinant factors
Fear of fall	Worrying about falling so much that the person do not take part in activities	Psychological determinant factors
Emotional well being	The state of being mentally healthy and happy	Psychological determinant factors
Self perceived fatigue	How people view themselves as being tired, that affects how they function.	Psychological determinant factors

Anxiety	A feeling that causes people to worry and can cause their heart rate to increase or make them breathe faster	Psychological determinant factors
Apathy	The lack of interest in in life activities or interactions with others	Psychological determinant factors
Fear of reinjury		Psychological determinant factors
Affect	How people feel and can be from good to bad	Psychological determinant factors
Extraversion	Personal feature that makes people more likely to be with people than be by ourselves	Psychological determinant factors
Openness	Personal feature that makes people more likely to be open to new things	Psychological determinant factors
Agreeableness	Personal feature that makes people more likely to agree with others.	Psychological determinant factors
Neuroticism	Personal feature that makes people more likely to get angry easily	Psychological determinant factors
Conscientiousness	Personal feature that makes people more likely to be organized, responsible, and hardworking	Psychological determinant factors
Discharge goals and expectations	Things someone hopes to achieve or desire to happen following discharge	Psychological determinant factors
Living situation	living alone or living with someone, for example rommates, family members, or spouse/partner	Social determinant factors
Loneliness (emotional and social loneliness)	An unpleasant feeling associated with having few or no friends or having lost connections with people, places, or things or when	Social determinant factors
Social isolation	The feeling people have when they do not have contact with others	Social determinant factors
Social participation	Activities that allow people to connect with others in the community.	Social determinant factors
Social network (quality and quantity)	The type and number of social relationships that people have	Social determinant factors

Social support	The help, comfort, concern and care people receive from family and friends to handle problems better	Social determinant factors
Name	Plain definition	DomainName
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Weather	Refers to temperatures, seasons (e.g summer/winter conditions), and others (e.g., wind, fog, rain)	Environmental determinant factors
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	and sit down within a small timeframe	
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Apathy	The lack of interest in in life activities or interactions with others	Psychological determinant factors
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Social network (quality and quantity)	The type and number of social relationships that people have	Social determinant factors
Social support	The help, comfort, concern and care people receive from family and friends to handle problems better	Social determinant factors

Round 1 Ratings

Factors	All Experts (n=60/78)					Older Adults (n=7/9)			Caregivers (n=9/11)			Researchers (n=20/28)			Clinicians (n=24/26)		
	Mean (SD)	Median (IQR)	1-3, N (%)	4-6, N (%)	7-9, N (%)	1-3, N (%)	4-6, N (%)	7-9, N (%)	1-3, N (%)	4-6, N (%)	7-9, N (%)	1-3, N (%)	4-6, N (%)	7-9, N (%)	1-3, N (%)	4-6, N (%)	7-9, N (%)
Cognitive determinants (n=7)																	
Attention	6.8 (1.9)	7 (5-8.5)	4 (7.1%)	18 (32.1%)	34 (60.7%)	1 (16.7%)	3 (50.0%)	2 (33.3%)	2 (22.2%)	2 (22.2%)	5 (55.6%)	1 (5.3%)	7 (36.8%)	11 (57.9%)	0 (0.0%)	6 (27.3%)	16 (72.7%)
Executive function	6.7 (1.8)	7 (6-8)	3 (5.6%)	17 (31.5%)	34 (63.0%)	0 (0.0%)	3 (50.0%)	3 (50.0%)	0 (0.0%)	3 (37.5%)	5 (62.5%)	1 (5.3%)	6 (31.6%)	12 (63.2%)	2 (9.5%)	5 (23.8%)	14 (66.7%)
Language	6.0 (2.1)	6 (5-7)	9 (16.1%)	21 (37.5%)	26 (46.4%)	1 (16.7%)	3 (50.0%)	2 (33.3%)	0 (0.0%)	4 (44.4%)	5 (55.6%)	5 (26.3%)	6 (31.6%)	8 (42.1%)	3 (13.6%)	8 (36.4%)	11 (50.0%)
Memory	6.8 (1.8)	7 (6-8)	2 (3.6%)	18 (32.1%)	36 (64.3%)	0 (0.0%)	2 (33.3%)	4 (66.7%)	1 (11.1%)	2 (22.2%)	6 (66.7%)	1 (5.3%)	6 (31.6%)	12 (63.2%)	0 (0.0%)	8 (36.4%)	14 (63.6%)
Visuospatial function	R	7 (6-8)	3 (5.5%)	12 (21.8%)	40 (72.7%)	1 (16.7%)	1 (16.7%)	4 (66.7%)	0 (0.0%)	2 (25.0%)	6 (75.0%)	1 (5.3%)	5 (26.3%)	13 (68.4%)	1 (4.5%)	4 (18.2%)	17 (77.3%)
Processing speed	6.1 (1.8)	6 (5-7.5)	4 (7.1%)	29 (51.8%)	23 (41.1%)	0 (0.0%)	2 (33.3%)	4 (66.7%)	1 (11.1%)	5 (55.6%)	3 (33.3%)	3 (15.8%)	9 (47.4%)	7 (36.8%)	0 (0.0%)	13 (59.1%)	9 (40.9%)
Global cognition	7.0 (1.5)	7 (6-8)	1 (1.8%)	18 (32.7%)	36 (65.5%)	0 (0.0%)	2 (33.3%)	4 (66.7%)	1 (12.5%)	2 (25.0%)	5 (62.5%)	0 (0.0%)	7 (36.8%)	12 (63.2%)	0 (0.0%)	7 (31.8%)	15 (68.2%)
Environmental determinants (n=18)																	
Street characteristics	5.6 (2.1)	6 (4-7)	10 (18.2%)	25 (45.5%)	20 (36.4%)	1 (16.7%)	3 (50.0%)	2 (33.3%)	2 (22.2%)	4 (44.4%)	3 (33.3%)	3 (15.8%)	9 (47.4%)	7 (36.8%)	4 (19.0%)	9 (42.9%)	8 (38.1%)
Discharge environment (living environment)	7.5 (1.7)	8 (7-9)	2 (3.6%)	8 (14.3%)	46 (82.1%)	0 (0.0%)	1 (16.7%)	5 (83.3%)	0 (0.0%)	2 (22.2%)	7 (77.8%)	2 (10.5%)	3 (15.8%)	14 (73.7%)	0 (0.0%)	2 (9.1%)	20 (90.9%)
Residential characteristics	6.4 (2.3)	7 (5-9)	8 (14.5%)	16 (29.1%)	31 (56.4%)	1 (16.7%)	1 (16.7%)	4 (66.7%)	0 (0.0%)	2 (22.2%)	7 (77.8%)	2 (11.1%)	9 (50.0%)	7 (38.9%)	5 (22.7%)	4 (18.2%)	13 (59.1%)
Land use mix	4.7 (2.4)	5 (3-6)	17 (34.7%)	20 (40.8%)	12 (24.5%)	0 (0.0%)	4 (66.7%)	2 (33.3%)	3 (37.5%)	2 (25.0%)	3 (37.5%)	4 (26.7%)	10 (66.7%)	1 (6.7%)	10 (50.0%)	4 (20.0%)	6 (30.0%)
Sidewalk characteristics	6.2 (2.0)	6 (4-8)	5 (9.1%)	24 (43.6%)	26 (47.3%)	0 (0.0%)	2 (33.3%)	4 (66.7%)	0 (0.0%)	5 (55.6%)	4 (44.4%)	2 (10.5%)	8 (42.1%)	9 (47.4%)	3 (14.3%)	9 (42.9%)	9 (42.9%)
Crime-related safety	6.0 (2.0)	6 (4-7)	6 (10.9%)	25 (45.5%)	24 (43.6%)	0 (0.0%)	2 (33.3%)	4 (66.7%)	0 (0.0%)	3 (33.3%)	6 (66.7%)	3 (15.8%)	8 (42.1%)	8 (42.1%)	3 (14.3%)	12 (57.1%)	6 (28.6%)
Traffic-related safety	6.2 (1.8)	6 (5-7)	5 (9.1%)	25 (45.5%)	25 (45.5%)	1 (16.7%)	3 (50.0%)	2 (33.3%)	0 (0.0%)	3 (33.3%)	6 (66.7%)	1 (5.3%)	9 (47.4%)	9 (47.4%)	3 (14.3%)	10 (47.6%)	8 (38.1%)
Access to recreational facilities	5.9 (2.0)	6 (5-7)	6 (10.9%)	28 (50.9%)	21 (38.2%)	0 (0.0%)	2 (33.3%)	4 (66.7%)	1 (11.1%)	5 (55.6%)	3 (33.3%)	1 (5.3%)	13 (68.4%)	5 (26.3%)	4 (19.0%)	8 (38.1%)	9 (42.9%)
Access to destinations	6.4 (1.7)	7 (6-7)	4 (7.5%)	18 (34.0%)	31 (58.5%)	0 (0.0%)	2 (33.3%)	4 (66.7%)	1 (11.1%)	3 (33.3%)	5 (55.6%)	2 (11.1%)	7 (38.9%)	9 (50.0%)	1 (5.0%)	6 (30.0%)	13 (65.0%)
Access to rest areas	6.1 (2.1)	7 (5-8)	6 (11.1%)	19 (35.2%)	29 (53.7%)	0 (0.0%)	2 (33.3%)	4 (66.7%)	0 (0.0%)	4 (44.4%)	5 (55.6%)	3 (15.8%)	6 (31.6%)	10 (52.6%)	3 (15.0%)	7 (35.0%)	10 (50.0%)
Access to public transit	6.5 (2.0)	7 (5-8)	3 (5.5%)	19 (34.5%)	33 (60.0%)	0 (0.0%)	2 (33.3%)	4 (66.7%)	0 (0.0%)	4 (44.4%)	5 (55.6%)	2 (10.5%)	4 (21.1%)	13 (68.4%)	1 (4.8%)	9 (42.9%)	11 (52.4%)
Weather	5.2 (2.4)	5 (3-7)	16 (29.1%)	19 (34.5%)	20 (36.4%)	1 (16.7%)	2 (33.3%)	3 (50.0%)	1 (11.1%)	6 (66.7%)	2 (22.2%)	6 (31.6%)	7 (36.8%)	6 (31.6%)	8 (38.1%)	4 (19.0%)	9 (42.9%)
Natural scenery	4.8 (2.3)	5 (3-6)	20 (36.4%)	23 (41.8%)	12 (21.8%)	1 (16.7%)	2 (33.3%)	3 (50.0%)	3 (33.3%)	3 (33.3%)	3 (33.3%)	7 (36.8%)	11 (57.9%)	1 (5.3%)	9 (42.9%)	7 (33.3%)	5 (23.8%)
Environmental quality	5.5 (2.2)	6 (4-7)	11 (20.8%)	24 (45.3%)	18 (34.0%)	0 (0.0%)	4 (66.7%)	2 (33.3%)	1 (11.1%)	5 (55.6%)	3 (33.3%)	4 (22.2%)	8 (44.4%)	6 (33.3%)	6 (30.0%)	7 (35.0%)	7 (35.0%)
Social factors	6.4 (2.0)	7 (5-8)	4 (7.3%)	21 (38.2%)	30 (54.5%)	0 (0.0%)	3 (50.0%)	3 (50.0%)	0 (0.0%)	3 (33.3%)	6 (66.7%)	2 (10.5%)	7 (36.8%)	10 (52.6%)	2 (9.5%)	8 (38.1%)	11 (52.4%)
Social attitude	5.8 (2.2)	6 (4-7)	8 (14.5%)	25 (45.5%)	22 (40.0%)	1 (16.7%)	3 (50.0%)	2 (33.3%)	0 (0.0%)	4 (44.4%)	5 (55.6%)	5 (26.3%)	7 (36.8%)	7 (36.8%)	2 (9.5%)	11 (52.4%)	8 (38.1%)
Social capital	5.9 (2.0)	6 (4.5-7.5)	6 (10.7%)	26 (46.4%)	24 (42.9%)	0 (0.0%)	3 (50.0%)	3 (50.0%)	0 (0.0%)	3 (33.3%)	6 (66.7%)	5 (26.3%)	8 (42.1%)	6 (31.6%)	1 (4.5%)	12 (54.5%)	9 (40.9%)
Social cohesion	5.5 (1.9)	5 (4-7)	9 (16.7%)	27 (50.0%)	18 (33.3%)	1 (16.7%)	3 (50.0%)	2 (33.3%)	1 (11.1%)	3 (33.3%)	5 (55.6%)	5 (27.8%)	10 (55.6%)	3 (16.7%)	2 (9.5%)	11 (52.4%)	8 (38.1%)

Factors	All Experts (n=60/78)					Older Adults (n=7/9)			Caregivers (n=9/11)			Researchers (n=20/28)			Clinicians (n=24/26)		
	Mean (SD)	Median (IQR)	1-3, N (%)	4-6, N (%)	7-9, N (%)	1-3, N (%)	4-6, N (%)	7-9, N (%)	1-3, N (%)	4-6, N (%)	7-9, N (%)	1-3, N (%)	4-6, N (%)	7-9, N (%)	1-3, N (%)	4-6, N (%)	7-9, N (%)
Financial determinants (n=3)																	
Personal income	5.6 (2.4)	5 (4-7)	11 (19.0%)	22 (37.9%)	25 (43.1%)	2 (28.6%)	1 (14.3%)	4 (57.1%)	0 (0.0%)	4 (44.4%)	5 (55.6%)	6 (31.6%)	6 (31.6%)	7 (36.8%)	3 (13.0%)	11 (47.8%)	9 (39.1%)
Household income	5.3 (2.3)	5 (4-7)	12 (20.7%)	27 (46.6%)	19 (32.8%)	2 (28.6%)	1 (14.3%)	4 (57.1%)	0 (0.0%)	6 (66.7%)	3 (33.3%)	5 (26.3%)	8 (42.1%)	6 (31.6%)	5 (21.7%)	12 (52.2%)	6 (26.1%)
Family income	5.1 (2.3)	5 (4-7)	12 (21.8%)	27 (49.1%)	16 (29.1%)	2 (28.6%)	1 (14.3%)	4 (57.1%)	0 (0.0%)	6 (66.7%)	3 (33.3%)	6 (35.3%)	8 (47.1%)	3 (17.6%)	4 (18.2%)	12 (54.5%)	6 (27.3%)
Personal determinants (n=11)																	
Age	6.8 (2.3)	7 (6-9)	7 (12.3%)	13 (22.8%)	37 (64.9%)	1 (16.7%)	1 (16.7%)	4 (66.7%)	1 (11.1%)	2 (22.2%)	6 (66.7%)	1 (5.3%)	3 (15.8%)	15 (78.9%)	4 (17.4%)	7 (30.4%)	12 (52.2%)
Gender	4.8 (2.4)	5 (3-7)	22 (38.6%)	18 (31.6%)	17 (29.8%)	3 (50.0%)	1 (16.7%)	2 (33.3%)	3 (33.3%)	2 (22.2%)	4 (44.4%)	5 (26.3%)	11 (57.9%)	3 (15.8%)	11 (47.8%)	4 (17.4%)	8 (34.8%)
Sex	4.8 (2.4)	5 (3-7)	23 (40.4%)	17 (29.8%)	17 (29.8%)	3 (50.0%)	2 (33.3%)	1 (16.7%)	3 (33.3%)	2 (22.2%)	4 (44.4%)	6 (31.6%)	9 (47.4%)	4 (21.1%)	11 (47.8%)	4 (17.4%)	8 (34.8%)
Culture	5.2 (2.1)	5 (3-6)	15 (26.3%)	28 (49.1%)	14 (24.6%)	3 (50.0%)	2 (33.3%)	1 (16.7%)	0 (0.0%)	5 (55.6%)	4 (44.4%)	3 (15.8%)	12 (63.2%)	4 (21.1%)	9 (39.1%)	9 (39.1%)	5 (21.7%)
Ethnicity	4.6 (2.3)	5 (3-6)	24 (42.1%)	20 (35.1%)	13 (22.8%)	3 (50.0%)	2 (33.3%)	1 (16.7%)	2 (22.2%)	2 (22.2%)	5 (55.6%)	9 (47.4%)	7 (36.8%)	3 (15.8%)	10 (43.5%)	9 (39.1%)	4 (17.4%)
Race	4.4 (2.4)	4 (3-6)	25 (44.6%)	19 (33.9%)	12 (21.4%)	4 (66.7%)	1 (16.7%)	1 (16.7%)	2 (25.0%)	3 (37.5%)	3 (37.5%)	9 (47.4%)	7 (36.8%)	3 (15.8%)	10 (43.5%)	8 (34.8%)	5 (21.7%)
Educational level	5.1 (2.1)	5 (3-6)	16 (28.1%)	27 (47.4%)	14 (24.6%)	3 (50.0%)	2 (33.3%)	1 (16.7%)	2 (22.2%)	5 (55.6%)	2 (22.2%)	3 (15.8%)	10 (52.6%)	6 (31.6%)	8 (34.8%)	10 (43.5%)	5 (21.7%)
Occupation	5.3 (2.3)	6 (3-7)	15 (26.3%)	22 (38.6%)	20 (35.1%)	3 (50.0%)	2 (33.3%)	1 (16.7%)	4 (44.4%)	4 (44.4%)	1 (11.1%)	3 (15.8%)	9 (47.4%)	7 (36.8%)	5 (21.7%)	7 (30.4%)	11 (47.8%)
Marital status	5.2 (2.2)	5 (4-7)	13 (22.8%)	27 (47.4%)	17 (29.8%)	2 (33.3%)	2 (33.3%)	2 (33.3%)	0 (0.0%)	7 (77.8%)	2 (22.2%)	4 (21.1%)	9 (47.4%)	6 (31.6%)	7 (30.4%)	9 (39.1%)	7 (30.4%)
Religion	3.4 (2.2)	3 (2-5)	36 (65.5%)	14 (25.5%)	5 (9.1%)	4 (66.7%)	1 (16.7%)	1 (16.7%)	5 (62.5%)	3 (37.5%)	0 (0.0%)	13 (72.2%)	5 (27.8%)	0 (0.0%)	14 (60.9%)	5 (21.7%)	4 (17.4%)
Smoking and alcohol consumption	6.5 (2.0)	7 (6-8)	5 (9.1%)	19 (34.5%)	31 (56.4%)	1 (16.7%)	4 (66.7%)	1 (16.7%)	0 (0.0%)	1 (12.5%)	7 (87.5%)	2 (11.1%)	6 (33.3%)	10 (55.6%)	2 (8.7%)	8 (34.8%)	13 (56.5%)
Physical determinants (n=24)																	
Muscle strength	7.4 (1.7)	8 (7-9)	3 (5.2%)	7 (12.1%)	48 (82.8%)	0 (0.0%)	1 (14.3%)	6 (85.7%)	1 (11.1%)	1 (11.1%)	7 (77.8%)	2 (10.0%)	4 (20.0%)	14 (70.0%)	0 (0.0%)	1 (4.5%)	21 (95.5%)
Muscle power	7.0 (1.9)	7 (6-9)	3 (5.2%)	17 (29.3%)	38 (65.5%)	0 (0.0%)	2 (28.6%)	5 (71.4%)	2 (22.2%)	1 (11.1%)	6 (66.7%)	1 (5.0%)	9 (45.0%)	10 (50.0%)	0 (0.0%)	5 (22.7%)	17 (77.3%)
Muscle endurance	6.6 (1.8)	7 (6-8)	6 (10.5%)	18 (31.6%)	33 (57.9%)	0 (0.0%)	1 (14.3%)	6 (85.7%)	2 (25.0%)	1 (12.5%)	5 (62.5%)	4 (20.0%)	5 (25.0%)	11 (55.0%)	0 (0.0%)	11 (50.0%)	11 (50.0%)
Muscle coordination	6.8 (2.0)	7 (6-8)	5 (8.8%)	16 (28.1%)	36 (63.2%)	1 (14.3%)	1 (14.3%)	5 (71.4%)	1 (12.5%)	1 (12.5%)	6 (75.0%)	3 (15.0%)	7 (35.0%)	10 (50.0%)	0 (0.0%)	7 (31.8%)	15 (68.2%)
Range of motion	6.5 (1.7)	7 (5-8)	2 (3.5%)	26 (45.6%)	29 (50.9%)	0 (0.0%)	3 (42.9%)	4 (57.1%)	0 (0.0%)	4 (50.0%)	4 (50.0%)	1 (5.0%)	12 (60.0%)	7 (35.0%)	1 (4.5%)	7 (31.8%)	14 (63.6%)
Body composition	5.3 (2.2)	5 (4-7)	13 (23.2%)	28 (50.0%)	15 (26.8%)	0 (0.0%)	3 (42.9%)	4 (57.1%)	3 (37.5%)	2 (25.0%)	3 (37.5%)	7 (36.8%)	11 (57.9%)	1 (5.3%)	3 (13.6%)	12 (54.5%)	7 (31.8%)
Proprioception	6.3 (1.9)	6 (5-8)	4 (7.1%)	26 (46.4%)	26 (46.4%)	0 (0.0%)	4 (66.7%)	2 (33.3%)	2 (25.0%)	2 (25.0%)	4 (50.0%)	2 (10.0%)	10 (50.0%)	8 (40.0%)	0 (0.0%)	10 (45.5%)	12 (54.5%)
Sensation	6.4 (1.7)	7 (5-7)	2 (3.6%)	24 (42.9%)	30 (53.6%)	0 (0.0%)	2 (28.6%)	5 (71.4%)	1 (12.5%)	3 (37.5%)	4 (50.0%)	1 (5.3%)	11 (57.9%)	7 (36.8%)	0 (0.0%)	8 (36.4%)	14 (63.6%)
Pain	7.6 (1.5)	8 (7-9)	1 (1.7%)	12 (20.7%)	45 (77.6%)	0 (0.0%)	0 (0.0%)	7 (100.0%)	0 (0.0%)	0 (0.0%)	9 (100.0%)	1 (5.0%)	6 (30.0%)	13 (65.0%)	0 (0.0%)	6 (27.3%)	16 (72.7%)
History of falls	8.0 (1.3)	8.5 (7-9)	0 (0.0%)	6 (10.3%)	52 (89.7%)	0 (0.0%)	0 (0.0%)	7 (100.0%)	0 (0.0%)	0 (0.0%)	9 (100.0%)	0 (0.0%)	3 (15.0%)	17 (85.0%)	0 (0.0%)	3 (13.6%)	19 (86.4%)
Balance	7.9 (1.3)	8 (7-9)	1 (1.7%)	6 (10.3%)	51 (87.9%)	0 (0.0%)	3 (42.9%)	4 (57.1%)	0 (0.0%)	0 (0.0%)	9 (100.0%)	1 (5.0%)	2 (10.0%)	17 (85.0%)	0 (0.0%)	1 (4.5%)	21 (95.5%)

Factors	All Experts (n=60/78)					Older Adults (n=7/9)			Caregivers (n=9/11)			Researchers (n=20/28)			Clinicians (n=24/26)		
	Mean (SD)	Median (IQR)	1-3, N (%)	4-6, N (%)	7-9, N (%)	1-3, N (%)	4-6, N (%)	7-9, N (%)	1-3, N (%)	4-6, N (%)	7-9, N (%)	1-3, N (%)	4-6, N (%)	7-9, N (%)	1-3, N (%)	4-6, N (%)	7-9, N (%)
Fatigue	6.9 (1.6)	7 (6-8)	1 (1.7%)	20 (34.5%)	37 (63.8%)	0 (0.0%)	4 (57.1%)	3 (42.9%)	0 (0.0%)	2 (22.2%)	7 (77.8%)	1 (5.0%)	6 (30.0%)	13 (65.0%)	0 (0.0%)	8 (36.4%)	14 (63.6%)
Vision	7.6 (1.4)	8 (7-9)	1 (1.7%)	7 (12.1%)	50 (86.2%)	0 (0.0%)	0 (0.0%)	7 (100.0%)	0 (0.0%)	2 (22.2%)	7 (77.8%)	1 (5.0%)	3 (15.0%)	16 (80.0%)	0 (0.0%)	2 (9.1%)	20 (90.9%)
Number and type of comorbidities	7.2 (1.5)	7 (6-9)	0 (0.0%)	18 (31.6%)	39 (68.4%)	0 (0.0%)	2 (28.6%)	5 (71.4%)	0 (0.0%)	1 (12.5%)	7 (87.5%)	0 (0.0%)	8 (40.0%)	12 (60.0%)	0 (0.0%)	7 (31.8%)	15 (68.2%)
Gait speed	6.3 (1.9)	6 (5-8)	6 (10.5%)	27 (47.4%)	24 (42.1%)	0 (0.0%)	4 (57.1%)	3 (42.9%)	2 (25.0%)	4 (50.0%)	2 (25.0%)	2 (10.0%)	9 (45.0%)	9 (45.0%)	2 (9.1%)	10 (45.5%)	10 (45.5%)
Respiratory system	7.0 (1.5)	7 (6-8)	0 (0.0%)	21 (36.8%)	36 (63.2%)	0 (0.0%)	2 (28.6%)	5 (71.4%)	0 (0.0%)	2 (25.0%)	6 (75.0%)	0 (0.0%)	10 (50.0%)	10 (50.0%)	0 (0.0%)	7 (31.8%)	15 (68.2%)
Speech impairment	5.4 (2.1)	6 (4-7)	11 (19.3%)	27 (47.4%)	19 (33.3%)	0 (0.0%)	2 (28.6%)	5 (71.4%)	0 (0.0%)	5 (55.6%)	4 (44.4%)	8 (40.0%)	9 (45.0%)	3 (15.0%)	3 (14.3%)	11 (52.4%)	7 (33.3%)
Hearing	6.0 (1.9)	6 (5-8)	7 (12.1%)	27 (46.6%)	24 (41.4%)	0 (0.0%)	1 (14.3%)	6 (85.7%)	0 (0.0%)	7 (77.8%)	2 (22.2%)	4 (20.0%)	9 (45.0%)	7 (35.0%)	3 (13.6%)	10 (45.5%)	9 (40.9%)
Dizziness	7.5 (1.4)	8 (7-9)	1 (1.7%)	11 (19.0%)	46 (79.3%)	1 (14.3%)	1 (14.3%)	5 (71.4%)	0 (0.0%)	1 (11.1%)	8 (88.9%)	0 (0.0%)	3 (15.0%)	17 (85.0%)	0 (0.0%)	6 (27.3%)	16 (72.7%)
Frequency of exercise/physical activity	6.5 (1.7)	6 (5-8)	2 (3.5%)	30 (52.6%)	25 (43.9%)	0 (0.0%)	4 (57.1%)	3 (42.9%)	1 (11.1%)	4 (44.4%)	4 (44.4%)	0 (0.0%)	13 (68.4%)	6 (31.6%)	1 (4.5%)	9 (40.9%)	12 (54.5%)
Self-care activities of daily living	7.2 (1.7)	7 (7-9)	3 (5.3%)	11 (19.3%)	43 (75.4%)	0 (0.0%)	2 (28.6%)	5 (71.4%)	1 (11.1%)	2 (22.2%)	6 (66.7%)	2 (10.5%)	4 (21.1%)	13 (68.4%)	0 (0.0%)	3 (13.6%)	19 (86.4%)
Instrumental activities of daily living	7.0 (1.8)	7 (6-9)	3 (5.3%)	15 (26.3%)	39 (68.4%)	0 (0.0%)	2 (28.6%)	5 (71.4%)	0 (0.0%)	3 (33.3%)	6 (66.7%)	3 (15.8%)	4 (21.1%)	12 (63.2%)	0 (0.0%)	6 (27.3%)	16 (72.7%)
Frailty	7.5 (1.4)	7.5 (7-9)	1 (1.8%)	11 (19.6%)	44 (78.6%)	0 (0.0%)	2 (28.6%)	5 (71.4%)	0 (0.0%)	2 (25.0%)	6 (75.0%)	0 (0.0%)	4 (21.1%)	15 (78.9%)	1 (4.5%)	3 (13.6%)	18 (81.8%)
Use of mobility aid	7.7 (1.4)	8 (7-9)	0 (0.0%)	10 (17.2%)	48 (82.8%)	0 (0.0%)	1 (14.3%)	6 (85.7%)	0 (0.0%)	3 (33.3%)	6 (66.7%)	0 (0.0%)	3 (15.0%)	17 (85.0%)	0 (0.0%)	3 (13.6%)	19 (86.4%)
Psychological determinants (n=15)																	
Depression	7.1 (1.7)	7 (6-9)	2 (3.4%)	17 (29.3%)	39 (67.2%)	1 (14.3%)	5 (71.4%)	1 (14.3%)	0 (0.0%)	3 (33.3%)	6 (66.7%)	1 (5.3%)	3 (15.8%)	15 (78.9%)	0 (0.0%)	6 (26.1%)	17 (73.9%)
Self-efficacy	7.0 (1.6)	7 (6-8)	2 (3.4%)	15 (25.9%)	41 (70.7%)	0 (0.0%)	4 (57.1%)	3 (42.9%)	1 (11.1%)	3 (33.3%)	5 (55.6%)	1 (5.3%)	3 (15.8%)	15 (78.9%)	0 (0.0%)	5 (21.7%)	18 (78.3%)
Motivation	6.5 (1.5)	7 (6-7)	3 (5.3%)	21 (36.8%)	33 (57.9%)	1 (14.3%)	3 (42.9%)	3 (42.9%)	0 (0.0%)	5 (62.5%)	3 (37.5%)	2 (10.5%)	7 (36.8%)	10 (52.6%)	0 (0.0%)	6 (26.1%)	17 (73.9%)
Fear of fall	7.9 (1.2)	8 (7-9)	0 (0.0%)	8 (13.8%)	50 (86.2%)	0 (0.0%)	2 (28.6%)	5 (71.4%)	0 (0.0%)	0 (0.0%)	9 (100.0%)	0 (0.0%)	2 (10.5%)	17 (89.5%)	0 (0.0%)	4 (17.4%)	19 (82.6%)
Emotional well being	6.7 (1.6)	7 (6-8)	1 (1.7%)	27 (46.6%)	30 (51.7%)	0 (0.0%)	5 (71.4%)	2 (28.6%)	0 (0.0%)	2 (22.2%)	7 (77.8%)	1 (5.3%)	7 (36.8%)	11 (57.9%)	0 (0.0%)	13 (56.5%)	10 (43.5%)
Self-perceived fatigue	6.6 (1.7)	6.5 (5.5-8)	3 (5.4%)	25 (44.6%)	28 (50.0%)	0 (0.0%)	4 (57.1%)	3 (42.9%)	1 (11.1%)	4 (44.4%)	4 (44.4%)	2 (10.5%)	8 (42.1%)	9 (47.4%)	0 (0.0%)	9 (42.9%)	12 (57.1%)
Anxiety	6.7 (1.5)	7 (6-8)	1 (1.7%)	24 (41.4%)	33 (56.9%)	0 (0.0%)	6 (85.7%)	1 (14.3%)	0 (0.0%)	5 (55.6%)	4 (44.4%)	1 (5.3%)	4 (21.1%)	14 (73.7%)	0 (0.0%)	9 (39.1%)	14 (60.9%)
Apathy	6.2 (1.6)	6 (5-7)	3 (5.4%)	29 (51.8%)	24 (42.9%)	0 (0.0%)	6 (85.7%)	1 (14.3%)	0 (0.0%)	4 (57.1%)	3 (42.9%)	2 (10.5%)	10 (52.6%)	7 (36.8%)	1 (4.3%)	9 (39.1%)	13 (56.5%)
Fear of reinjury	7.2 (1.7)	7 (6-9)	2 (3.5%)	17 (29.8%)	38 (66.7%)	0 (0.0%)	3 (42.9%)	4 (57.1%)	0 (0.0%)	3 (33.3%)	6 (66.7%)	2 (10.5%)	3 (15.8%)	14 (73.7%)	0 (0.0%)	8 (36.4%)	14 (63.6%)
Affect	5.7 (1.8)	6 (5-7)	7 (13.7%)	28 (54.9%)	16 (31.4%)	0 (0.0%)	6 (85.7%)	1 (14.3%)	1 (14.3%)	4 (57.1%)	2 (28.6%)	3 (17.6%)	8 (47.1%)	6 (35.3%)	3 (15.0%)	10 (50.0%)	7 (35.0%)
Extraversion	4.8 (2.0)	5 (3-6)	18 (34.6%)	25 (48.1%)	9 (17.3%)	0 (0.0%)	6 (85.7%)	1 (14.3%)	3 (42.9%)	1 (14.3%)	3 (42.9%)	5 (29.4%)	10 (58.8%)	2 (11.8%)	10 (47.6%)	8 (38.1%)	3 (14.3%)
Openness	5.0 (2.0)	5 (3-6)	17 (31.5%)	26 (48.1%)	11 (20.4%)	1 (14.3%)	5 (71.4%)	1 (14.3%)	2 (25.0%)	4 (50.0%)	2 (25.0%)	6 (35.3%)	10 (58.8%)	1 (5.9%)	8 (36.4%)	7 (31.8%)	7 (31.8%)
Agreeableness	4.9 (1.8)	5 (3-6)	17 (31.5%)	27 (50.0%)	10 (18.5%)	1 (14.3%)	5 (71.4%)	1 (14.3%)	2 (25.0%)	5 (62.5%)	1 (12.5%)	8 (47.1%)	7 (41.2%)	2 (11.8%)	6 (27.3%)	10 (45.5%)	6 (27.3%)

Factors	All Experts (n=60/78)					Older Adults (n=7/9)			Caregivers (n=9/11)			Researchers (n=20/28)			Clinicians (n=24/26)		
	Mean (SD)	Median (IQR)	1-3, N (%)	4-6, N (%)	7-9, N (%)	1-3, N (%)	4-6, N (%)	7-9, N (%)	1-3, N (%)	4-6, N (%)	7-9, N (%)	1-3, N (%)	4-6, N (%)	7-9, N (%)	1-3, N (%)	4-6, N (%)	7-9, N (%)
Affect	5.7 (1.8)	6 (5-7)	7 (13.7%)	28 (54.9%)	16 (31.4%)	0 (0.0%)	6 (85.7%)	1 (14.3%)	1 (14.3%)	4 (57.1%)	2 (28.6%)	3 (17.6%)	8 (47.1%)	6 (35.3%)	3 (15.0%)	10 (50.0%)	7 (35.0%)
Extraversion	4.8 (2.0)	5 (3-6)	18 (34.6%)	25 (48.1%)	9 (17.3%)	0 (0.0%)	6 (85.7%)	1 (14.3%)	3 (42.9%)	1 (14.3%)	3 (42.9%)	5 (29.4%)	10 (58.8%)	2 (11.8%)	10 (47.6%)	8 (38.1%)	3 (14.3%)
Openness	5.0 (2.0)	5 (3-6)	17 (31.5%)	26 (48.1%)	11 (20.4%)	1 (14.3%)	5 (71.4%)	1 (14.3%)	2 (25.0%)	4 (50.0%)	2 (25.0%)	6 (35.3%)	10 (58.8%)	1 (5.9%)	8 (36.4%)	7 (31.8%)	7 (31.8%)
Agreeableness	4.9 (1.8)	5 (3-6)	17 (31.5%)	27 (50.0%)	10 (18.5%)	1 (14.3%)	5 (71.4%)	1 (14.3%)	2 (25.0%)	5 (62.5%)	1 (12.5%)	8 (47.1%)	7 (41.2%)	2 (11.8%)	6 (27.3%)	10 (45.5%)	6 (27.3%)
Neuroticism	5.1 (2.1)	5 (3-6.5)	16 (30.8%)	23 (44.2%)	13 (25.0%)	2 (28.6%)	4 (57.1%)	1 (14.3%)	3 (37.5%)	3 (37.5%)	2 (25.0%)	6 (37.5%)	7 (43.8%)	3 (18.8%)	5 (23.8%)	9 (42.9%)	7 (33.3%)
Conscientiousness	4.9 (2.0)	5 (3-6)	18 (34.0%)	23 (43.4%)	12 (22.6%)	1 (14.3%)	6 (85.7%)	0 (0.0%)	3 (37.5%)	4 (50.0%)	1 (12.5%)	8 (50.0%)	6 (37.5%)	2 (12.5%)	6 (27.3%)	7 (31.8%)	9 (40.9%)
Social determinants (n=6)																	
Living situation	8.0 (1.3)	9 (7-9)	0 (0.0%)	9 (16.1%)	47 (83.9%)	0 (0.0%)	2 (33.3%)	4 (66.7%)	0 (0.0%)	0 (0.0%)	9 (100.0%)	0 (0.0%)	3 (15.8%)	16 (84.2%)	0 (0.0%)	4 (18.2%)	18 (81.8%)
Loneliness (emotional and social loneliness)	7.2 (1.6)	7 (6-9)	1 (1.8%)	18 (32.1%)	37 (66.1%)	0 (0.0%)	3 (50.0%)	3 (50.0%)	0 (0.0%)	2 (22.2%)	7 (77.8%)	1 (5.3%)	4 (21.1%)	14 (73.7%)	0 (0.0%)	9 (40.9%)	13 (59.1%)
Social isolation	7.1 (1.4)	7 (6-8)	0 (0.0%)	18 (32.7%)	37 (67.3%)	0 (0.0%)	3 (50.0%)	3 (50.0%)	0 (0.0%)	3 (33.3%)	6 (66.7%)	0 (0.0%)	4 (21.1%)	15 (78.9%)	0 (0.0%)	8 (38.1%)	13 (61.9%)
Social participation	7.1 (1.6)	7 (6-8)	2 (3.6%)	14 (25.0%)	40 (71.4%)	1 (16.7%)	2 (33.3%)	3 (50.0%)	0 (0.0%)	3 (33.3%)	6 (66.7%)	1 (5.3%)	3 (15.8%)	15 (78.9%)	0 (0.0%)	6 (27.3%)	16 (72.7%)
Social network (quality and quantity)	6.7 (1.6)	7 (6-8)	3 (5.4%)	17 (30.4%)	36 (64.3%)	1 (16.7%)	2 (33.3%)	3 (50.0%)	0 (0.0%)	2 (22.2%)	7 (77.8%)	0 (0.0%)	9 (47.4%)	10 (52.6%)	2 (9.1%)	4 (18.2%)	16 (72.7%)
Social support	7.7 (1.3)	8 (7-9)	1 (1.8%)	9 (16.1%)	46 (82.1%)	0 (0.0%)	2 (33.3%)	4 (66.7%)	0 (0.0%)	1 (11.1%)	8 (88.9%)	1 (5.3%)	3 (15.8%)	15 (78.9%)	0 (0.0%)	3 (13.6%)	19 (86.4%)

Notes:

1. 78 participants were invited to participate, 60 participated (77% response rate). Only the 60 participants were invited in the subsequent Rounds. Participants rated 84 factors, of which 16 factors reached consensus in Round 1.

2. Cells highlighted in green indicate consensus was reached among that category. For instance, under cognitive determinants, visuospatial function reached consensus across all groups but only among caregivers, and clinicians, but not among researchers or older adults. Attention only reached consensus among clinicians and not in any other group.

3. 1-3 = Not important; 4-6 = Important; 7-9 = Critical. Consensus is reached for each factor when ≥70% of experts rated a factor as "Critical" (scores ≥7) and ≤15% of experts rated a factor as "Not Important" (scores ≤3).

4. N = number of; % = percentages; SD = Standard Deviation; IQR = Interquartile Range

Round 2 Ratings

Factors	All Experts (n=52/60)					Older Adults (n=7/7)			Caregivers (n=7/9)			Researchers (n=19/20)			Clinicians (n=19/24)		
	Mean (SD)	Median (IQR)	1-3, N (%)	4-6, N (%)	7-9, N (%)	1-3, N (%)	4-6, N (%)	7-9, N (%)	1-3, N (%)	4-6, N (%)	7-9, N (%)	1-3, N (%)	4-6, N (%)	7-9, N (%)	1-3, N (%)	4-6, N (%)	7-9, N (%)
Cognitive determinants (n=6)																	
Attention	7.1 (1.9)	7 (6.5-9)	4 (7.7%)	9 (17.3%)	39 (75.0%)	1 (14.3%)	3 (42.9%)	3 (42.9%)	2 (25.0%)	2 (25.0%)	4 (50.0%)	0 (0.0%)	2 (10.5%)	17 (89.5%)	1 (5.6%)	2 (11.1%)	15 (83.3%)
Executive function	6.9 (1.7)	7 (7-8)	2 (3.9%)	10 (19.6%)	39 (76.5%)	0 (0.0%)	3 (42.9%)	4 (57.1%)	0 (0.0%)	2 (28.6%)	5 (71.4%)	0 (0.0%)	2 (11.1%)	16 (88.9%)	2 (11.1%)	2 (11.1%)	14 (77.8%)
Language	6.2 (1.9)	7 (6-7)	6 (11.5%)	19 (36.5%)	27 (51.9%)	2 (28.6%)	2 (28.6%)	3 (42.9%)	0 (0.0%)	3 (37.5%)	5 (62.5%)	2 (11.1%)	10 (55.6%)	6 (33.3%)	2 (11.1%)	4 (22.2%)	12 (66.7%)
Memory	7.2 (1.5)	7 (7-8)	1 (1.9%)	9 (17.3%)	42 (80.8%)	0 (0.0%)	2 (28.6%)	5 (71.4%)	0 (0.0%)	1 (12.5%)	7 (87.5%)	0 (0.0%)	3 (16.7%)	15 (83.3%)	1 (5.6%)	3 (16.7%)	14 (77.8%)
Processing speed	6.3 (1.7)	6 (6-7)	3 (5.8%)	29 (55.8%)	20 (38.5%)	0 (0.0%)	3 (42.9%)	4 (57.1%)	1 (12.5%)	3 (37.5%)	4 (50.0%)	1 (5.6%)	13 (72.2%)	4 (22.2%)	1 (5.6%)	10 (55.6%)	7 (38.9%)
Global cognition	7.1 (1.6)	7 (6-8)	2 (3.9%)	14 (27.5%)	35 (68.6%)	0 (0.0%)	3 (42.9%)	4 (57.1%)	1 (14.3%)	0 (0.0%)	6 (85.7%)	0 (0.0%)	5 (27.8%)	13 (72.2%)	1 (5.6%)	5 (27.8%)	12 (66.7%)
Environmental determinants (n=18)																	
Street characteristics	5.8 (1.9)	6 (5-7)	6 (11.8%)	23 (45.1%)	22 (43.1%)	1 (14.3%)	5 (71.4%)	1 (14.3%)	1 (12.5%)	4 (50.0%)	3 (37.5%)	1 (5.6%)	8 (44.4%)	9 (50.0%)	3 (17.6%)	6 (35.3%)	8 (47.1%)
Residential characteristics	6.3 (2.1)	7 (5-7.5)	6 (11.5%)	19 (36.5%)	27 (51.9%)	1 (14.3%)	2 (28.6%)	4 (57.1%)	0 (0.0%)	1 (12.5%)	7 (87.5%)	1 (5.6%)	13 (72.2%)	4 (22.2%)	4 (22.2%)	3 (16.7%)	11 (61.1%)
Land use mix	4.5 (2.3)	5 (3-6)	17 (36.2%)	21 (44.7%)	9 (19.1%)	0 (0.0%)	5 (71.4%)	2 (28.6%)	3 (42.9%)	1 (14.3%)	3 (42.9%)	4 (26.7%)	11 (73.3%)	0 (0.0%)	10 (58.8%)	4 (23.5%)	3 (17.6%)
Sidewalk characteristics	6.1 (1.7)	6 (5-7)	3 (6.0%)	23 (46.0%)	24 (48.0%)	0 (0.0%)	3 (42.9%)	4 (57.1%)	0 (0.0%)	5 (62.5%)	3 (37.5%)	0 (0.0%)	7 (41.2%)	10 (58.8%)	3 (17.6%)	8 (47.1%)	6 (35.3%)
Crime-related safety	5.8 (1.7)	6 (5-7)	5 (9.8%)	28 (54.9%)	18 (35.3%)	0 (0.0%)	2 (28.6%)	5 (71.4%)	0 (0.0%)	3 (37.5%)	5 (62.5%)	2 (11.1%)	12 (66.7%)	4 (22.2%)	3 (17.6%)	11 (64.7%)	3 (17.6%)
Traffic-related safety	6.2 (1.6)	6 (5-7)	3 (5.9%)	23 (45.1%)	25 (49.0%)	1 (14.3%)	4 (57.1%)	2 (28.6%)	0 (0.0%)	3 (37.5%)	5 (62.5%)	0 (0.0%)	8 (44.4%)	10 (55.6%)	2 (11.8%)	8 (47.1%)	7 (41.2%)
Access to recreational facilities	5.8 (1.6)	6 (5-7)	4 (7.8%)	31 (60.8%)	16 (31.4%)	0 (0.0%)	3 (42.9%)	4 (57.1%)	1 (12.5%)	7 (87.5%)	0 (0.0%)	1 (5.6%)	16 (88.9%)	1 (5.6%)	2 (11.8%)	5 (29.4%)	10 (58.8%)
Access to destinations	6.5 (1.7)	7 (6-7)	4 (8.0%)	12 (24.0%)	34 (68.0%)	0 (0.0%)	3 (42.9%)	4 (57.1%)	1 (12.5%)	3 (37.5%)	4 (50.0%)	1 (5.9%)	4 (23.5%)	12 (70.6%)	2 (11.8%)	2 (11.8%)	13 (76.5%)
Access to rest areas	6.4 (1.7)	7 (6-7)	4 (8.0%)	14 (28.0%)	32 (64.0%)	0 (0.0%)	3 (42.9%)	4 (57.1%)	1 (12.5%)	3 (37.5%)	4 (50.0%)	1 (5.9%)	4 (23.5%)	12 (70.6%)	2 (11.8%)	4 (23.5%)	11 (64.7%)
Access to public transit	6.6 (1.5)	7 (6-7)	2 (3.9%)	13 (25.5%)	36 (70.6%)	1 (14.3%)	3 (42.9%)	3 (42.9%)	0 (0.0%)	3 (37.5%)	5 (62.5%)	1 (5.6%)	2 (11.1%)	15 (83.3%)	0 (0.0%)	5 (29.4%)	12 (70.6%)
Weather	5.0 (2.2)	5 (3-7)	16 (31.4%)	16 (31.4%)	19 (37.3%)	1 (14.3%)	2 (28.6%)	4 (57.1%)	2 (25.0%)	4 (50.0%)	2 (25.0%)	6 (33.3%)	6 (33.3%)	6 (33.3%)	7 (41.2%)	3 (17.6%)	7 (41.2%)
Natural scenery	4.6 (2.1)	5 (3-6)	19 (37.3%)	25 (49.0%)	7 (13.7%)	1 (14.3%)	3 (42.9%)	3 (42.9%)	3 (37.5%)	4 (50.0%)	1 (12.5%)	7 (38.9%)	10 (55.6%)	1 (5.6%)	8 (47.1%)	7 (41.2%)	2 (11.8%)
Environmental quality	5.4 (2.1)	6 (4-7)	9 (18.0%)	26 (52.0%)	15 (30.0%)	0 (0.0%)	4 (57.1%)	3 (42.9%)	1 (12.5%)	6 (75.0%)	1 (12.5%)	3 (17.6%)	12 (70.6%)	2 (11.8%)	5 (29.4%)	4 (23.5%)	8 (47.1%)
Social factors	6.2 (1.9)	7 (5-7)	4 (8.0%)	19 (38.0%)	27 (54.0%)	0 (0.0%)	3 (42.9%)	4 (57.1%)	0 (0.0%)	3 (37.5%)	5 (62.5%)	1 (5.9%)	8 (47.1%)	8 (47.1%)	3 (17.6%)	5 (29.4%)	9 (52.9%)
Social attitude	5.5 (2.1)	5 (4-7)	9 (17.6%)	22 (43.1%)	20 (39.2%)	1 (14.3%)	4 (57.1%)	2 (28.6%)	0 (0.0%)	4 (50.0%)	4 (50.0%)	5 (27.8%)	6 (33.3%)	7 (38.9%)	3 (17.6%)	8 (47.1%)	6 (35.3%)
Social capital	5.8 (1.9)	6 (4-7)	6 (11.5%)	24 (46.2%)	22 (42.3%)	0 (0.0%)	4 (57.1%)	3 (42.9%)	0 (0.0%)	2 (25.0%)	6 (75.0%)	4 (22.2%)	10 (55.6%)	4 (22.2%)	2 (11.1%)	8 (44.4%)	8 (44.4%)
Social cohesion	5.5 (1.9)	5 (4-7)	8 (15.7%)	26 (51.0%)	17 (33.3%)	1 (14.3%)	4 (57.1%)	2 (28.6%)	1 (12.5%)	3 (37.5%)	4 (50.0%)	4 (23.5%)	12 (70.6%)	1 (5.9%)	2 (11.1%)	7 (38.9%)	9 (50.0%)
Government/institutional support systems	6.6 (1.6)	7 (6-7.5)	2 (3.8%)	20 (38.5%)	30 (57.7%)	0 (0.0%)	4 (57.1%)	3 (42.9%)	0 (0.0%)	3 (37.5%)	5 (62.5%)	2 (11.1%)	6 (33.3%)	10 (55.6%)	0 (0.0%)	7 (38.9%)	11 (61.1%)

Factors	All Experts (n=52/60)					Older Adults (n=7/7)			Caregivers (n=7/9)			Researchers (n=19/20)			Clinicians (n=19/24)		
	Mean (SD)	Median (IQR)	1-3, N (%)	4-6, N (%)	7-9, N (%)	1-3, N (%)	4-6, N (%)	7-9, N (%)	1-3, N (%)	4-6, N (%)	7-9, N (%)	1-3, N (%)	4-6, N (%)	7-9, N (%)	1-3, N (%)	4-6, N (%)	7-9, N (%)
Financial determinants (n=3)																	
Personal income	6.0 (2.0)	7 (5-7)	8 (15.4%)	16 (30.8%)	28 (53.8%)	3 (42.9%)	1 (14.3%)	3 (42.9%)	0 (0.0%)	3 (37.5%)	5 (62.5%)	4 (22.2%)	6 (33.3%)	8 (44.4%)	1 (5.6%)	6 (33.3%)	11 (61.1%)
Household income	5.5 (2.2)	5 (4-7)	10 (19.2%)	23 (44.2%)	19 (36.5%)	3 (42.9%)	1 (14.3%)	3 (42.9%)	0 (0.0%)	4 (50.0%)	4 (50.0%)	4 (22.2%)	11 (61.1%)	3 (16.7%)	3 (16.7%)	7 (38.9%)	8 (44.4%)
Family income	5.2 (2.2)	5 (4-7)	10 (19.6%)	26 (51.0%)	15 (29.4%)	3 (42.9%)	1 (14.3%)	3 (42.9%)	0 (0.0%)	5 (62.5%)	3 (37.5%)	5 (29.4%)	11 (64.7%)	1 (5.9%)	2 (11.1%)	9 (50.0%)	7 (38.9%)
Personal determinants (n=11)																	
Age	7.1 (2.1)	7 (6.5-9)	5 (9.6%)	8 (15.4%)	39 (75.0%)	1 (14.3%)	2 (28.6%)	4 (57.1%)	1 (12.5%)	2 (25.0%)	5 (62.5%)	1 (5.6%)	1 (5.6%)	16 (88.9%)	2 (11.1%)	3 (16.7%)	13 (72.2%)
Gender	4.7 (2.1)	5 (3-6.5)	21 (40.4%)	18 (34.6%)	13 (25.0%)	4 (57.1%)	1 (14.3%)	2 (28.6%)	4 (50.0%)	0 (0.0%)	4 (50.0%)	3 (16.7%)	14 (77.8%)	1 (5.6%)	10 (55.6%)	3 (16.7%)	5 (27.8%)
Sex	4.5 (2.3)	5 (3-7)	24 (46.2%)	13 (25.0%)	15 (28.8%)	4 (57.1%)	1 (14.3%)	2 (28.6%)	4 (50.0%)	0 (0.0%)	4 (50.0%)	6 (33.3%)	10 (55.6%)	2 (11.1%)	10 (55.6%)	2 (11.1%)	6 (33.3%)
Culture	4.9 (1.9)	5 (4-6)	12 (23.1%)	32 (61.5%)	8 (15.4%)	4 (57.1%)	1 (14.3%)	2 (28.6%)	0 (0.0%)	6 (75.0%)	2 (25.0%)	1 (5.6%)	16 (88.9%)	1 (5.6%)	7 (38.9%)	9 (50.0%)	2 (11.1%)
Ethnicity	4.2 (2.1)	3 (3-5)	27 (51.9%)	18 (34.6%)	7 (13.5%)	4 (57.1%)	1 (14.3%)	2 (28.6%)	2 (25.0%)	4 (50.0%)	2 (25.0%)	11 (61.1%)	6 (33.3%)	1 (5.6%)	10 (55.6%)	7 (38.9%)	1 (5.6%)
Race	3.9 (2.0)	3 (3-5)	33 (63.5%)	11 (21.2%)	8 (15.4%)	5 (71.4%)	1 (14.3%)	1 (14.3%)	2 (25.0%)	4 (50.0%)	2 (25.0%)	13 (72.2%)	4 (22.2%)	1 (5.6%)	13 (72.2%)	2 (11.1%)	3 (16.7%)
Educational level	4.7 (2.0)	5 (3-6)	17 (32.7%)	27 (51.9%)	8 (15.4%)	4 (57.1%)	2 (28.6%)	1 (14.3%)	3 (37.5%)	4 (50.0%)	1 (12.5%)	2 (11.1%)	14 (77.8%)	2 (11.1%)	8 (44.4%)	6 (33.3%)	4 (22.2%)
Occupation	5.6 (1.7)	6 (5-7)	8 (15.4%)	28 (53.8%)	16 (30.8%)	3 (42.9%)	3 (42.9%)	1 (14.3%)	2 (25.0%)	5 (62.5%)	1 (12.5%)	0 (0.0%)	14 (77.8%)	4 (22.2%)	3 (16.7%)	6 (33.3%)	9 (50.0%)
Marital status	5.3 (1.9)	5 (4-7)	8 (15.4%)	29 (55.8%)	15 (28.8%)	2 (28.6%)	2 (28.6%)	3 (42.9%)	0 (0.0%)	8 (100.0%)	0 (0.0%)	0 (0.0%)	14 (77.8%)	4 (22.2%)	6 (33.3%)	5 (27.8%)	7 (38.9%)
Religion	3.1 (1.8)	3 (2-4)	35 (70.0%)	13 (26.0%)	2 (4.0%)	5 (71.4%)	1 (14.3%)	1 (14.3%)	3 (42.9%)	4 (57.1%)	0 (0.0%)	13 (76.5%)	4 (23.5%)	0 (0.0%)	14 (77.8%)	3 (16.7%)	1 (5.6%)
Smoking and alcohol consumption	6.6 (1.7)	7 (6-7)	3 (5.9%)	17 (33.3%)	31 (60.8%)	1 (14.3%)	4 (57.1%)	2 (28.6%)	0 (0.0%)	3 (37.5%)	5 (62.5%)	1 (5.9%)	4 (23.5%)	12 (70.6%)	1 (5.6%)	6 (33.3%)	11 (61.1%)
Physical determinants (n=19)																	
Muscle power	7.2 (1.6)	7 (6-9)	1 (1.9%)	13 (25.0%)	38 (73.1%)	0 (0.0%)	2 (28.6%)	5 (71.4%)	0 (0.0%)	2 (25.0%)	6 (75.0%)	1 (5.6%)	6 (33.3%)	11 (61.1%)	0 (0.0%)	3 (16.7%)	15 (83.3%)
Muscle endurance	6.8 (1.8)	7 (6-8)	5 (9.6%)	9 (17.3%)	38 (73.1%)	0 (0.0%)	2 (28.6%)	5 (71.4%)	2 (25.0%)	0 (0.0%)	6 (75.0%)	2 (11.1%)	4 (22.2%)	12 (66.7%)	1 (5.6%)	3 (16.7%)	14 (77.8%)
Muscle coordination	7.2 (1.5)	7 (6.5-8.5)	1 (1.9%)	12 (23.1%)	39 (75.0%)	1 (14.3%)	2 (28.6%)	4 (57.1%)	0 (0.0%)	2 (25.0%)	6 (75.0%)	0 (0.0%)	6 (33.3%)	12 (66.7%)	0 (0.0%)	2 (11.1%)	16 (88.9%)
Range of motion	6.5 (1.5)	7 (6-8)	2 (3.9%)	22 (43.1%)	27 (52.9%)	0 (0.0%)	2 (28.6%)	5 (71.4%)	1 (14.3%)	2 (28.6%)	4 (57.1%)	1 (5.6%)	14 (77.8%)	3 (16.7%)	0 (0.0%)	4 (22.2%)	14 (77.8%)
Body composition	5.4 (2.0)	5 (4-7)	8 (15.7%)	30 (58.8%)	13 (25.5%)	0 (0.0%)	2 (28.6%)	5 (71.4%)	2 (28.6%)	3 (42.9%)	2 (28.6%)	5 (27.8%)	12 (66.7%)	1 (5.6%)	1 (5.6%)	12 (66.7%)	5 (27.8%)
Proprioception	6.5 (1.8)	7 (6-7)	2 (4.0%)	22 (44.0%)	26 (52.0%)	0 (0.0%)	3 (50.0%)	3 (50.0%)	1 (14.3%)	2 (28.6%)	4 (57.1%)	0 (0.0%)	12 (66.7%)	6 (33.3%)	1 (5.6%)	5 (27.8%)	12 (66.7%)
Sensation	6.4 (1.6)	7 (6-7)	2 (3.9%)	20 (39.2%)	29 (56.9%)	0 (0.0%)	3 (42.9%)	4 (57.1%)	1 (12.5%)	2 (25.0%)	5 (62.5%)	0 (0.0%)	12 (70.6%)	5 (29.4%)	1 (5.6%)	3 (16.7%)	14 (77.8%)
Fatigue	7.2 (1.2)	7 (7-8)	0 (0.0%)	7 (13.5%)	45 (86.5%)	0 (0.0%)	1 (14.3%)	6 (85.7%)	0 (0.0%)	2 (25.0%)	6 (75.0%)	0 (0.0%)	2 (11.1%)	16 (88.9%)	0 (0.0%)	2 (11.1%)	16 (88.9%)
Number and type of comorbidities	7.4 (1.4)	7 (7-9)	0 (0.0%)	11 (21.6%)	40 (78.4%)	0 (0.0%)	1 (14.3%)	6 (85.7%)	0 (0.0%)	1 (14.3%)	6 (85.7%)	0 (0.0%)	5 (27.8%)	13 (72.2%)	0 (0.0%)	4 (22.2%)	14 (77.8%)
Gait speed	6.3 (2.0)	6 (5-8)	6 (11.8%)	22 (43.1%)	23 (45.1%)	0 (0.0%)	4 (57.1%)	3 (42.9%)	2 (28.6%)	3 (42.9%)	2 (28.6%)	2 (11.1%)	7 (38.9%)	9 (50.0%)	2 (11.1%)	8 (44.4%)	8 (44.4%)
Respiratory system	7.1 (1.5)	7 (6-8)	1 (1.9%)	16 (30.8%)	35 (67.3%)	0 (0.0%)	1 (14.3%)	6 (85.7%)	0 (0.0%)	1 (12.5%)	7 (87.5%)	0 (0.0%)	11 (61.1%)	7 (38.9%)	1 (5.6%)	3 (16.7%)	14 (77.8%)

Factors	All Experts (n=52/60)					Older Adults (n=7/7)			Caregivers (n=7/9)			Researchers (n=19/20)			Clinicians (n=19/24)		
	Mean (SD)	Median (IQR)	1-3, N (%)	4-6, N (%)	7-9, N (%)	1-3, N (%)	4-6, N (%)	7-9, N (%)	1-3, N (%)	4-6, N (%)	7-9, N (%)	1-3, N (%)	4-6, N (%)	7-9, N (%)	1-3, N (%)	4-6, N (%)	7-9, N (%)
Speech impairment	5.5 (1.8)	5 (4-6)	5 (9.6%)	35 (67.3%)	12 (23.1%)	0 (0.0%)	3 (42.9%)	4 (57.1%)	0 (0.0%)	5 (62.5%)	3 (37.5%)	5 (27.8%)	13 (72.2%)	0 (0.0%)	0 (0.0%)	13 (72.2%)	5 (27.8%)
Hearing	6.2 (1.5)	6 (5-7)	2 (3.8%)	30 (57.7%)	20 (38.5%)	0 (0.0%)	1 (14.3%)	6 (85.7%)	0 (0.0%)	5 (62.5%)	3 (37.5%)	2 (11.1%)	12 (66.7%)	4 (22.2%)	0 (0.0%)	11 (61.1%)	7 (38.9%)
Current and previous physical activities level across life-course	6.6 (1.4)	6 (6-7)	1 (1.9%)	27 (51.9%)	24 (46.2%)	0 (0.0%)	2 (28.6%)	5 (71.4%)	1 (12.5%)	4 (50.0%)	3 (37.5%)	0 (0.0%)	16 (88.9%)	2 (11.1%)	0 (0.0%)	5 (27.8%)	13 (72.2%)
Instrumental activities of daily living	7.5 (1.6)	8 (7-9)	1 (1.9%)	9 (17.3%)	42 (80.8%)	0 (0.0%)	1 (14.3%)	6 (85.7%)	0 (0.0%)	3 (37.5%)	5 (62.5%)	1 (5.6%)	3 (16.7%)	14 (77.8%)	0 (0.0%)	2 (11.1%)	16 (88.9%)
Ability to climb stairs / steps	7.3 (1.3)	7 (6-9)	0 (0.0%)	13 (25.5%)	38 (74.5%)	0 (0.0%)	1 (14.3%)	6 (85.7%)	0 (0.0%)	7 (87.5%)	1 (12.5%)	0 (0.0%)	3 (16.7%)	15 (83.3%)	0 (0.0%)	2 (11.8%)	15 (88.2%)
Ability to walk 400m or city block	6.7 (1.6)	7 (6-8)	2 (3.9%)	18 (35.3%)	31 (60.8%)	0 (0.0%)	0 (0.0%)	7 (100.0%)	2 (25.0%)	4 (50.0%)	2 (25.0%)	0 (0.0%)	6 (33.3%)	12 (66.7%)	0 (0.0%)	8 (47.1%)	9 (52.9%)
Ability to dual task	6.2 (1.8)	6 (5-7)	2 (3.9%)	28 (54.9%)	21 (41.2%)	0 (0.0%)	1 (14.3%)	6 (85.7%)	1 (12.5%)	6 (75.0%)	1 (12.5%)	0 (0.0%)	10 (55.6%)	8 (44.4%)	1 (5.9%)	10 (58.8%)	6 (35.3%)
Baseline or habitual physical function/mobility	7.5 (1.4)	7.5 (6-9)	0 (0.0%)	13 (26.0%)	37 (74.0%)	0 (0.0%)	2 (28.6%)	5 (71.4%)	0 (0.0%)	2 (28.6%)	5 (71.4%)	0 (0.0%)	6 (33.3%)	12 (66.7%)	0 (0.0%)	3 (17.6%)	14 (82.4%)
Psychological determinants (n=14)																	
Depression	7.4 (1.5)	7 (7-9)	1 (1.9%)	8 (15.4%)	43 (82.7%)	1 (14.3%)	4 (57.1%)	2 (28.6%)	0 (0.0%)	2 (25.0%)	6 (75.0%)	0 (0.0%)	1 (5.6%)	17 (94.4%)	0 (0.0%)	1 (5.6%)	17 (94.4%)
Motivation	6.9 (1.0)	7 (7-7)	0 (0.0%)	10 (19.2%)	42 (80.8%)	0 (0.0%)	3 (42.9%)	4 (57.1%)	0 (0.0%)	3 (37.5%)	5 (62.5%)	0 (0.0%)	2 (11.1%)	16 (88.9%)	0 (0.0%)	2 (11.1%)	16 (88.9%)
Emotional well being	6.7 (1.5)	7 (6-7.5)	1 (1.9%)	20 (38.5%)	31 (59.6%)	0 (0.0%)	4 (57.1%)	3 (42.9%)	0 (0.0%)	4 (50.0%)	4 (50.0%)	1 (5.6%)	2 (11.1%)	15 (83.3%)	0 (0.0%)	10 (55.6%)	8 (44.4%)
Self-perceived fatigue	6.7 (1.4)	6 (6-8)	0 (0.0%)	28 (53.8%)	24 (46.2%)	0 (0.0%)	5 (71.4%)	2 (28.6%)	0 (0.0%)	6 (75.0%)	2 (25.0%)	0 (0.0%)	11 (61.1%)	7 (38.9%)	0 (0.0%)	6 (33.3%)	12 (66.7%)
Anxiety	6.6 (1.2)	7 (6-7)	0 (0.0%)	20 (38.5%)	32 (61.5%)	0 (0.0%)	6 (85.7%)	1 (14.3%)	0 (0.0%)	6 (75.0%)	2 (25.0%)	0 (0.0%)	2 (11.1%)	16 (88.9%)	0 (0.0%)	6 (33.3%)	12 (66.7%)
Apathy	6.4 (1.3)	7 (6-7)	0 (0.0%)	25 (49.0%)	26 (51.0%)	0 (0.0%)	5 (71.4%)	2 (28.6%)	0 (0.0%)	5 (71.4%)	2 (28.6%)	0 (0.0%)	10 (55.6%)	8 (44.4%)	0 (0.0%)	5 (27.8%)	13 (72.2%)
Fear of reinjury	7.3 (1.6)	7 (6-9)	0 (0.0%)	15 (28.8%)	37 (71.2%)	0 (0.0%)	5 (71.4%)	2 (28.6%)	0 (0.0%)	4 (50.0%)	4 (50.0%)	0 (0.0%)	2 (11.1%)	16 (88.9%)	0 (0.0%)	4 (22.2%)	14 (77.8%)
Affect	5.8 (1.9)	6 (5-7)	6 (12.2%)	23 (46.9%)	20 (40.8%)	0 (0.0%)	6 (85.7%)	1 (14.3%)	1 (14.3%)	4 (57.1%)	2 (28.6%)	3 (17.6%)	5 (29.4%)	9 (52.9%)	2 (11.8%)	8 (47.1%)	7 (41.2%)
Extraversion	4.7 (1.8)	5 (3-6)	16 (32.0%)	29 (58.0%)	5 (10.0%)	0 (0.0%)	6 (85.7%)	1 (14.3%)	4 (57.1%)	2 (28.6%)	1 (14.3%)	3 (16.7%)	15 (83.3%)	0 (0.0%)	9 (52.9%)	6 (35.3%)	2 (11.8%)
Openness	4.9 (1.8)	5 (3-6)	16 (30.8%)	29 (55.8%)	7 (13.5%)	1 (14.3%)	5 (71.4%)	1 (14.3%)	3 (37.5%)	4 (50.0%)	1 (12.5%)	4 (22.2%)	14 (77.8%)	0 (0.0%)	8 (44.4%)	6 (33.3%)	4 (22.2%)
Agreeableness	4.7 (1.7)	5 (3-6)	17 (32.7%)	27 (51.9%)	8 (15.4%)	1 (14.3%)	5 (71.4%)	1 (14.3%)	3 (37.5%)	4 (50.0%)	1 (12.5%)	7 (38.9%)	10 (55.6%)	1 (5.6%)	6 (33.3%)	8 (44.4%)	4 (22.2%)
Neuroticism	4.4 (1.9)	5 (3-5)	20 (40.8%)	23 (46.9%)	6 (12.2%)	2 (28.6%)	4 (57.1%)	1 (14.3%)	5 (62.5%)	2 (25.0%)	1 (12.5%)	6 (37.5%)	10 (62.5%)	0 (0.0%)	7 (41.2%)	7 (41.2%)	3 (17.6%)
Conscientiousness	4.7 (1.9)	5 (3-6)	20 (40.0%)	19 (38.0%)	11 (22.0%)	1 (14.3%)	5 (71.4%)	1 (14.3%)	4 (50.0%)	4 (50.0%)	0 (0.0%)	10 (62.5%)	6 (37.5%)	0 (0.0%)	5 (27.8%)	4 (22.2%)	9 (50.0%)
Discharge goals and expectations	7.2 (1.5)	7 (6-9)	0 (0.0%)	15 (30.0%)	35 (70.0%)	0 (0.0%)	3 (42.9%)	4 (57.1%)	0 (0.0%)	3 (42.9%)	4 (57.1%)	0 (0.0%)	6 (35.3%)	11 (64.7%)	0 (0.0%)	3 (16.7%)	15 (83.3%)

Factors	All Experts (n=52/60)					Older Adults (n=7/7)			Caregivers (n=7/9)			Researchers (n=19/20)			Clinicians (n=19/24)		
	Mean (SD)	Median (IQR)	1-3, N (%)	4-6, N (%)	7-9, N (%)	1-3, N (%)	4-6, N (%)	7-9, N (%)	1-3, N (%)	4-6, N (%)	7-9, N (%)	1-3, N (%)	4-6, N (%)	7-9, N (%)	1-3, N (%)	4-6, N (%)	7-9, N (%)
Social determinants (n=3)																	
Loneliness (emotional and social loneliness)	7.1 (1.6)	7 (6-9)	1 (1.9%)	14 (26.9%)	37 (71.2%)	0 (0.0%)	3 (42.9%)	4 (57.1%)	0 (0.0%)	2 (25.0%)	6 (75.0%)	1 (5.6%)	2 (11.1%)	15 (83.3%)	0 (0.0%)	7 (38.9%)	11 (61.1%)
Social isolation	7.1 (1.3)	7 (7-8)	1 (1.9%)	11 (21.2%)	40 (76.9%)	0 (0.0%)	3 (42.9%)	4 (57.1%)	0 (0.0%)	3 (37.5%)	5 (62.5%)	1 (5.6%)	2 (11.1%)	15 (83.3%)	0 (0.0%)	3 (16.7%)	15 (83.3%)
Social network (quality and quantity)	6.9 (1.3)	7 (6-8)	1 (1.9%)	13 (25.0%)	38 (73.1%)	1 (14.3%)	2 (28.6%)	4 (57.1%)	0 (0.0%)	2 (25.0%)	6 (75.0%)	0 (0.0%)	9 (50.0%)	9 (50.0%)	0 (0.0%)	0 (0.0%)	18 (100.0%)

Notes:

1. Only 60 experts were invited in this Round because they were the experts that responded in Round 1.

2. Experts suggested additional 16 factors, of which Steering Committee Memebers agreed and decided to add seven factors, as others are replicated in the factors. See Appendix A for the explanations.

3. Experts only re-rated 68 factors that did not reach consensus in Rounds 2.

4. Cells highlighted in green indicate consensus was reached among that category. For instance, under cognitive determinants, attention reached consensus across all groups and only among researchers and clinicians and not among older adults and caregivers. Executive function reached consensus across all groups, and only among caregivers, researchers and clinicians.

4. 1-3 = Not important; 4-6 = Important; 7-9 = Critical. Consensus is reached for each factor when ≥70% of experts rated a factor as "Critical" (scores ≥7) and ≤15% of experts rated a factor as "Not Important" (scores ≤3).

5. N = number of; % = percentages; SD = Standard Deviation; IQR = Interquartile Range

Round 3 Ratings

Factors	All Experts (n=52/60)					Older Adults (n=7/7)			Caregivers (n=8/9)			Researchers (n=17/20)			Clinicians (n=20/24)		
	Mean (SD)	Median (IQR)	1-3, N (%)	4-6, N (%)	7-9, N (%)	1-3, N (%)	4-6, N (%)	7-9, N (%)	1-3, N (%)	4-6, N (%)	7-9, N (%)	1-3, N (%)	4-6, N (%)	7-9, N (%)	1-3, N (%)	4-6, N (%)	7-9, N (%)
Cognitive determinants (n=3)																	
Language	6.1 (2.0)	7 (5-7)	8 (15.7%)	13 (25.5%)	30 (58.8%)	2 (28.6%)	1 (14.3%)	4 (57.1%)	1 (12.5%)	2 (25.0%)	5 (62.5%)	3 (18.8%)	5 (31.3%)	8 (50.0%)	2 (10.0%)	5 (25.0%)	13 (65.0%)
Processing speed	6.2 (1.8)	6 (6-7)	4 (7.7%)	27 (51.9%)	21 (40.4%)	0 (0.0%)	3 (42.9%)	4 (57.1%)	1 (12.5%)	3 (37.5%)	4 (50.0%)	2 (11.8%)	10 (58.8%)	5 (29.4%)	1 (5.0%)	11 (55.0%)	8 (40.0%)
Global cognition	6.9 (1.8)	7 (6-8)	4 (7.8%)	11 (21.6%)	36 (70.6%)	0 (0.0%)	2 (28.6%)	5 (71.4%)	2 (28.6%)	0 (0.0%)	5 (71.4%)	1 (5.9%)	5 (29.4%)	11 (64.7%)	1 (5.0%)	4 (20.0%)	15 (75.0%)
Environmental determinants (n=17)																	
Street characteristics	5.9 (1.8)	6 (4-7)	5 (9.8%)	24 (47.1%)	22 (43.1%)	1 (14.3%)	5 (71.4%)	1 (14.3%)	1 (12.5%)	4 (50.0%)	3 (37.5%)	1 (5.9%)	7 (41.2%)	9 (52.9%)	2 (10.5%)	8 (42.1%)	9 (47.4%)
Residential characteristics	6.4 (2.0)	7 (5.5-7)	6 (11.5%)	14 (26.9%)	32 (61.5%)	1 (14.3%)	2 (28.6%)	4 (57.1%)	0 (0.0%)	1 (12.5%)	7 (87.5%)	1 (5.9%)	8 (47.1%)	8 (47.1%)	4 (20.0%)	3 (15.0%)	13 (65.0%)
Land use mix	4.3 (2.3)	4 (3-6)	18 (36.7%)	22 (44.9%)	9 (18.4%)	1 (14.3%)	4 (57.1%)	2 (28.6%)	3 (42.9%)	1 (14.3%)	3 (42.9%)	3 (18.8%)	12 (75.0%)	1 (6.3%)	11 (57.9%)	5 (26.3%)	3 (15.8%)
Sidewalk characteristics	6.0 (2.0)	6.5 (4-7)	5 (10.0%)	20 (40.0%)	25 (50.0%)	0 (0.0%)	3 (42.9%)	4 (57.1%)	0 (0.0%)	3 (37.5%)	5 (62.5%)	0 (0.0%)	7 (43.8%)	9 (56.3%)	5 (26.3%)	7 (36.8%)	7 (36.8%)
Crime-related safety	5.8 (1.9)	6 (4-7)	7 (13.7%)	22 (43.1%)	22 (43.1%)	0 (0.0%)	2 (28.6%)	5 (71.4%)	0 (0.0%)	2 (25.0%)	6 (75.0%)	2 (11.8%)	12 (70.6%)	3 (17.6%)	5 (26.3%)	6 (31.6%)	8 (42.1%)
Traffic-related safety	6.1 (1.9)	7 (5-7)	5 (9.8%)	20 (39.2%)	26 (51.0%)	1 (14.3%)	2 (28.6%)	4 (57.1%)	0 (0.0%)	3 (37.5%)	5 (62.5%)	0 (0.0%)	8 (47.1%)	9 (52.9%)	4 (21.1%)	7 (36.8%)	8 (42.1%)
Access to recreational facilities	6.1 (1.5)	6 (6-7)	3 (5.9%)	29 (56.9%)	19 (37.3%)	0 (0.0%)	2 (28.6%)	5 (71.4%)	0 (0.0%)	8 (100.0%)	0 (0.0%)	1 (5.9%)	13 (76.5%)	3 (17.6%)	2 (10.5%)	6 (31.6%)	11 (57.9%)
Access to destinations	6.7 (1.3)	7 (6-7)	2 (3.9%)	13 (25.5%)	36 (70.6%)	0 (0.0%)	3 (42.9%)	4 (57.1%)	0 (0.0%)	3 (37.5%)	5 (62.5%)	1 (5.9%)	4 (23.5%)	12 (70.6%)	1 (5.3%)	3 (15.8%)	15 (78.9%)
Access to rest areas	6.5 (1.7)	7 (6-8)	4 (7.8%)	13 (25.5%)	34 (66.7%)	0 (0.0%)	2 (28.6%)	5 (71.4%)	1 (12.5%)	2 (25.0%)	5 (62.5%)	0 (0.0%)	4 (23.5%)	13 (76.5%)	3 (15.8%)	5 (26.3%)	11 (57.9%)
Weather	5.2 (2.3)	5 (3-7)	16 (31.4%)	12 (23.5%)	23 (45.1%)	1 (14.3%)	1 (14.3%)	5 (71.4%)	3 (37.5%)	2 (25.0%)	3 (37.5%)	3 (17.6%)	7 (41.2%)	7 (41.2%)	9 (47.4%)	2 (10.5%)	8 (42.1%)
Natural scenery	4.4 (2.0)	5 (3-5)	21 (41.2%)	22 (43.1%)	8 (15.7%)	1 (14.3%)	3 (42.9%)	3 (42.9%)	3 (37.5%)	4 (50.0%)	1 (12.5%)	7 (41.2%)	9 (52.9%)	1 (5.9%)	10 (52.6%)	6 (31.6%)	3 (15.8%)
Environmental quality	5.3 (2.0)	6 (4-7)	9 (17.6%)	29 (56.9%)	13 (25.5%)	0 (0.0%)	5 (71.4%)	2 (28.6%)	1 (12.5%)	6 (75.0%)	1 (12.5%)	2 (11.8%)	12 (70.6%)	3 (17.6%)	6 (31.6%)	6 (31.6%)	7 (36.8%)
Social factors	6.1 (1.9)	6 (5-7)	3 (5.9%)	23 (45.1%)	25 (49.0%)	0 (0.0%)	4 (57.1%)	3 (42.9%)	0 (0.0%)	4 (50.0%)	4 (50.0%)	0 (0.0%)	9 (52.9%)	8 (47.1%)	3 (15.8%)	6 (31.6%)	10 (52.6%)
Social attitude	5.6 (2.0)	5 (4-7)	6 (11.8%)	28 (54.9%)	17 (33.3%)	1 (14.3%)	4 (57.1%)	2 (28.6%)	0 (0.0%)	4 (50.0%)	4 (50.0%)	2 (11.8%)	8 (47.1%)	7 (41.2%)	3 (15.8%)	12 (63.2%)	4 (21.1%)
Social capital	6.0 (1.9)	6 (5-8)	3 (5.8%)	28 (53.8%)	21 (40.4%)	0 (0.0%)	4 (57.1%)	3 (42.9%)	0 (0.0%)	2 (25.0%)	6 (75.0%)	1 (5.9%)	11 (64.7%)	5 (29.4%)	2 (10.0%)	11 (55.0%)	7 (35.0%)
Social cohesion	5.7 (1.9)	5 (5-7)	5 (9.8%)	28 (54.9%)	18 (35.3%)	1 (14.3%)	3 (42.9%)	3 (42.9%)	1 (12.5%)	3 (37.5%)	4 (50.0%)	1 (6.3%)	12 (75.0%)	3 (18.8%)	2 (10.0%)	10 (50.0%)	8 (40.0%)
Government/institutional support systems	6.9 (1.4)	7 (6-8)	0 (0.0%)	17 (33.3%)	34 (66.7%)	0 (0.0%)	4 (57.1%)	3 (42.9%)	0 (0.0%)	3 (37.5%)	5 (62.5%)	0 (0.0%)	5 (31.3%)	11 (68.8%)	0 (0.0%)	5 (25.0%)	15 (75.0%)
Financial determinants (n=3)																	
Personal income	5.8 (1.8)	7 (5-7)	7 (13.5%)	18 (34.6%)	27 (51.9%)	3 (42.9%)	1 (14.3%)	3 (42.9%)	0 (0.0%)	3 (37.5%)	5 (62.5%)	3 (17.6%)	5 (29.4%)	9 (52.9%)	1 (5.0%)	9 (45.0%)	10 (50.0%)
Household income	5.4 (2.0)	5 (4.5-7)	10 (19.2%)	23 (44.2%)	19 (36.5%)	3 (42.9%)	1 (14.3%)	3 (42.9%)	0 (0.0%)	4 (50.0%)	4 (50.0%)	3 (17.6%)	10 (58.8%)	4 (23.5%)	4 (20.0%)	8 (40.0%)	8 (40.0%)
Family income	5.3 (2.0)	5 (4-7)	9 (17.6%)	28 (54.9%)	14 (27.5%)	3 (42.9%)	2 (28.6%)	2 (28.6%)	0 (0.0%)	5 (62.5%)	3 (37.5%)	4 (25.0%)	11 (68.8%)	1 (6.3%)	2 (10.0%)	10 (50.0%)	8 (40.0%)

Factors	All Experts (n=52/60)					Older Adults (n=7/7)			Caregivers (n=8/9)			Researchers (n=17/20)			Clinicians (n=20/24)		
	Mean (SD)	Median (IQR)	1-3, N (%)	4-6, N (%)	7-9, N (%)	1-3, N (%)	4-6, N (%)	7-9, N (%)	1-3, N (%)	4-6, N (%)	7-9, N (%)	1-3, N (%)	4-6, N (%)	7-9, N (%)	1-3, N (%)	4-6, N (%)	7-9, N (%)
Personal determinants (n=11)																	
Gender	4.5 (2.2)	4 (3-7)	26 (50.0%)	11 (21.2%)	15 (28.8%)	5 (71.4%)	1 (14.3%)	1 (14.3%)	4 (50.0%)	0 (0.0%)	4 (50.0%)	7 (41.2%)	6 (35.3%)	4 (23.5%)	10 (50.0%)	4 (20.0%)	6 (30.0%)
Sex	4.3 (2.3)	3 (3-7)	28 (53.8%)	10 (19.2%)	14 (26.9%)	5 (71.4%)	1 (14.3%)	1 (14.3%)	4 (50.0%)	0 (0.0%)	4 (50.0%)	10 (58.8%)	5 (29.4%)	2 (11.8%)	9 (45.0%)	4 (20.0%)	7 (35.0%)
Culture	4.9 (1.9)	5 (3-6)	13 (25.5%)	29 (56.9%)	9 (17.6%)	4 (57.1%)	2 (28.6%)	1 (14.3%)	0 (0.0%)	6 (75.0%)	2 (25.0%)	2 (11.8%)	12 (70.6%)	3 (17.6%)	7 (36.8%)	9 (47.4%)	3 (15.8%)
Ethnicity	4.1 (2.2)	3 (3-5)	27 (54.0%)	15 (30.0%)	8 (16.0%)	5 (71.4%)	1 (14.3%)	1 (14.3%)	3 (37.5%)	3 (37.5%)	2 (25.0%)	9 (56.3%)	4 (25.0%)	3 (18.8%)	10 (52.6%)	7 (36.8%)	2 (10.5%)
Race	3.9 (2.1)	3 (3-5)	31 (60.8%)	11 (21.6%)	9 (17.6%)	5 (71.4%)	1 (14.3%)	1 (14.3%)	3 (37.5%)	4 (50.0%)	1 (12.5%)	10 (62.5%)	3 (18.8%)	3 (18.8%)	13 (65.0%)	3 (15.0%)	4 (20.0%)
Educational level	4.9 (1.9)	5 (3.5-6)	13 (25.0%)	30 (57.7%)	9 (17.3%)	4 (57.1%)	2 (28.6%)	1 (14.3%)	2 (25.0%)	5 (62.5%)	1 (12.5%)	2 (11.8%)	14 (82.4%)	1 (5.9%)	5 (25.0%)	9 (45.0%)	6 (30.0%)
Occupation	5.8 (1.7)	6 (5-7)	7 (13.5%)	26 (50.0%)	19 (36.5%)	3 (42.9%)	2 (28.6%)	2 (28.6%)	2 (25.0%)	5 (62.5%)	1 (12.5%)	0 (0.0%)	11 (64.7%)	6 (35.3%)	2 (10.0%)	8 (40.0%)	10 (50.0%)
Marital status	5.4 (2.0)	5 (4-7)	8 (15.4%)	28 (53.8%)	16 (30.8%)	2 (28.6%)	2 (28.6%)	3 (42.9%)	0 (0.0%)	8 (100.0%)	0 (0.0%)	0 (0.0%)	13 (76.5%)	4 (23.5%)	6 (30.0%)	5 (25.0%)	9 (45.0%)
Religion	3.4 (2.2)	3 (2-4)	32 (64.0%)	13 (26.0%)	5 (10.0%)	6 (85.7%)	0 (0.0%)	1 (14.3%)	3 (42.9%)	4 (57.1%)	0 (0.0%)	10 (62.5%)	5 (31.3%)	1 (6.3%)	13 (65.0%)	4 (20.0%)	3 (15.0%)
Smoking and alcohol consumption	6.5 (1.7)	7 (6-8)	3 (5.8%)	17 (32.7%)	32 (61.5%)	1 (14.3%)	4 (57.1%)	2 (28.6%)	0 (0.0%)	2 (25.0%)	6 (75.0%)	1 (5.9%)	7 (41.2%)	9 (52.9%)	1 (5.0%)	4 (20.0%)	15 (75.0%)
History of recent re-admission to hospital	7.1 (1.5)	7 (6-8)	1 (2.0%)	13 (26.5%)	35 (71.4%)	1 (14.3%)	3 (42.9%)	3 (42.9%)	0 (0.0%)	3 (42.9%)	4 (57.1%)	0 (0.0%)	4 (25.0%)	12 (75.0%)	0 (0.0%)	3 (15.8%)	16 (84.2%)
Physical determinants (n=11)																	
Range of motion	6.7 (1.6)	7 (6-8)	2 (3.9%)	14 (27.5%)	35 (68.6%)	1 (14.3%)	2 (28.6%)	4 (57.1%)	1 (14.3%)	1 (14.3%)	5 (71.4%)	0 (0.0%)	7 (41.2%)	10 (58.8%)	0 (0.0%)	4 (20.0%)	16 (80.0%)
Body composition	5.5 (2.0)	6 (4-7)	8 (15.7%)	25 (49.0%)	18 (35.3%)	1 (14.3%)	2 (28.6%)	4 (57.1%)	2 (28.6%)	3 (42.9%)	2 (28.6%)	3 (17.6%)	10 (58.8%)	4 (23.5%)	2 (10.0%)	10 (50.0%)	8 (40.0%)
Proprioception	6.4 (1.5)	6.5 (6-7)	1 (2.0%)	24 (48.0%)	25 (50.0%)	0 (0.0%)	5 (83.3%)	1 (16.7%)	1 (14.3%)	2 (28.6%)	4 (57.1%)	0 (0.0%)	11 (64.7%)	6 (35.3%)	0 (0.0%)	6 (30.0%)	14 (70.0%)
Sensation	6.6 (1.2)	7 (6-7)	1 (1.9%)	14 (26.9%)	37 (71.2%)	0 (0.0%)	4 (57.1%)	3 (42.9%)	1 (12.5%)	0 (0.0%)	7 (87.5%)	0 (0.0%)	6 (35.3%)	11 (64.7%)	0 (0.0%)	4 (20.0%)	16 (80.0%)
Gait speed	6.3 (1.9)	6 (5-8)	6 (11.8%)	20 (39.2%)	25 (49.0%)	0 (0.0%)	5 (71.4%)	2 (28.6%)	2 (28.6%)	3 (42.9%)	2 (28.6%)	1 (5.9%)	8 (47.1%)	8 (47.1%)	3 (15.0%)	4 (20.0%)	13 (65.0%)
Respiratory system	7.2 (1.3)	7 (6-8)	0 (0.0%)	14 (26.9%)	38 (73.1%)	0 (0.0%)	1 (14.3%)	6 (85.7%)	0 (0.0%)	1 (12.5%)	7 (87.5%)	0 (0.0%)	7 (41.2%)	10 (58.8%)	0 (0.0%)	5 (25.0%)	15 (75.0%)
Speech impairment	5.5 (1.8)	5.5 (4-6.5)	4 (7.7%)	35 (67.3%)	13 (25.0%)	0 (0.0%)	4 (57.1%)	3 (42.9%)	0 (0.0%)	6 (75.0%)	2 (25.0%)	3 (17.6%)	13 (76.5%)	1 (5.9%)	1 (5.0%)	12 (60.0%)	7 (35.0%)
Hearing	6.3 (1.3)	6 (6-7)	0 (0.0%)	31 (59.6%)	21 (40.4%)	0 (0.0%)	3 (42.9%)	4 (57.1%)	0 (0.0%)	4 (50.0%)	4 (50.0%)	0 (0.0%)	13 (76.5%)	4 (23.5%)	0 (0.0%)	11 (55.0%)	9 (45.0%)
Current and previous physical activities level across life-course	6.6 (1.5)	6 (6-7)	1 (1.9%)	26 (50.0%)	25 (48.1%)	0 (0.0%)	3 (42.9%)	4 (57.1%)	1 (12.5%)	4 (50.0%)	3 (37.5%)	0 (0.0%)	13 (76.5%)	4 (23.5%)	0 (0.0%)	6 (30.0%)	14 (70.0%)
Ability to walk 400m or city block	6.3 (1.7)	7 (5-7)	4 (7.7%)	21 (40.4%)	27 (51.9%)	0 (0.0%)	1 (14.3%)	6 (85.7%)	2 (25.0%)	4 (50.0%)	2 (25.0%)	0 (0.0%)	6 (35.3%)	11 (64.7%)	2 (10.0%)	10 (50.0%)	8 (40.0%)
Ability to dual task	5.8 (1.7)	6 (4-7)	4 (7.7%)	32 (61.5%)	16 (30.8%)	0 (0.0%)	2 (28.6%)	5 (71.4%)	1 (12.5%)	6 (75.0%)	1 (12.5%)	0 (0.0%)	13 (76.5%)	4 (23.5%)	3 (15.0%)	11 (55.0%)	6 (30.0%)

Factors	All Experts (n=52/60)					Older Adults (n=7/7)			Caregivers (n=8/9)			Researchers (n=17/20)			Clinicians (n=20/24)		
	Mean (SD)	Median (IQR)	1-3, N (%)	4-6, N (%)	7-9, N (%)	1-3, N (%)	4-6, N (%)	7-9, N (%)	1-3, N (%)	4-6, N (%)	7-9, N (%)	1-3, N (%)	4-6, N (%)	7-9, N (%)	1-3, N (%)	4-6, N (%)	7-9, N (%)
Psychological determinants (n=10)																	
Emotional well being	6.8 (1.3)	7 (6-7)	1 (1.9%)	23 (44.2%)	28 (53.8%)	0 (0.0%)	4 (57.1%)	3 (42.9%)	0 (0.0%)	3 (37.5%)	5 (62.5%)	1 (5.9%)	5 (29.4%)	11 (64.7%)	0 (0.0%)	11 (55.0%)	9 (45.0%)
Self-perceived fatigue	6.5 (1.4)	6 (6-8)	1 (1.9%)	32 (61.5%)	19 (36.5%)	0 (0.0%)	5 (71.4%)	2 (28.6%)	0 (0.0%)	7 (87.5%)	1 (12.5%)	1 (5.9%)	11 (64.7%)	5 (29.4%)	0 (0.0%)	9 (45.0%)	11 (55.0%)
Anxiety	6.5 (1.3)	7 (6-7)	1 (1.9%)	22 (42.3%)	29 (55.8%)	0 (0.0%)	5 (71.4%)	2 (28.6%)	0 (0.0%)	6 (75.0%)	2 (25.0%)	1 (5.9%)	3 (17.6%)	13 (76.5%)	0 (0.0%)	8 (40.0%)	12 (60.0%)
Apathy	6.1 (1.5)	6 (5-7)	2 (3.9%)	25 (49.0%)	24 (47.1%)	0 (0.0%)	4 (57.1%)	3 (42.9%)	0 (0.0%)	6 (85.7%)	1 (14.3%)	1 (5.9%)	7 (41.2%)	9 (52.9%)	1 (5.0%)	8 (40.0%)	11 (55.0%)
Affect	5.6 (1.7)	5 (5-7)	6 (11.8%)	25 (49.0%)	20 (39.2%)	0 (0.0%)	6 (85.7%)	1 (14.3%)	2 (28.6%)	4 (57.1%)	1 (14.3%)	2 (11.8%)	6 (35.3%)	9 (52.9%)	2 (10.0%)	9 (45.0%)	9 (45.0%)
Extraversion	4.5 (1.7)	5 (3-6)	19 (37.3%)	28 (54.9%)	4 (7.8%)	0 (0.0%)	6 (85.7%)	1 (14.3%)	5 (71.4%)	2 (28.6%)	0 (0.0%)	4 (23.5%)	12 (70.6%)	1 (5.9%)	10 (50.0%)	8 (40.0%)	2 (10.0%)
Openness	4.7 (1.7)	5 (3-6)	17 (32.7%)	29 (55.8%)	6 (11.5%)	2 (28.6%)	4 (57.1%)	1 (14.3%)	3 (37.5%)	5 (62.5%)	0 (0.0%)	4 (23.5%)	12 (70.6%)	1 (5.9%)	8 (40.0%)	8 (40.0%)	4 (20.0%)
Agreeableness	4.5 (1.5)	5 (3-5)	18 (34.6%)	29 (55.8%)	5 (9.6%)	2 (28.6%)	4 (57.1%)	1 (14.3%)	1 (12.5%)	6 (75.0%)	1 (12.5%)	8 (47.1%)	8 (47.1%)	1 (5.9%)	7 (35.0%)	11 (55.0%)	2 (10.0%)
Neuroticism	4.3 (1.7)	4 (3-5)	21 (41.2%)	25 (49.0%)	5 (9.8%)	2 (28.6%)	4 (57.1%)	1 (14.3%)	6 (75.0%)	1 (12.5%)	1 (12.5%)	6 (37.5%)	9 (56.3%)	1 (6.3%)	7 (35.0%)	11 (55.0%)	2 (10.0%)
Conscientiousness	4.7 (2.0)	5 (3-6)	19 (37.3%)	21 (41.2%)	11 (21.6%)	2 (28.6%)	4 (57.1%)	1 (14.3%)	4 (50.0%)	3 (37.5%)	1 (12.5%)	7 (43.8%)	8 (50.0%)	1 (6.3%)	6 (30.0%)	6 (30.0%)	8 (40.0%)

Notes:

1. Only 60 experts were invited in this Round because they were the experts that responded in Round 1.

2. Experts only re-rated 55 factors that did not reach consensus in Rounds 2.

3. Cells highlighted in green indicate consensus was reached among that category. For instance, under cognitive determinants, global cognition reached consensus across all groups but only among older adults, caregivers, and clinicians, but not among researchers.

4. 1-3 = Not important; 4-6 = Important; 7-9 = Critical. Consensus is reached for each factor when ≥70% of experts rated a factor as "Critical" (scores ≥7) and ≤15% of experts rated a factor as "Not Important" (scores ≤3).

5. N = number of; % = percentages; SD = Standard Deviation; IQR = Interquartile Range

Appendix 7A – For mobility factors, plain language definition of mobility factors, and the mean (SD) and median (IQR) rating for each factor)

Name	Plain Language definition	DomainName	Mean (SD)	Median (IQR)
Cognitive determinant factors				
Attention	The ability to focus on something while ignoring other things	Cognitive determinant factors	6.8 (1.9)	7 (5-8.5)
Executive function	A set of mental skills that allows people to plan, decide, find solutions to problems, and control themselves from acting without thinking	Cognitive determinant factors	6.7 (1.8)	7 (6-8)
Language	Refers to sound, signs, symbols and gestures that can be used to communicate ideas, thoughts and emotions from one person to another	Cognitive determinant factors	6.0 (2.1)	6 (5-7)
Memory	The ability to remember things about past events or knowledge	Cognitive determinant factors	6.8 (1.8)	7 (6-8)
Visuospatial function	How people understand what they see and how it relates to where they are, for example, using a map to get from one place to another, walk	Cognitive determinant factors	7.1 (1.5)	7 (6-8)
Processing speed	The time needed to take in information, make sense of it and begin to respond	Cognitive determinant factors	6.1 (1.8)	6 (5-7.5)
Global cognition	Refers to the way people think, judge, learn, understand, remember, and see things	Cognitive determinant factors	7.0 (1.5)	7 (6-8)
Environmental determinant factors				
Street characteristics	How streets look, how well the streets are connected to one another and where the streetlights are located	Environmental determinant factors	5.6 (2.1)	6 (4-7)
Discharge environment (living environment)	What kind of house is the person discharged to, and could be home, appartment, retirement home	Environmental determinant factors	7.5 (1.7)	8 (7-9)
Residential characteristics	The number of people, houses, public parks in an area, and the location of houses	Environmental determinant factors	6.4 (2.3)	7 (5-9)
Land use mix	How land is used within a community, for example how much land is used for homes, shops, and offices	Environmental determinant factors	4.7 (2.4)	5 (3-6)
Sidewalk characteristics	How the sidewalks look, for example, are there any cracks or bumps; how big the sidewalks are, how close the sidewalks are to the road	Environmental determinant factors	6.2 (2.0)	6 (4-8)
Crime-related safety	How safe is the community based on the number of people around and how unfriendly people are	Environmental determinant factors	6.0 (2.0)	6 (4-7)
Traffic-related safety	How safe it is to cross the roads in the community, based on crosswalks, stop signs, stoplights and the timing of stoplights, and the speec	Environmental determinant factors	6.2 (1.8)	6 (5-7)
Access to recreational facilities	How many community fitness or recreation centers are close by, how much does it cost to attend, and how easy it is to get there, for examp	Environmental determinant factors	5.9 (2.0)	6 (5-7)
Access to destinations	How many shops, services, senior centers are close by, how much does it cost to attend the senior centers, how easy it is to get there, and	Environmental determinant factors	6.4 (1.7)	7 (6-7)
Access to rest areas	How many rest areas such as benches, or public washrooms are there in the community, and how much does it cost to use	Environmental determinant factors	6.1 (2.1)	7 (5-8)
Access to public transit	How easy it is to take public transit, including how many routes, how far away bus stops are and the cost of a ticket	Environmental determinant factors	6.5 (2.0)	7 (5-8)
Weather	Refers to temperatures, seasons (e.g summer/winter conditions), and others (e.g., wind, fog, rain)	Environmental determinant factors	5.2 (2.4)	5 (3-7)
Natural scenery	Refers to green open areas, water, trees, flowers and trails in the community	Environmental determinant factors	4.8 (2.3)	5 (3-6)
Environmental quality	Refers to air quality (air pollution)	Environmental determinant factors	5.5 (2.2)	6 (4-7)
Social factors	The number of people and the amount of interaction between people in the community	Environmental determinant factors	6.4 (2.0)	7 (5-8)
Social attitude	How people feel about older people in our community and actions towards them	Environmental determinant factors	5.8 (2.2)	6 (4-7)
Social capital	The connections, shared values and understandings in society that enable people to trust each other and work together	Environmental determinant factors	5.9 (2.0)	6 (4.5-7.5)
Social cohesion	How strong relationships are in the community that encourage people to provide help and support to each other, for example, if someone r	Environmental determinant factors	5.5 (1.9)	5 (4-7)
Financial determinant factors				
Personal income	The total amount of money a person receives from all sources (e.g work salary, government benefits, investments)	Financial determinant factors	5.6 (2.4)	5 (4-7)
Household income	The total amount of money all people who are related and unrelated, who are 16 years or older, living in the same house receive	Financial determinant factors	5.3 (2.3)	5 (4-7)
Family income	The total amount of money all people who are related by birth, marriage or adoption, who are 16 years or older, living in the same house rec	Financial determinant factors	5.1 (2.3)	5 (4-7)

Name	Plain Language definition	DomainName	Mean (SD)	Median (IQR)
Personal determinant factors				
Age		Personal determinant factors	6.8 (2.3)	7 (6-9)
Gender	Societal norms and expectations for how society thinks men and women should act and what they should do	Personal determinant factors	4.8 (2.4)	5 (3-7)
Sex	The sex (male or female) at birth and on your birth certificate	Personal determinant factors	4.8 (2.4)	5 (3-7)
Culture	The way of life of groups of people including their customs, activities, beliefs, and values	Personal determinant factors	5.2 (2.1)	5 (3-6)
Ethnicity	How a group of people identify based on their family origins and their culture and cultural traditions such as Arab, French, Caribbean, Afr	Personal determinant factors	4.6 (2.3)	5 (3-6)
Race	How a group of people identify based on their skin colour, facial shape and hair (e.g., White/Caucasian, Brown, Black)	Personal determinant factors	4.4 (2.4)	4 (3-6)
Educational level		Personal determinant factors	5.1 (2.1)	5 (3-6)
Occupation		Personal determinant factors	5.3 (2.3)	6 (3-7)
Marital status		Personal determinant factors	5.2 (2.2)	5 (4-7)
Religion		Personal determinant factors	3.4 (2.2)	3 (2-5)
Smoking and alcohol consumption		Personal determinant factors	6.5 (2.0)	7 (6-8)
Physical determinant factors				
Muscle strength	The amount of tension a muscle develops to move or lift an object, for example. How strong or weak a muscle is.	Physical determinant factors	7.4 (1.7)	8 (7-9)
Muscle power	How fast the muscle can work, for example how fast can we stand up and sit down within a small timeframe	Physical determinant factors	7.0 (1.9)	7 (6-9)
Muscle endurance	How long a muscle can work	Physical determinant factors	6.6 (1.8)	7 (6-8)
Muscle coordination	How the muscles work together to move	Physical determinant factors	6.8 (2.0)	7 (6-8)
Range of motion	The ability of a joint to move in all its directions	Physical determinant factors	6.5 (1.7)	7 (5-8)
Body composition	A description of how much of the body is muscle or fat	Physical determinant factors	5.3 (2.2)	5 (4-7)
Proprioception	The ability to sense the body in space, where it is located, the movement of the body	Physical determinant factors	6.3 (1.9)	6 (5-8)
Sensation	The ability to feel touch, pain, temperature, vibration	Physical determinant factors	6.4 (1.7)	7 (5-7)
Pain		Physical determinant factors	7.6 (1.5)	8 (7-9)
History of falls		Physical determinant factors	8.0 (1.3)	8.5 (7-9)
Balance		Physical determinant factors	7.9 (1.3)	8 (7-9)
Fatigue	Always feeling tired	Physical determinant factors	6.9 (1.6)	7 (6-8)
Vision		Physical determinant factors	7.6 (1.4)	8 (7-9)
Number and type of of comorbidities	The number and type of chronic conditions (e.g., high blood pressure, diabetes, arthritis)	Physical determinant factors	7.2 (1.5)	7 (6-9)
Gait speed	The time it takes to walk a distance	Physical determinant factors	6.3 (1.9)	6 (5-8)
Respiratory system	The lungs and tissues that help people breathe, and how we breath	Physical determinant factors	7.0 (1.5)	7 (6-8)
Speech impairment	Cannot speak	Physical determinant factors	5.4 (2.1)	6 (4-7)
Hearing		Physical determinant factors	6.0 (1.9)	6 (5-8)
Dizziness	a feeling of faint	Physical determinant factors	7.5 (1.4)	8 (7-9)
Frequency of exercise/physical activity		Physical determinant factors	6.5 (1.7)	6 (5-8)
Self care activities of daily living	Refers to bathing, dressing and undressing, feeding self, using the toilet, and taking medication	Physical determinant factors	7.2 (1.7)	7 (7-9)
Instrumental activities of daily living	Things you do everyday to take care of yourself and your home, and they include managing finances (paying bills), driving or planning o	Physical determinant factors	7.0 (1.8)	7 (6-9)
Frailty	People who are frail usually have 3 out of the following five symptoms: muscle loss, weakness a feeling of fatigue, slow walking speed, ar	Physical determinant factors	7.5 (1.4)	7.5 (7-9)
Use of mobility aid	The mobility assistive devices included scooter, powered and manual wheelchairs, walking aids (cane, walker, crutches).	Physical determinant factors	7.7 (1.4)	8 (7-9)

Name	Plain Language definition	DomainName	Mean (SD)	Median (IQR)
Psychological determinant factors				
Depression	A feeling of sadness and loss of interest, which stops someone from doing normal activities	Psychological determinant factors	7.1 (1.7)	7 (6-9)
Self efficacy	The belief someone have in the abilities to carry out and complete a task.	Psychological determinant factors	7.0 (1.6)	7 (6-8)
Motivation	The reasons people act or behave in a specific way	Psychological determinant factors	6.5 (1.5)	7 (6-7)
Fear of fall	Worrying about falling so much that the person do not take part in activities	Psychological determinant factors	7.9 (1.2)	8 (7-9)
Emotional well being	The state of being mentally healthy and happy	Psychological determinant factors	6.7 (1.6)	7 (6-8)
Self perceived fatigue	How people view themselves as being tired, that affects how they function.	Psychological determinant factors	6.6 (1.7)	6.5 (5.5-8)
Anxiety	A feeling that causes people to worry and can cause their heart rate to increase or make them breathe faster	Psychological determinant factors	6.7 (1.5)	7 (6-8)
Apathy	The lack of interest in in life activities or interactions with others	Psychological determinant factors	6.2 (1.6)	6 (5-7)
Fear of reinjury		Psychological determinant factors	7.2 (1.7)	7 (6-9)
Affect	How people feel and can be from good to bad	Psychological determinant factors	5.7 (1.8)	6 (5-7)
Extraversion	Personal feature that makes people more likely to be with people than be by ourselves	Psychological determinant factors	4.8 (2.0)	5 (3-6)
Openness	Personal feature that makes people more likely to be open to new things	Psychological determinant factors	5.0 (2.0)	5 (3-6)
Agreeableness	Personal feature that makes people more likely to agree with others.	Psychological determinant factors	4.9 (1.8)	5 (3-6)
Neuroticism	Personal feature that makes people more likely to get angry easily	Psychological determinant factors	5.1 (2.1)	5 (3-6.5)
Conscientiousness	Personal feature that makes people more likely to be organized, responsible, and hardworking	Psychological determinant factors	4.9 (2.0)	5 (3-6)
Social determinant factors				
Living situation	living alone or living with someone, for example rommates, family members, or spouse/partner	Social determinant factors	8.0 (1.3)	9 (7-9)
Loneliness (emotional and social loneliness)	An unpleasant feeling associated with having few or no friends or having lost connections with people, places, or things or when	Social determinant factors	7.2 (1.6)	7 (6-9)
Social isolation	The feeling people have when they do not have contact with others	Social determinant factors	7.1 (1.4)	7 (6-8)
Social participation	Activities that allow people to connect with others in the community.	Social determinant factors	7.1 (1.6)	7 (6-8)
Social network (quality and quantity)	The type and number of social relationships that people have	Social determinant factors	6.7 (1.6)	7 (6-8)
Social support	The help, comfort, concern and care people receive from family and friends to handle problems better	Social determinant factors	7.7 (1.3)	8 (7-9)

Notes:

Yellow highlighted factors are those that have a median >=7, which we described as being rated "high"

Red highlighted factors are those that have a median =<3, which we described as being rated "low"

Factors that are not highlighted had a median ranging 4 to 6.