

THEORY TO PRACTICE IN THE PHYSICAL DISABILITY COMMUNITY

TRANSLATING THEORY TO PRACTICE:
UNDERSTANDING THE ROLE OF THEORY
IN REAL-WORLD BEHAVIOUR CHANGE INTERVENTIONS
IN THE PHYSICAL DISABILITY COMMUNITY

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ABSTRACT

The purpose of this dissertation was to test the utility of theories across the development, implementation, and evaluation of three nationwide knowledge translation (KT) interventions in the physical disability community. Using a theory-based evaluation guided by the Theory of Planned Behaviour (TPB), Study 1 evaluates the effectiveness of an evidence-based, continuing education module designed to increase emergency health care professionals' (HCPs) knowledge and use of clinical practice guidelines for managing patients with spinal cord injury (SCI) who present with autonomic dysreflexia. Findings suggest that behaviour change theory should be integrated into the intervention to change theory-based determinants of behaviour, and that information about intervention implementation may help explain observed outcomes.

Study 2 examined the use of theory across three phases of research in the Canadian Paralympic Committee's *Changing Minds, Changing Lives* (CMCL) intervention. Study 2.1 describes the restructuring of the CMCL curriculum to include research evidence and theory. Study 2.2 evaluates the short- and long-term effects of the CMCL intervention on HCPs' social cognitions for discussing leisure-time physical activity (LTPA), and explores key implementation variables that predict changes in HCPs' social cognitions. Overall Study 2 results suggest that: (1) using a KT framework and integrating stakeholders throughout intervention development increases the likelihood that interventionists will adopt and implement the intervention, and (2) real-world implementation is important to understanding intervention effectiveness.

Study 3 examines the effectiveness, and its implementation correlates, of *Get in Motion* (GIM), a nationwide, LTPA-enhancing telephone counseling service for adults with SCI. Study 3 furthers our understanding of the relationship between implementation and effectiveness, and suggests key implementation ingredients that could be targeted in future refinements of GIM. Together, the dissertation studies contribute to our understanding of how to use theory when developing, implementing, and evaluating behaviour change interventions targeting HCPs and other end-users in the physical disability community.

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“It is impossible to connect the dots looking forward, you can only connect them looking backwards. You have to trust that the dots will somehow connect in your future.... because believing that the dots will connect down the road will give you the confidence to follow your heart, even when it leads you off the well-worn path. And that will make all the difference.”

Steve Jobs

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LIST OF ABBREVIATIONS

AD	autonomic dysreflexia
ANCOVA	analysis of covariance
ANOVA	analysis of variance
CIHR	Canadian Institutes of Health Research
CMCL	Changing Minds, Changing Lives
CPC	Canadian Paralympic Committee
CPG	clinical practice guideline
DOI	Diffusion of Innovations
GIM	Get in Motion
HCPs	health care professionals
KT	knowledge translation
KTA	Knowledge-to-Action
LTPA	leisure-time physical activity
MVPA	moderate-vigorous physical activity
PBC	perceived behavioural control
RCT	randomized controlled trial
SCI	spinal cord injury
SPSS	Statistical Package for the Social Sciences
TPB	Theory of Planned Behaviour

PREFACE
DECLARATION OF ACADEMIC ACHIEVEMENT

This thesis, presented in sandwich format, is based on the following four original manuscripts.

STUDY 1 (Chapter 2)

Tomasone, J. R., Pulkkinen, W., Martin Ginis, K. A., & Krassioukov, A. (In Press). The “ABCs of AD”: A pilot test of an online educational module to increase use of the autonomic dysreflexia clinical management guidelines among paramedic and nurse trainees. *Journal of Spinal Cord Medicine*, 37(4). <http://www.maneyonline.com/loi/scm>

J.R. Tomasone’s role in Study 1:

- Author of ethics application at McMaster University
- Contributed to study design and measure selection
- Lead investigator responsible for data collection, analysis and interpretation
- Primary author of manuscript

Role of co-authors in Study 1:

- KMG and AK conceived of/designed the study and obtained funding
- KMG assisted JRT with obtaining ethics approval at McMaster University
- WP and AK obtained ethics approval at their respective institutions
- WP assisted JRT with data collection
- KMG assisted JRT with the analysis and interpretation of the data
- KMG, WP and AK revised the article and approved of the final version of the manuscript before submission to *The Journal of Spinal Cord Medicine*

STUDY 2 (Chapters 3 and 4)

1. **Tomasone, J. R.**, Martin Ginis, K. A., Estabrooks, P. A., & Domenicucci, L. (2014). *Changing Minds, Changing Lives* from the top down: An investigation of the dissemination and adoption of a Canada-wide educational intervention to enhance health care professionals’ intentions to prescribe physical activity. *International Journal of Behavioral Medicine (Special Call: Dissemination and Implementation)*. E-pub ahead of print (May 2, 2014). doi:10.1007/s12529-014-9414-6

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J. R. Tomasone’s role in Study 2:

- Author of ethics application
- Contributed to study design and measure selection
- Led participatory curriculum development process (Study 2.1)
- Incorporated research evidence and behaviour change theory into the new curriculum (Study 2.1)
- Trained Provincial Coordinators to deliver new curriculum (Study 2.1)
- Refined measure used to collect implementation data (Presenter Checklist)
- Worked closely with interventionists to monitor ongoing implementation of intervention during study period
- Lead investigator responsible for data collection, synthesis, analysis, and interpretation
- Primary author of manuscripts

Role of co-authors in Study 2:

- KMG and PAE contributed to study design and measure selection
- KMG and LD were involved in participatory curriculum development process (Study 2A)
- LD was the point of contact at the Canadian Paralympic Committee for JRT during the study period
- KMG assisted JRT with obtaining ethics approval at McMaster University
- KMG assisted JRT with the analysis and interpretation of the data
- KMG and PAE provided critical feedback on previous drafts of both manuscript
- KMG, PAE, and LD approved of the final versions of the manuscripts prior to submission for peer review

STUDY 3 (Chapter 5)

Tomasone, J. R., Arbour-Nicitopoulos, K. P., Latimer-Cheung, A. E., & Martin Ginis, K. A. *Get in Motion 2.0*: The relationship between the implementation and effectiveness of a real-world leisure-time physical activity telephone counseling service for adults with spinal cord injury.

J. R. Tomasone's role in Study 3:

- Author of ethics application
- Contributed to study design and measure selection
- Developed measure used to collect implementation data (Counseling Session Checklist)
- Assisted with training of counselor in behaviour change theories and intervention strategies
- Program Coordinator of nationwide service during study period (responsible for enrolling and tracking clients throughout service)
- Lead investigator responsible for data collection, analysis, and interpretation
- Worked closely with counselor to monitor and troubleshoot ongoing implementation of service during study period
- Primary author of manuscript

Role of co-authors in Study 3:

- KPAN, AELC, and KMG contributed to study design and measure selection
- KPAN and KMG assisted JRT with obtaining ethics approval at McMaster University
- KPAN assisted JRT with monitoring and troubleshooting ongoing implementation of service during study period and with training of counselor in behaviour change theories and intervention strategies
- KMG assisted JRT with the analysis and interpretation of the data

CHAPTER 1:
INTRODUCTION

*"In theory, there is no difference between theory and practice.
But in practice, there is."
- Yogi Berra*

1.0 PHYSICAL ACTIVITY AMONG PEOPLE WITH PHYSICAL DISABILITIES

1.1 Physical disability and inactivity-related health

Individuals experience a physical disability when an impairment in their physical function, such as paralysis of their legs, limits their ability to participate in society (Human Resources and Skills Development Canada, 2013). A physical disability may be present from birth (e.g., congenital disabilities like cerebral palsy) or may be developed during one's lifetime (e.g., acquired disabilities like multiple sclerosis). Acquired physical disabilities can result from non-traumatic (e.g., surgical complications, physiological disease) or traumatic causes (e.g., motor vehicle accident, falls). In 2006, approximately 14.3% of the Canadian population (4.4 million individuals) reported having a disability, and because the incidence of disability increases in older individuals, this percentage will continue to rise as our demographic ages (Statistics Canada, 2006).

Of the 4.4 million individuals living with a disability in Canada, there are 86,000 who have a traumatic or non-traumatic spinal cord injury (SCI; Farry & Baxter, 2010). Because physical function is typically impaired below the level of damage to the spinal cord, the degree of physical impairment resulting from a SCI depends on the level and completeness of injury. For example, if an individual experiences damage to the cervical region of their spinal cord, s/he is said to have

tetraplegia and likely experiences impairments in the trunk and both upper and lower extremities. If an individual experiences damage to the thoracic or lumbar regions of his/her spinal cord, s/he is said to have paraplegia and often only experience impairments in the trunk and lower extremities. An individual with an incomplete SCI is more likely to retain motor and sensory function below the level of injury than an individual with a complete SCI.

Physical impairments coupled with the physiological changes that come secondary to a physical disability (e.g., deconditioning of the cardiovascular and muscular systems) result in a decline in mobility and a subsequent increase in sedentary time (Jacobs & Nash, 2004; King, Petrenchik, Law, & Hurley, 2009). These lifestyle changes put individuals with a physical disability at greater risk of developing inactivity-related diseases (e.g., diabetes, hypertension, obesity) and secondary complications (e.g., pain, fatigue, pressure sores; Anson & Shepherd, 1996; Nash, 2005). They are also more likely to experience decreased psychological and social well-being (Anson & Shepherd, 1996) and overall quality of life (Dijkers, 1997) compared to their able-bodied counterparts.

1.2 Physical activity for people with physical disabilities

For individuals with physical disabilities, participating in leisure-time physical activity (LTPA), or physical activity that an individual chooses to do in their spare time, such as exercising or playing sports (Godin & Shephard, 1985), can lead to physical, psychological, social and quality of life benefits (Cooper et

al., 1999; Durstine et al., 2000; Giacobbi, Stancil, Hardin, & Bryant, 2008; Heath & Fentem, 1997; Tomasone, Wesch, Martin Ginis, & Noreau, 2013). Together, the benefits associated with participating in LTPA can mitigate the impact of a disability on one's daily functioning, and contribute to a decreased incidence of secondary complications and increased overall health and well-being (Crawford, Hollingsworth, Morgan, & Gray, 2008). However, despite these recognized benefits, only 3% of Canadians with a disability (Statistics Canada, 2001) participate in LTPA, making people with a physical disability one of the most inactive segments of the Canadian population. This is compounded by the fact that people with physical disabilities are rarely targeted in health promotion efforts (Kehn & Kroll, 2009). Consequently, there has been a burgeoning interest in developing and disseminating LTPA-promoting interventions for this population (Mudge et al., 2013; Rimmer, 1999).

1.3 Increasing LTPA participation among people with physical disabilities

In recent years, a substantial body of literature has emerged that points to several promising strategies for promoting LTPA among people with physical disabilities. For example, populations with physical disabilities – including people with SCI (Martin Ginis et al., 2011), multiple sclerosis (Latimer-Cheung et al., 2013), and disability groups as a whole (U.S. Department of Health & Human Services, 2012) – now have evidence-based physical activity guidelines that recommend how much LTPA one should engage in to achieve fitness benefits.

Resources have also been created that provide people with physical disabilities information to help them achieve the LTPA recommendations in the guidelines (e.g., the SCI Get Fit Toolkit; Arbour-Nicitopoulos et al., 2013). Researchers have identified that the preferred messengers of LTPA information for people with physical disabilities are credible sources, including health care professionals (HCPs) or peers with physical disability, and that LTPA information is ideally shared via mediated strategies, such as over the telephone or internet (Faulkner et al., 2010; Letts et al., 2011). Experimental studies have been conducted which show that behavioural strategies, such as planning to be active and to manage LTPA barriers, can help adults with SCI sustain their LTPA-related cognitions and increase their LTPA behaviour (Arbour-Nicitopoulos, Martin Ginis, & Latimer, 2009; Latimer, Martin Ginis, & Arbour, 2006). This evidence-base has contributed to the development of several interventions that have been implemented in a real-world setting in order to raise knowledge users' awareness and use of research findings. These interventions are about translating research evidence in order to close a knowledge-to-action gap among people who could benefit from using the best available knowledge to change their behaviour. The bridging of this knowledge-to-action gap is termed "knowledge translation" (KT; Graham et al., 2006), and interventions that aim to close the gap are referred to as "KT interventions" (Wensing, Bosch, & Grol, 2013).

2.0 KNOWLEDGE TRANSLATION (KT) INTERVENTIONS

2.1 KT as evidence-based behaviour change

There is a growing interest in KT among researchers (Grimshaw et al., 2012), community organizations (Martin Ginis et al., 2012), granting agencies (Graham & Tetroe, 2007), and policymakers (Lavis, 2006); however, confusion exists around a consistent definition and meaning of “KT” (Graham et al., 2006).

The Canadian Institutes of Health Research (CIHR; 2014) defines KT as

“a dynamic and iterative process that includes the synthesis, dissemination, exchange, and ethically-sound application of knowledge to improve the health of Canadians, provide more effective health services and products, and strengthen the health care system. This process takes place within a complex system of interactions between researchers and knowledge users which may vary in intensity, complexity and level of engagement depending on the nature of the research and the findings as well as the needs of the particular knowledge user.”

The Ontario Neurotrauma Foundation uses a more general definition of KT:

“getting the right information to the right people in the right format at the right time, so as to influence decision-making” (Ontario Neurotrauma Foundation, 2013). Both of these definitions highlight that KT is about spreading (i.e., disseminating) and enhancing the uptake of the best-available evidence in an accessible format so that people are able to use (i.e., apply, implement) it.

Using evidence may require action on the part of the end user, and may thus prompt a change in their behaviour. The people who use this evidence may encompass many different groups of knowledge users or target audiences, from consumers (e.g., patients, care-givers) to practitioners (e.g., HCPs) to researchers

to granting agencies to policymakers (Grimshaw et al., 2012). The change in knowledge users' behaviour may be reflected as an alteration in one's current behaviour (e.g., consumers may increase their current LTPA participation as a result of becoming aware of physical activity guidelines), as the adoption of a new behaviour (e.g., HCPs may begin to discuss LTPA with patients during routine patient-provider interactions when they become aware of physical activity guidelines), or as the development of a new policy (e.g., hospital administrators may instruct HCPs to complete continuing education about promoting LTPA to their patients).

Although evidence promotes awareness of why and/or how to change behaviour, knowledge alone is insufficient for behaviour change (Conn, Hafdahl, Brown, & Brown, 2008; Ferris, von Gunten, & Emanuel, 2011). This is particularly true when the target behaviour is complex, is influenced by multiple levels of factors (e.g., individual, social and environmental factors), and requires ongoing self-monitoring to sustain its performance. For instance, initiating and maintaining a physically active lifestyle depends not only on one's awareness of evidence-based physical activity guidelines, but also on personal motivations, health and mobility status, and the social and physical barriers and facilitators in one's environment (Katzmarzyk, 2010). For HCPs, the adoption and implementation of a clinical practice guideline in routine practice depends not only on the clinicians' awareness of the guideline, but also on their attitudes towards and confidence for using the guideline, and their perceptions of their

organization's and licensing body's support of the guideline (Cabana et al., 1999; Davis & Taylor-Vaisey, 1997; Gaddis, Greenwald & Huckson, 2007). Hence, changing such complex behaviours requires strategies beyond simply providing information. Thus, while KT interventions are important for disseminating evidence-based research findings, interventions that also explicitly aim to change end-users' perceptions (e.g., social cognitive determinants) of the target behaviour are likely superior at increasing individuals' motivation for changing their behaviour. To facilitate changes in these behavioural determinants, it has been suggested that KT interventions include a foundation in behaviour change theories (Eccles et al., 2005; Medical Research Council, 2008).

2.2 KT as theory-based behaviour change

2.2.1 The distinction between frameworks and theories

Frameworks and theories are often used in research to help scientists communicate ideas and the relationships between concepts. However, the distinction between frameworks and theories leads to differing uses of the two types of organizing schema for KT interventions. A framework is a representation of a given phenomenon that provides logical structure to the key concepts or stages leading to the phenomenon (Meyers et al., 2012). Frameworks serve to clarify concepts or propose relationships among concepts and are often used as an organized guide for developing interventions. However, when

planning an intervention, frameworks do not tell you how you might target behaviour, predict outcomes, or explain findings.

On the other hand, a theory can predict or explain how certain phenomena, events, or behaviours occur (Bem & Looren-de-Jong, 1997). To be considered a theory instead of a framework, a list of requirements must be met. A theory must: (1) include clearly-defined, mutually-exclusive constructs that are consistently used and observed, (2) be empirically validated and not falsified by existing observations, (3) explain major observations in a parsimonious, logical, coherent, and comprehensive manner, and (4) yield testable hypotheses that can be tested through observation (Brawley, 1993; Graham, Tetroe, & the KT Theories Research Group, 2007; Michie, West, & Spring, 2013).

2.2.2 Using frameworks in KT exemplar: The Knowledge-to-Action framework

An example of a framework that is often used in KT efforts is the Knowledge-to-Action (KTA) framework, which provides a conceptual approach that is useful for implementing research evidence in a practical setting (Figure 1; Graham et al., 2006). This framework is divided into two processes – knowledge creation and knowledge application (action cycle) – with each process encompassing a number of stages. The process of knowledge creation is represented by a knowledge funnel wherein research evidence gets distilled through the stages of knowledge inquiry (e.g., primary studies), to knowledge syntheses, to knowledge tools/products. Throughout the three stages of

knowledge creation, knowledge can be tailored to meet the knowledge users' needs, so that research evidence leaving the knowledge funnel is as applicable to end-users as possible. Following knowledge creation, knowledge tools/products enter the action cycle, where knowledge is applied in practice. The action cycle was developed after an assessment of the commonalities of more than 30 planned action theories, which are intended to help understand variables that increase or decrease the likelihood of the occurrence of change (Graham et al., 2006). In the action cycle, knowledge tools/products that address a specific problem are selected and adapted to the local context where they will be applied. Barriers and facilitators to knowledge use are then addressed before specific intervention strategies are selected, tailored, and implemented to facilitate knowledge use in practice. Once implemented, knowledge use should be monitored and outcomes should be evaluated to determine if the tool/product is leading to expected changes, or if a modification of the tool/product is necessary. The last stage of the action cycle is determining whether knowledge use is maintained, which subsequently feeds back to the start of the action cycle. Importantly, knowledge creation and knowledge application can influence one another throughout the KTA process; that is, emerging research evidence can lead to refinements in the action cycle, and findings from the action cycle can lead to the generation of new research evidence. The KTA framework has been adopted by the CIHR as the accepted model for promoting the application of research and a framework for the process of KT (Straus, Tetroe, & Graham, 2011). Yet, the KTA cycle does not

specify what to target in a KT intervention, and it cannot be used to make predictions or explain how change might occur following the application of the knowledge tool/product in a practical setting; this gap can be filled by using theory.

2.2.3 The role of theory in behaviour change research

Theories are often used in behaviour change research to identify intervention components that should be targeted to produce behaviour change, and to facilitate the standardization of new knowledge in the field and the reproducibility of study findings (ICEBeRG, 2006). The use of theory also helps researchers compare results across multiple studies that test the same theory in different contexts and populations. While the use of theories has been encouraged for both research and practice in the health behaviour change field for decades (e.g., Brawley, 1993), theory is still neglected in 44% of experimental studies of LTPA and dietary interventions (Prestwich et al., 2013). This lack of theory in research settings makes it challenging for researchers to determine how intervention strategies that have demonstrated efficacy for changing behaviour in research might be applied in practical, real-world, KT interventions.

2.2.4 The role of theory in KT interventions

The use of theory in KT interventions has a number of advantages, namely offering: (1) a generalizable intervention framework that can be applied across different settings and individuals, (2) the opportunity for the accumulation of knowledge about intervention feasibility and quality, and (3) an explicit

framework for the analysis of intervention effectiveness (Eccles et al., 2009; ICEBeRG, 2006). However, the extent to which these advantages are realized depends on how the theories are used in KT intervention research (Davies, Walker, & Grimshaw, 2010).

First, a theory may be *explicitly tested* in an intervention by specifying an a priori hypothesis based on the theory, then designing both the intervention and evaluation to test whether the hypothesis stands in the given context for the given population. Second, a study may use a theory as a *conceptual basis* for the selection of intervention strategies or the explanation of results, but not explicitly test a hypothesis based on the theory. Third, studies may examine *specific constructs* from a theory without examining the constructs within the theory's overall framework (i.e., only one component of a theory is targeted, measured, or tested in the intervention/study without examining the relationships between constructs). It has been suggested that explicit use of theory in KT interventions will generate a more comprehensive understanding of the predictors of behaviour change in practical settings (Davies et al., 2010; Grimshaw et al., 2002).

2.2.5 Using theory in KT exemplar: The Theory of Planned Behaviour

A theory that is commonly used in both the health behaviour change and KT fields is the Theory of Planned Behavior (TPB). Developed by Ajzen (1991), the TPB is used to predict and/or explain individual-level behaviour. The TPB posits that one's attitudes (beliefs about the consequences of one's behaviour), subjective norms (perceptions of what significant others want one to do, and the

value attached to these perceptions), and perceived behavioural control (PBC; confidence in one's abilities to perform the behaviour regardless of what barriers may be present) predict intention to perform the target behaviour. In turn, the target behaviour is directly predicted by one's intention (the level of effort and planning one is willing to exert for performing the target behaviour), as well as PBC.

In the health behaviour change field, the TPB has been widely used to predict individual-level LTPA behaviour, as well as to inform the development and evaluation of LTPA-enhancing interventions (Armitage & Conner, 2001; Webb & Sheeran, 2006). In the KT field, where a multidisciplinary team of researchers and other stakeholders often work together (CIHR, 2012), using the TPB for intervention development, implementation, and evaluation has advantages because it is comprised of simple constructs that can be reasonably understood across disciplines (Brehaut & Eva, 2012). However, the TPB is often criticized as being better at predicting intentions to engage in a behaviour as opposed to performing the behaviour itself (e.g., Godin, Belanger-Gravel, Eccles, & Grimshaw, 2008). The TPB has also been criticized as it is a static theory of behaviour, not a theory of behaviour change, and thus does not take into account the dynamic role of behaviour on subsequent cognitions and behaviour. The TPB also has an exclusive focus on rational reasoning and conscious decision-making, without consideration of the influential role of habitual thought processes, emotions, and behaviours. Others have criticized the TPB as being *too*

parsimonious in that it limits behaviour to being mediated through only four constructs, although there is a recognized large gap between intentions and behaviour. Indeed, researchers have started to extend the TPB by testing models that include additional variables (e.g., self-regulatory strategies to “close” the intention-behaviour gap) to elaborate the theory. For a complete review of these and additional contemporary criticisms of the TPB, please refer to Sniehotta, Presseau, and Araújo-Soares (2014).

Despite these limitations, the TPB has demonstrated utility in theory-based evaluations that investigate possible causal mechanisms of how interventions lead to behaviour change (i.e., through an individual’s intention; Ramsay et al., 2010). Among research that promotes the uptake and use of research knowledge among HCPs (Eccles et al., 2005; Eccles et al., 2012; Godin et al., 2008), the TPB has been suggested to be an ideal behaviour change theory as it accounts for a variety of factors known to influence professional behaviour across different HCP populations, behaviours and contexts. However, the utility of the TPB for predicting HCPs’ intentions to use physical activity guidelines and discuss LTPA in a clinical setting has yet to be examined.

2.3 Special considerations for KT interventions that aim to change behaviour

Behaviour change interventions are often studied through experimental, lab-based studies, and the success of a given intervention strategy may hinge on the control the researchers had over the study variables. On the other hand, KT

interventions occur in the “real-world”, necessitating appropriate methods for their meaningful and widespread use in a practical, applied setting where it is more challenging to have control over study variables. While theory-based interventions may prove to be effective at changing social cognitive determinants of behaviour in controlled research settings, little work has been done to examine how theory-based interventions can be disseminated and implemented in the real-world.

As suggested by the KTA framework (Graham et al., 2006), in order for real-world KT efforts to be successful, one must plan for a number of factors that may influence the intervention’s impact. Within the practical setting, the specific needs of the knowledge user and interventionists, as well as the barriers and facilitators to knowledge use among interventionists and end-users, should be considered (Graham et al., 2006; Grimshaw et al., 2012). Further, because “real-world” settings encompass many levels of influence on behaviour (e.g., individual, social and environmental influences), it is important to consider the application of different bodies of research evidence and different theories in order to target change at each of these levels (Estabrooks et al., 2006; Graham et al., 2007). Therefore, relying solely on a single theory for KT behaviour change interventions may be too parsimonious when it comes to understanding intervention effectiveness; thus, researchers may need to explore beyond the parameters that a theory sets (Rycroft-Malone, 2007). These considerations are of importance because the use of theory throughout the research process (e.g.,

throughout the KTA framework) may impact whether the KT intervention does, in fact, lead to a change in behaviour.

3.0 THEORY USE IN KT INTERVENTION RESEARCH

3.1 Three phases of KT intervention research: Development, implementation, and evaluation

When conducting KT intervention research, the research process can be divided into three phases that are in line with Graham and colleagues' (2006) KTA framework: development, implementation, and evaluation of the intervention. Each of these phases offers a unique opportunity for the incorporation of research evidence and theory, as well as knowledge user and interventionist involvement.

The *development phase* is represented by the KTA framework's knowledge funnel and first four stages in the action cycle (identify, review, select knowledge; adapt knowledge to local context; assess barriers to knowledge use; select, tailor, implement interventions; see Figure 1; Graham et al., 2006). During this phase, the purpose of the intervention is outlined and refined, and appropriate methodology and data collection tools are selected or developed (CIHR, 2012). This phase requires that decisions be made about how applicable knowledge can be presented in a clear, concise and user-friendly format that is of value to end-users. A key part of the development phase is to forecast potential barriers and facilitators that may influence the use of the intervention by interventionists and

the uptake of knowledge by end-users, and to incorporate strategies within the intervention that will overcome barriers and enhance facilitators (Graham et al., 2006); both of these tasks should integrate research-derived knowledge and the practical knowledge of stakeholders. In this phase, theories can be used to guide the selection of intervention strategies. The constructs, or determinants of behaviour, from the selected theory(ies) are targeted by using intervention strategies that have been previously shown, or have the potential to impact, said constructs (e.g., Michie, Johnston, Francis, Hardeman & Eccles, 2008). When theory is integrated into the development of an intervention, it is possible for researchers to make explicit a priori hypotheses based on theory (Davies et al., 2010; French et al., 2012); thus, in this phase, theory is used to assist in the identification of appropriate variables, outcomes, and measures that will be used to determine effectiveness (French et al., 2012; Rycroft-Malone, 2007). The development phase is an ideal opportunity for collaborating with knowledge users to ensure that the intervention and data collection methods can be implemented feasibly alongside current practice.

Once an intervention is fully developed, it can be used, or implemented, in practice. The *implementation phase* is represented by the fourth and fifth stages of the KTA framework's action cycle (implement interventions; monitor knowledge use; see Figure 1; Graham et al., 2006). During this phase, the strategies that were developed to change end-users' behaviour are applied by interventionists, and theory-based constructs can be measured for the purposes of exploring the

processes and correlates associated with behaviour change (Davies et al., 2010; ICEBeRG, 2006). During this phase, it is important to monitor intervention delivery by interventionists, as well as the uptake of the intervention by end-users, since the degree and quality of implementation can influence intervention outcomes (Durlak & DuPre, 2008). Awareness of, and data collection about, the intricacies inherent in implementing an intervention in a real-world setting may help to explain why interventions succeed or fail, to identify how changes to intervention use can impact outcomes, and to understand intervention features that should be included in future refinements of the intervention (Dusenbury et al., 2003). These implementation intricacies can also be thought of as “key intervention ingredients”, or critical features of an intervention’s design that may be responsible for its effectiveness (Durlak & DuPre, 2008). Certainly, the monitoring of implementation includes the input of interventionists, end-users and other stakeholders involved in the intervention, as these individuals have first-hand experience of the intervention’s multifaceted processes and outcomes.

Finally, the *evaluation phase* is represented by the last two stages of the KTA framework’s action cycle (evaluate outcomes; sustain knowledge use; see Figure 1; Graham et al., 2006) and involves determining whether the intervention is effective at enhancing the uptake and use of knowledge by, as well as changing the behaviour of, end-users. This phase involves additional data collection (e.g., determining the sustainability of the intervention in the setting and the maintenance of intervention outcomes among end-users), data interpretation, and

the dissemination of findings to relevant groups of stakeholders (Graham et al., 2006). Stakeholder involvement can provide practical context to research findings and establish appropriate means for sharing research results. During the evaluation phase, theories can be used to explain the results of the study and to make inferences about possible causal mechanisms that lead (or do not lead) to behaviour change (e.g., mediators; ICEBeRG, 2006). Theory-based evaluations can also inform future research efforts by providing insight into what can be refined at each phase to enhance intervention effectiveness, thus leading to the formulation of additional research questions and re-initiating the intervention development, implementation, and evaluation processes (Ramsay et al., 2010). When this occurs, emerging research or practical evidence may be incorporated as the action cycle repeats itself. The use and examination of theory across these various stages of intervention research has been suggested to be the next step in understanding how and why KT interventions lead to behaviour change (Eccles et al., 2009).

3.2 Current use of evidence and theory in KT interventions

By definition, interventions cannot be considered “KT” unless they translate the best available research evidence in an accessible format so that the knowledge can be applied in a practical setting. Consequently, KT interventions are frequently evidence-based. Conversely, KT interventions are infrequently theory-based. A recent systematic review that examined the use of theory in the

KT field found that less than 25% of studies used theory, with only 6% of studies explicitly testing study hypotheses based on theory (Davies et al., 2010).

Therefore, there is a paucity of research examining the use of theory during intervention development and implementation phases, and how theory use during these stages influences the effectiveness of real-world KT interventions.

As the field of KT becomes increasingly more concerned with achieving intervention effectiveness under “real-world conditions” (Dusenbury et al., 2005), the use of theory across the research phases is becoming increasingly more important in order to hone in on the critical modifiable and non-modifiable intervention components that predict or explain intervention effectiveness/behaviour change (Durlak & DuPre, 2008; Grimshaw et al., 2002). This dissertation aims to fill this gap by exploring how the use of theory during the development and implementation phases can enhance the evaluation phase of KT intervention research.

4.0 GENERAL PURPOSE OF DISSERTATION

The purpose of this dissertation was to test the utility of theories across the development, implementation, and evaluation of three real-world, nationwide KT interventions in the physical disability community. First, two educational interventions designed for HCPs who work with patients with physical disabilities were tested. Second, an informational and behavioural intervention designed for

directly for end-users (i.e., people with SCI) was tested. An overview of each study is presented next.

4.1 Study 1

Using a theory-based evaluation guided by the TPB (Ajzen, 1991), Study 1 evaluated the short-term effectiveness of an evidence-based, online continuing education module (“*ABCs of Autonomic Dysreflexia (AD)*”) designed to increase emergency HCPs’ knowledge and use of clinical practice guidelines (CPGs) for the management of patients with SCI who present with AD (a sudden increase in blood pressure that can result from participating in LTPA which can be life-threatening if not managed promptly and properly; Krassioukov, Warburton, Teasell, & Eng, 2009). Paramedic and nurse trainees were recruited from two training programs in Canada, and completed measures assessing their knowledge of, and TPB social cognitions towards using, the AD-CPGs immediately before and after they viewed the “ABCs of AD” module. It was hypothesized that trainees would report significant increases in their knowledge of, and attitudes, subjective norms, PBC, and intentions towards using, the AD-CPGs immediately following completion of the KT intervention.

4.2 Study 2

Study 2 examined the use of theory across all three phases of research in the Canadian Paralympic Committee’s *Changing Minds, Changing Lives* (CMCL)

intervention. CMCL is a Canada-wide educational seminar program designed to enhance HCPs' intentions to discuss LTPA to patients with physical disabilities. First, Study 2.1 was conducted to describe how research evidence and intervention strategies that target the TPB constructs (Ajzen, 1991) were incorporated in the restructuring of the CMCL curriculum. Study 2.1 also examined changes in CMCL interventionists' TPB cognitions for delivering the new curriculum, and whether they felt the new curriculum met characteristics that would facilitate its adoption and use. Interventionists completed TPB measures at pre- and post-training and at 6-month follow-up. It was hypothesized that interventionists would report significant increases in social cognitions to use the new CMCL curriculum immediately following their training, and that these increases would be sustained over a 6-month period, reflecting their acceptance and adoption of the new curriculum.

Following the development and implementation of the CMCL curriculum (Study 2.1), Study 2.2 evaluated the effectiveness and short- and long-term maintenance of the CMCL intervention on HCPs' TPB social cognitions to discuss LTPA. Prior-to, as well as immediately, one, and six months following a CMCL seminar, HCPs completed questionnaires that assessed the TPB constructs with regard to discussing LTPA with their patients with a physical disability. It was hypothesized that HCPs would report significant increases in their attitudes, subjective norms, PBC, and intentions to discuss LTPA immediately following their attendance at a CMCL seminar, but that these increases would not be

maintained at 1- and 6-month follow-up. Given that the TPB has been shown to predict HCPs' clinical behaviours other than LTPA prescription, we also hypothesized that attitudes, subjective norms, and PBC would emerge as significant predictors of HCPs' intentions to discuss LTPA.

Study 2.2 also explored key implementation variables that predict changes in HCPs' social cognitions. Key presenter characteristics and intervention delivery components were extracted from presenter demographic questionnaires (completed by interventionists during training) and seminar checklists (completed by interventionists following the delivery of each seminar), respectively. It was hypothesized that presenter characteristics would predict changes in HCPs' subjective norms and that intervention delivery components would predict changes in HCPs' attitudes and PBC for discussing LTPA with their patients with physical disabilities.

4.3 Study 3

Study 3 examined the effectiveness, and its implementation correlates, of SCI Action Canada's *Get in Motion* (GIM) telephone counseling service. GIM uses evidence and theory-based information and theory-based intervention strategies to promote LTPA behaviour among Canadian adults with SCI. The purpose of Study 3 was to explore the implementation correlates of change in LTPA intentions and behaviour among clients who enrolled in the GIM service between September 2011-January 2014 (i.e., its second phase/action cycle;

Graham et al., 2006). GIM clients completed measures of their LTPA intentions and behaviour when they enrolled in the service, and at every two months throughout the six month service. It was hypothesized that clients would report high intentions at baseline, that these high intentions would be sustained throughout enrolment, and that LTPA behaviour would increase during clients' six month enrolment in the service.

In addition, and in line with the fifth stage of the KTA action cycle (monitor knowledge use; Graham et al., 2006), the implementation of the telephone counseling sessions was monitored through the use of a Counseling Session Checklist. Clients who completed six months of counseling were asked to reflect on their perceptions of the service. It was hypothesized that intervention dose (i.e., clients' exposure to the GIM service) would be positively correlated with changes in LTPA intentions and behaviour. In the absence of previous LTPA implementation literature examining the influence of real-world intervention content and perceived quality on effectiveness, no hypotheses were put forth for the relationship between these variables and changes in LTPA intentions and behaviour.

5.0 SUMMARY

Four studies were undertaken to test the utility of theories across the development, implementation, and evaluation of three real-world, nationwide KT interventions in the physical disability community. These studies are presented in

the subsequent four chapters, followed by a general discussion summarizing how this dissertation has contributed to the literature on both KT and LTPA-enhancing real-world interventions in the physical disability community.

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Figure 1. The Knowledge-to-Action framework (Graham et al., 2006).

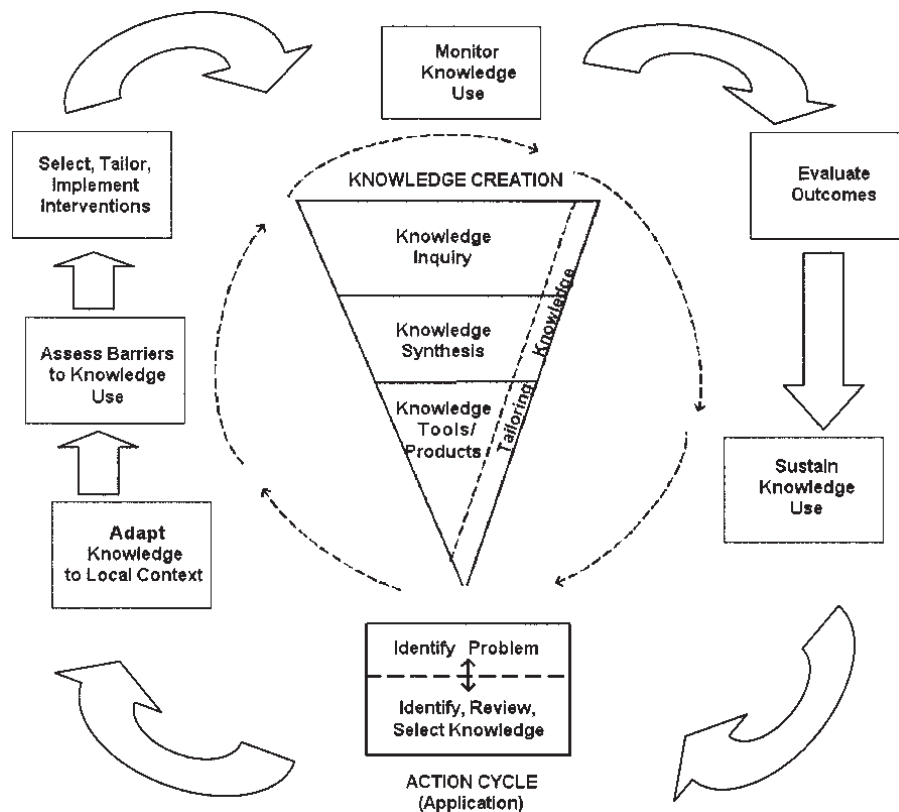


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CHAPTER 2

The “ABCs of AD”:

A pilot test of an online educational module to increase use of the autonomic dysreflexia clinical practice guidelines among paramedic and nurse trainees

Preamble

The “ABCs of AD”: A pilot test of an online educational module to increase use of the autonomic dysreflexia clinical practice guidelines among paramedic and nurse trainees is the first study in the dissertation series. The study examines the short-term effectiveness of an evidence-based, online continuing education module (“ABCs of AD”) on paramedic and nurse trainees’ knowledge of, and Theory of Planned Behaviour social cognitions for using, the autonomic dysreflexia (AD) clinical practice guidelines (CPGs).

The following manuscript is currently in press at the *Journal of Spinal Cord Medicine* (Volume 37, Issue 4). The word document version of the manuscript (formatted according to the *Journal of Spinal Cord Medicine* author guidelines) is included in the dissertation as author proofs are not yet available.

The copyright for this manuscript is currently held by Maney Publishing (the publisher for the *Journal of Spinal Cord Medicine*). Permission was received to include the manuscript (before typesetting) in the dissertation (see Appendix D.2).

Contribution of Study 1 to overall dissertation

Study 1 demonstrates that an evidence-based knowledge translation (KT) intervention is important for imparting knowledge; however, the theory-based evaluation demonstrated that changes in social cognitions were not present among trainees, and it can be inferred that behaviour change (i.e., use of the AD-CPGs in practice) would be unlikely. Findings from Study 1 also suggest that measuring implementation factors can help explain why changes in outcomes do or do not occur. Thus, Study 1 contributes to the overall dissertation by suggesting that (1) behaviour change theory should be integrated into the intervention curriculum during the development phase in order to be able to explicitly test hypotheses about intervention outcomes based on theory, and (2) information about the implementation of a KT intervention may help explain observed outcomes during the intervention’s evaluation phase.

Because the Theory of Planned Behaviour (TPB) has been previously shown to predict changes in health care professionals’ intentions and behaviours for adopting a clinical practice guideline (e.g., Eccles et al., 2012), the TPB was selected for the theory-based evaluation of the intervention in Study 1.

Abstract

Context/Objective: Despite the availability of clinical practice guidelines (CPGs), gaps in autonomic dysreflexia (AD) knowledge and practice persist among health care professionals. A free online educational module, the "ABCs of AD", was developed to improve knowledge of the AD-CPGs among emergency health care personnel. The purpose of the current pilot study was to examine short-term changes in paramedic and nurse trainees' knowledge of, and social cognitions towards using, the AD-CPGs following completion of the module.

Design: Pre-post.

Methods: Thirty-four paramedic and nurse trainees from two training programs in Canada completed measures immediately before and after viewing the online "ABCs of AD" module.

Outcome Measures: AD knowledge test; Theory of Planned Behaviour social cognition questionnaire; module feedback survey.

Results: Paired samples *t*-tests revealed significant increases in participants' AD knowledge test scores ($M \pm SD_{pre} = 9.00 \pm 2.46$, $M \pm SD_{post} = 12.03 \pm 4.07$, $p < .001$; $d = .84$). Prior to viewing the module, participants reported positive social cognitions for using the AD-CPGs (all $M_s \geq 4.84$ out of 7). From pre- to post-module, no significant changes were seen in participants' social cognitions for using the AD-CPGs. Participants' average module viewing time was 36.73 ± 24.17 min (range 8-90 min). There was a decline in viewing from the first to the last module sections, with only half of participants viewing all six sections.

Conclusion: Knowledge alone is insufficient for clinical behaviour change; as such, social cognitive determinants of behaviour should be explicitly targeted in future iterations of the module to increase the likelihood that the module increases use of the AD-CPGs. To engage viewers across all module sections, the “ABCs of AD” module would benefit from the inclusion of supplementary learning strategies, such as interactive quizzes and peer-to-peer interaction.

Keywords: autonomic dysreflexia; clinical practice guideline; knowledge translation; psychological theory; spinal cord injuries.

Individuals with spinal cord injury (SCI) frequently experience autonomic dysreflexia (AD), an acute, episodic bout of hypertension characterized by a sudden, exaggerated increase in systolic and diastolic blood pressure above an individual's baseline.¹ Episodes of AD are often accompanied by pounding headache, flushing of the skin and profuse sweating above the level of injury, goose bumps above or below the level of injury, and cold pale skin below the level of injury.^{1,2} AD occurs frequently in up to 90% of individuals with SCI with injuries above the mid-thoracic spine (i.e., T6).¹ AD events are often unpredictable, can occur daily, and depend on a number of factors, including the presence of peripheral pain.^{2,3} Delayed recognition and unmanaged episodes of AD can lead to myocardial infarction,⁴ intracranial hemorrhage,⁵ and even death.⁶ However, such outcomes are avoidable if AD is recognized and managed promptly.^{2,6}

The Consortium for Spinal Cord Medicine has published clinical practice guidelines (CPGs) for recognizing and managing AD.⁷ More recently, a systematic review of research evaluating AD prevention and management strategies has been published.² Despite the availability of these evidence-based resources and guidelines, tremendous gaps in AD knowledge and practice persist among health care professionals.^{8,9} For example, Krassioukov and colleagues evaluated knowledge of AD among 133 emergency health care personnel (including paramedics and emergency room physicians and nurses) in three Canadian provinces.⁹ Over 80% of respondents rated their AD knowledge as

“Poor” or “Fair”, 25% of respondents failed to define AD correctly, and only 50% identified three or more associated signs and symptoms of AD. Given that paramedics and emergency room physicians and nurses are the most likely health care professionals to encounter a patient with AD, their lack of knowledge for diagnosing and managing AD is alarming. If AD is misdiagnosed or mismanaged, patients can spend a week or more in the hospital, suffering from unstable blood pressure and associated life-threatening complications. A targeted educational intervention to improve emergency personnel’s recognition and management of AD could have a profound impact on the medical treatment of people with SCI in Canada.

In response to this gap in knowledge, a free online educational module - "ABCs of AD" (available at <http://wp-dev.jibc.ca/abcofad/>) - was developed as part of an integrated knowledge translation (KT) project that brought together clinicians and scientists to assess and improve knowledge and management of AD among emergency health care personnel. The “ABCs of AD” module is delivered by an SCI clinician-scientist (AK) with supplementary video modules featuring a discussion between clinicians and people with SCI who have experienced AD. The target audience of the module is pre-hospital emergency care workers, including paramedics and emergency room nurses and physicians, with evidence-based content focusing on defining and diagnosing AD, recognizing signs and symptoms of AD, and using the AD-CPGs. The module is designed to take 60-90

minutes for users to complete, with the content distributed among six module sections.

Educational outreach methods that provide knowledge, such as courses, seminars, and e-learning modules, are generally effective at increasing knowledge, but ineffective at changing the practice, of health care professionals.¹⁰⁻¹² For example, knowledge about a CPG alone does not guarantee it will be adopted and implemented; individual level beliefs and other cognitions about the guideline, as well as environmental and organizational barriers and facilitators, can impact the translation of the knowledge contained in the guideline into health care practice.^{13,14} A theory-based process evaluation of the individual-level perceptions that may be associated with intervention effectiveness can be useful for understanding why behaviour change does or does not occur following a targeted educational intervention.¹⁵

The Theory of Planned Behaviour (TPB) is a psychological theory that has been used widely to predict and understand individual-level behavior,¹⁶ including health care professionals' behaviour.¹⁷⁻¹⁹ The TPB states that an individual's intention, or motivation, to perform a behaviour is the most proximal predictor of that behaviour.²⁰ Intention is predicted by the individual's attitude (evaluation of behaviour and its consequences), subjective norm (perceived sense of pressure from others to perform behaviour, and motivation to comply), and perceived behavioural control (PBC; sense of control and confidence for performing behaviour). PBC also has a direct influence on behaviour. Although the "ABCs

of AD” module was designed to be evidence-, but not behaviour change theory-, based, the module includes components that may inadvertently target users’ social cognitions for using the AD-CPGs. For example, by providing knowledge about AD and outcomes associated with using the AD-CPGs, the “ABCs of AD” module may target viewers’ *attitudes* towards using the guidelines. Because the module information is provided by practicing clinicians and people with SCI who have experienced AD, viewers may become aware of their professional duty to follow and increase their perceptions of *subjective norms* for using the AD-CPGs. Lastly, the module emphasizes the use of the AD-CPGs by discussing how the guidelines are used by other professionals (e.g., vicarious experiences) and encourages the use of the guidelines by all professionals (e.g., social persuasion); together these features of the module may target viewers’ *PBC*. Examining changes in viewers’ social cognitions would allow researchers to hone in on the module components that have the greatest potential for leading to changes in practice behaviour.

While it is important to educate health care professionals who would use the AD-CPGs in day-to-day practice, more proximal education of paramedic and nurse trainees would ensure that future health care professionals are equipped with the knowledge and resources necessary to implement the guidelines as soon as they enter the workforce. Further, exposure to CPGs during training may result in earlier adoption, and thus use, of the guidelines in practice. As such, the purpose of the current pilot study was to examine short-term changes in

paramedic and nurse trainees' knowledge of, and social cognitions towards using, the AD-CPGs following completion of the “ABCs of AD” module. We hypothesized that trainees would report significant increases in their knowledge of, and TPB social cognitions (e.g., attitudes, subjective norm, PBC, and intentions) towards using, the AD-CPGs immediately following completion of the “ABCs of AD” module.

Methods

Participants and Recruitment

Paramedic and nurse trainees enrolled at two different training institutions, one in British Columbia and one in Ontario, were recruited to participate in the current study. Both male and female trainees at any stage of their training (e.g., first year through fourth year) were asked to participate. A member of the research team visited paramedic and nursing classes at the training institutions to provide information about the study to trainees. During recruitment, the researcher made the trainees aware of the existence of AD-CPGs without providing specific information about the content of the guidelines. Note that the regular classroom instructor was not present in the classroom during recruitment and trainees were given the opportunity to have their questions about the study answered before participating. Interested trainees anonymously provided the research team member with their email address, which was used to contact trainees for collecting informed consent and administering online study measures,

as well as for providing online access to the “ABCs of AD” module. Each email address was assigned a unique study identification number so that data could be tracked anonymously. These classroom visits were done at the beginning of the school year to avoid the study measures conflicting with trainees’ mid-term and final exams.

Based on a previous report of an educational intervention about the AD-CPGs, a large sized effect was expected for changes in AD knowledge following the completion of the “ABCs of AD” module.⁹ G*Power statistical software indicated a sample of 24 participants was required to have 95% power to detect a large-sized effect at alpha less than .05.²¹

Protocol

Ethical clearance was provided by all institutional ethics boards. Informed consent and all data were collected using Fluid Surveys. Participants were emailed a link to the letter of information and consent form. Trainees who consented were directed to an online pre-module questionnaire which included demographic questions, TPB scales assessing participants’ social cognitions for using the AD-CPGs, and an AD knowledge test. Upon the completion of the pre-module questionnaire, participants were automatically directed to the “ABCs of AD” online module. Four days after the completion of the pre-module questionnaire, the research team emailed participants to remind them about the online module and to encourage them to view the module at their convenience.

Approximately one-week later, participants who completed the pre-module questionnaire were emailed a link to the post-module questionnaire, which included the same TPB scales and AD knowledge test as the pre-module questionnaire, as well as a brief module feedback survey. Participants who completed both the pre- and post-module questionnaires were sent a \$10 e-gift card to thank them for their time and effort.

Measures

Demographic information. Participants were asked to report their age, sex, ethnicity, province, program and year of study, and whether they had any previous experience with a patient with SCI. Participants were also asked to rate their current knowledge of AD as “None”, “Poor”, “Fair”, “Good”, or “Excellent”.

AD knowledge test. The AD knowledge test was written and previously used by a group of SCI physiatrists and experts in AD-CPGs.⁹ The AD knowledge test consisted of 11 questions of varying question types (e.g., case studies, multiple choice, matching; see Appendix A.2 for AD knowledge test) that assessed participants’ current knowledge of recognizing and managing a patient with AD. Responses were scored according to the previous study that used the survey,⁹ with a possible maximum score of 22.

TPB cognitions for using the AD-CPGs. Participants’ attitudes, subjective norms, and PBC were assessed with items adapted from Ajzen’s,²² Conner and Sparks’,²³ and Francis and colleagues’²⁴ recommendations for developing a TPB

questionnaire. All items were rated on a seven point Likert-type scale. For TPB construct scales with more than two items, item scores were averaged to give an overall construct score. Table 1 lists the items, response scale, and the internal reliability or correlation of the items for each scale included in the TPB questionnaire.

Module feedback survey. Participants were asked to report the number of minutes they spent working through the module, and indicate which module sections they viewed. Six items that assessed whether the participants felt the module information was novel, interesting, easy to understand, credible, personally important to them, and whether participants would recommend the module to a colleague, were rated on a 7-point Likert-type scale (*1 = Strongly disagree, 7 = Strongly agree*). Participants were also asked open-ended questions regarding what they found effective about the module, and additional strategies that would enhance the “ABCs of AD” module in the future.

Data Analysis

All data were screened for outliers and normality using established guidelines.²⁵ Descriptive statistics were calculated for each study measure. Paired samples *t*-tests were computed to identify significant changes in the TPB variables and AD knowledge test scores between pre- and post-module. Cohen’s *d* was calculated as an index of effect size.

Results

Participants

Of the 196 trainees who provided their email addresses, 86 completed the pre-module questionnaire and 34 completed the post-module questionnaire. The majority of participants who completed the pre-module questionnaire were female (72.1%), Caucasian (89.5%), and from Ontario (77.9%), with an average age of 24.33 years ($SD=6.20$). Participants were enrolled in either a nursing (53.5%) or paramedic (46.5%) program, and the majority of participants were in their second year of their program (67.4%). Less than 20% of trainees had previous experience with a patient with SCI, and most participants rated their knowledge of AD as “Poor” (43.7%) or “None” (39.1%). There were no significant differences in demographics between participants who completed only the pre- vs. both the pre- and post-module questionnaires. Please see Table 2 for complete participant demographic information.

Knowledge of, and social cognitions towards using, the AD-CPGs.

Table 3 contains the descriptive statistics, t -test results, and effect sizes for participants’ social cognitions and AD knowledge test scores. From pre- to post-module, significant increases in participants’ AD knowledge test scores were seen ($p<.001$; $d=.84$). Prior to viewing the “ABCs of AD” module, participants reported positive social cognitions for using the AD-CPGs (all $M_s \geq 4.84$ out of 7). From pre- to post-module, no significant changes were seen in participants’ social

cognitions for using the AD-CPGs; however, small effect sizes were seen for increases in participants' attitudes ($d=.22$), subjective norms ($d=.27$), and PBC ($d=.24$) to use the AD-CPGs.

Module feedback

Participants' average module viewing time was 36.73 ± 24.17 minutes, with a range of viewing times between 8 and 90 minutes. On average, participants viewed 4.48 ± 1.89 of the six module sections, with a decline in viewing from the first to the last module sections. Of the 34 participants who completed the post-module questionnaire, the percentage of participants who self-reported completing each module section are as follows: Introduction (88.2%), Getting Started (82.4%), Defining AD (76.5%), Diagnosis of AD (67.7%), Signs and Symptoms of AD (64.7%) and Management of AD (55.9%).¹ Participants had positive perceptions of the module – the average ranking of each of the six feedback items was greater than 5.67 out of 7 (see Table 4 for complete module feedback items and scores). The only exception was the item asking about the module's personal importance to participants, which had an average ranking of 4.67 out of 7.

When asked what they found particularly effective about the “ABCs of AD” module, participants listed the following: (1) valuable information ($n=8$), (2)

¹ Given the variability in participants' module viewing time and the number of module sections completed, repeated measures ANCOVAs controlling for these two variables on pre- to post-changes in AD knowledge test scores and TPB social cognitions would have been an appropriate analytic approach; however, the covariates violated the assumption of homogeneity of regression variance thus precluding this analytic strategy.

personal touch of stories of real people who have been affected by AD ($n=7$), (3)

clear concise information with relevant images and diagrams ($n=7$), (4)

organization/set up of the module (e.g., easy to navigate and follow different

sections; $n=5$), and (5) ability to work through the module at own pace ($n=3$).

Participants listed the following strategies as useful ways to enhance the “ABCs

of AD” module: (1) the inclusion of online quizzes to engage the viewer ($n=1$),

(2) more detail about the definition and etiology of AD at the front end of the

module ($n=1$), and (3) more specific information to engage paramedic and nursing

students ($n=1$).

Discussion

Following completion of the “ABCs of AD” online module, paramedic and nurse trainees achieved statistically significant improvements in their AD knowledge test scores. Despite these increases in knowledge, no statistically significant changes were seen in trainees’ TPB social cognitions to use AD-CPGs. Participants’ feedback about the module was positive, and several participants provided suggestions for future improvements to the module to more fully engage health care professional trainees.

Our first hypothesis – that participants’ AD knowledge would increase following exposure to the “ABCs of AD” module – was supported. Educational outreach interventions, such as the “ABCs of AD” module, have been shown to be effective at imparting new knowledge to attendees¹⁰⁻¹²; thus, these results are not

surprising. Despite these significant increases in AD knowledge test scores, trainees' post-module AD knowledge test scores were still relatively low (mean of 12 out of 22). A possible explanation for these low knowledge scores may reflect participants' lack of knowledge and experience with patients at their current stage of their career. Compared to practicing health care professionals, trainees likely have less prior theoretical and practical knowledge of SCI and pathophysiology, as well as how to manage patients and apply CPGs in general. As such, it may have been challenging for trainees to understand the relevance of the module content, as well as to integrate and apply the content when completing the post-module AD knowledge test. Trainees' feedback supports this explanation; compared to the other feedback items, trainees had lower perceptions of the module's personal importance, and they suggested that the "ABCs of AD" module could be enhanced by including more information that specifically engages trainees. These results suggest that the module content may not have been salient to trainees at this stage in their career; that is, trainees may not recognize the personal relevance of "ABCs of AD" module when they do not yet have experience with patients with SCI or are not currently working in a capacity where they can put their new knowledge into practice. This perception of personal importance may have negatively impacted participants' desire to view all six module sections, as well as their module viewing time.

Another explanation for the low AD knowledge test scores is the lack of exposure and engagement the participants had with the module content. Given

that most participants did not have previous experience with a patient with SCI, and the majority of participants rated their pre-module AD knowledge as “Poor” or “None”, the module likely presented trainees with new information. With an average module viewing time of approximately 37 minutes, it is unlikely that the trainees had adequate time to process and apply the new information. Moreover, given that participants only viewed 4.5 of 6 module sections, with just over half of participants viewing the last module section about AD management highlighting the use of the AD-CPGs, participants may not have been exposed to all the content that is evaluated on the AD knowledge test. In order to more fully engage viewers, additional learning strategies to enhance knowledge retention and application should be included in future iterations of the module. For example, enhanced interaction between the user and the module, such as through quizzes, may help to engage viewers in the content.²⁶ Also, peer-to-peer interaction (i.e., medical roundtables, discussion of case studies) is commonly used in health care professional practice to facilitate learning; this concept could be applied virtually in the module by including an online discussion board or real-time webinar discussion to give users the opportunity to ask each other questions and share practical experiences.²⁶ Including module end users during the development and/or refinement of the intervention may help ensure that the strategies included are feasible for enhancing interaction with the module content.

Despite the significant increases in AD knowledge test scores, our second hypothesis was not supported. There were no significant changes in participants’

TPB social cognitions for using the AD-CPGs between pre- and post-module. There are two possible reasons for this lack of change. First, participants' pre-module social cognitions were already quite positive (scores were greater than 4.79 out of 7 on the TPB measure). These initially high scores may have left little room for improvement, especially considering that the use of the guidelines is not imminent in their career; that is, most participants were at least one year from practicing in the field and applying the guidelines with real-life patients. Second, the "ABCs of AD" module was designed to translate evidence-based knowledge of AD and the AD-CPGs without overtly targeting viewers' social cognitions for enacting the guidelines. Previous research suggests that providing knowledge alone is necessary, but insufficient, for behaviour change,^{27,28} and that determinants of behaviour should be explicitly targeted in interventions in order to increase individuals' motivation for changing their behaviour.^{11,29} While the "ABCs of AD" module may have inadvertently targeted the TPB social cognitions, the overt inclusion of behavioural techniques that target these cognitions should be considered for future iterations of the module. For example, demonstrating to module viewers that social support processes are in place for the use of AD-CPGs in practice may be effective in changing social cognitive domains that could influence viewers' perceptions of attitudes, subjective norms, and PBC.³⁰ Third, examining individual-level perceptions of a guideline provides an incomplete picture of why guideline use does or does not occur.^{13,14} Environmental and organizational barriers and facilitators that influence the translation of the

knowledge contained in the guideline into health care practice should be examined, as these factors can impact individual-level perceptions.^{13,14,31} For example, the incorporation of the AD-CPG recommendations and algorithms into organizational and professional standards and policies (i.e., both the Basic and Advanced Life Support Patient Care Standards used as the standard of practice for paramedics in Ontario)^{32,33} would likely enhance individuals' attitudes, subjective norms, PBC, and intentions to use the guidelines, as well as increase the reach, adoption, and implementation of the guidelines.

While this study represents a pilot test of the “ABCs of AD” module among trainees, it is nevertheless important to expose health care professionals to guidelines early in their training to help generate a sense of norms about using guidelines throughout their career. There is an increasing demand for evidence-based practice in health care,³⁴ and health care professionals are inundated with ever-changing CPGs that they are expected to adopt and routinely use.¹³ Early exposure to guidelines, such as through educational outreach like the “ABCs of AD” module, may help create a normative culture of guideline use among trainees so that they are more open to adopting new guidelines throughout their practice (c.f., Rogers' Diffusion of Innovations³⁵).

Strengths and limitations

A strength of this study is the inclusion of a theory-based process evaluation for determining intervention effectiveness. Few evaluations of

implementation interventions, such as educational outreach, test hypotheses based on theory.³⁶ Theory-driven evaluations can help decipher the behavioural determinants of change when an intervention is hypothesized to be mediated by the theory's constructs.^{15,29} The current study's evaluation protocol can now be used to determine the impact of the "ABCs of AD" module on practicing health care professionals' knowledge of, and social cognitions for using, the AD-CPGs. Despite this strength, this study is limited by the low response rate at follow-up; only 40% of trainees who completed the pre-module questionnaire also completed the post-module questionnaire. This response rate may have improved if we had used personalized contacts when administering links to the questionnaires and modules (e.g., using the individual's name in a reminder email)³⁷; however, trainee anonymity was a key ethical concern of the training institutions, so personalization of emails beyond the participants' unique study ID was not possible. A second limitation is the lack of a control group that did not receive the "ABCs of AD" module. While the control group would likely not report changes in AD knowledge test scores, simply being in a study that asks about social cognitions for adopting CPGs might prompt changes in participants' social cognitions for using the AD-CPGs, a phenomenon referred to as the mere measurement effect.³⁸ The use of a control group is a consideration for future research evaluating the impact of the "ABCs of AD" module on changes in social cognitions for changing behaviour.

Conclusion/Future directions

The “ABCs of AD” online educational module appears to be effective at increasing health care professional trainees’ knowledge of, but not social cognitions for using, the AD-CPGs. The results of the current study suggest that the impact of the “ABCs of AD” module has the potential to be maximized by ensuring the module has a foundation in behaviour change theory and by incorporating additional learning strategies throughout the module. Explicit use of theory in the design of the module would better target the social cognitions that are more likely to lead to behaviour change among users (e.g., use of the AD-CPGs by health care professionals and trainees). The inclusion of supplementary adult learning strategies, such as interactive quizzes and peer-to-peer interaction, and tailoring of module content to the intended audience would help to ensure that users are engaged across all module sections and processing module content. Further, the module would benefit from including separate components that target trainees and professionals, with the appropriate end users being included in the intervention development process so to ensure the content is salient and acceptable to each target audience group. These suggestions are currently being considered by module developers, and would likely be facilitated by including behaviour change and knowledge translation researchers in the module development process.

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Table 1. Questionnaire items assessing trainees' social cognitions for using the autonomic dysreflexia clinical practice guidelines.

Theory of Planned Behaviour construct (# items)		Internal reliability score (α) or correlation (r)
Items included in scale		Response scale
Attitudes (6 items)		$\alpha s \geq .94$
1. Using the AD-CPGs would help me treat patients with SCI.		1 = Strongly disagree, 7 = Strongly agree
2. Complete the statement, "I think that following the AD-CPGs would be _____,"		
a. unsatisfying/satisfying		Anchors represent
b. inappropriate/appropriate		extremes (1/7) on 7-
c. unhelpful/helpful		point Likert scale
d. irresponsible/responsible		
e. bad/good		
Subjective norm (3 items)		$\alpha s \geq .76$
Complete the statement: "_____ want me to follow the AD-CPGs."		1 = Strongly disagree, 7 = Strongly agree
1. Other health care professionals...		
2. Patients with SCI...		
3. The people I work with...		
Perceived behavioural control (3 items)		$\alpha s \geq .73$
1. I am confident that I can follow the AD-CPGs when treating patients with SCI.		1 = Strongly disagree, 7 = Strongly agree
2. The decision to use the AD-CPGs is in my personal control.		
3. Whether I follow the AD-CPGs is entirely up to me.		
Intention (2 items)		$r s \geq .64$
1. I intend to follow the AD-CPGs when treating patients with SCI.		1 = Strongly disagree, 7 = Strongly agree
2. I will try to use the AD-CPGs when treating patients with SCI.		

Note. AD, autonomic dysreflexia; CPGs, clinical practice guidelines; SCI, spinal cord injury. The column indicating scale internal reliability (Cronbach alpha) scores for the items on the scale and Pearson correlations between the items on the scale represent the lowest value across the two time points (pre- and post-module). All internal reliability scores were acceptable.

Table 2. Demographic characteristics of participants who completed the pre- and post-module questionnaires.

Characteristic	Pre-module <i>n</i> =86	Post-module <i>n</i> =34
Age (<i>M</i> ± <i>SD</i> in years)	24.33±6.20	24.68±7.58
Sex		
Male	24 (27.9)	5 (14.7)
Female	62 (72.1)	29 (85.3)
Ethnicity		
Caucasian	77 (89.5)	32 (94.1)
Other	9 (10.5)	2 (5.9)
Province		
Ontario	67 (77.9)	27 (79.4)
British Columbia	19 (22.1)	7 (20.6)
Program		
Primary care paramedic	31 (36.0)	9 (26.5)
Advanced care paramedic	9 (10.5)	2 (5.9)
Practical nursing	11 (12.8)	7 (20.6)
BSc nursing	35 (40.7)	16 (47.1)
Year in program		
First	27 (31.4)	9 (26.5)
Second	58 (67.4)	25 (73.5)
Third	1 (1.2)	
Previous experience with patient with SCI		
Yes	16 (18.6)	4 (11.8)
No	70 (81.4)	30 (88.2)
Current knowledge of AD		
None	34 (39.1)	15 (44.1)
Poor	38 (43.7)	16 (47.1)
Fair	6 (6.9)	2 (5.9)
Good	2 (2.3)	0 (0)
Excellent	0 (0)	0 (0)

Note. AD, autonomic dysreflexia; BSc, Bachelor of Science; SCI, spinal cord injury. All values are *n* (%) unless otherwise indicated.

Table 3. Summary of changes in social cognitions to use AD-CPGs and AD knowledge test scores between pre- and post-module participation (n=34)

Construct	Module		Paired Samples <i>T</i> -test		Effect size
	Pre	Post	<i>T</i> -value	<i>p</i> -value	<i>d</i>
Attitude	5.43±1.41	5.76±1.14	-1.23	.23	.22
SN	4.84±1.09	5.18±1.17	-1.51	.14	.27
PBC	4.79±1.34	5.13±1.15	-1.23	.19	.24
Intention	5.36±1.38	5.55±1.34	-0.78	.44	.14
AD knowledge (out of 22)	9.00±2.46	12.03±4.07	-4.20	<.001	.84

Note. AD, autonomic dysreflexia; CPGs, clinical practice guidelines; PBC, perceived behavioural control; SN, subjective norms. All mean construct scores are reported as $M \pm SD$ and are out of 7, except AD knowledge test scores which are out of 22 (as noted).

Table 4. Participants' feedback about the "ABCs of AD" module.

Module feedback items	Mean±SD
I learned a lot of new information in the module.	5.87±1.85
The information in the module was interesting.	6.00±1.29
The information in the module was easy to understand.	6.17±1.58
The information in the module was credible.	6.33±1.49
The module was personally important to me.	4.67±2.02
I would recommend this module to a colleague.	5.67±1.54

Note. Scores are out of 7 (1 = *strongly disagree*, 7 = *strongly agree*).

CHAPTER 3

***Changing Minds, Changing Lives* from the top down:**

An investigation of the dissemination and adoption of a Canada-wide educational intervention to enhance health care professionals' intentions to prescribe physical activity

Preamble

Changing Minds, Changing Lives from the top down: An investigation of the dissemination and adoption of a Canada-wide educational intervention to enhance health care professionals' intentions to prescribe physical activity is the first part of the second study in the dissertation series (Study 2.1). The study describes the restructuring of the CMCL curriculum to include a foundation in up-to-date research evidence, theory-based strategies to target the CMCL attendees' Theory of Planned Behaviour (TPB) social cognitions for discussing leisure-time physical activity, and solutions to barriers of both intervention use by interventionists and knowledge use by end-users. This study also describes the dissemination and implementation of the CMCL program in Canada during the study period (November 2011 to August 2012). Finally, this study examines interventionists' TPB social cognitions for, and their acceptance and adoption of, the new curriculum. The findings in this study provide context to the theory-based evaluation of the CMCL intervention in Study 2.2 (Chapter 4.)

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Contribution of Study 2.1 to overall dissertation

Study 2.1 builds upon Study 1 by incorporating strategies that target constructs from a behaviour change theory (TPB) into the new CMCL curriculum. Study 2.1 also demonstrates the usefulness of using a knowledge translation (KT) framework (i.e., Diffusion of Innovations, DOI) and a KT principle (i.e., including stakeholders) during the intervention's development phase in order to increase the likelihood that interventionists will adopt and subsequently use/implement the intervention.

During the participatory curriculum development process, it became evident that the CMCL interventionists and other stakeholders felt that the new CMCL curriculum needed to serve specific purposes. The stakeholders elicited that the new curriculum should: (1) increase health care professionals' awareness of the benefits of talking about physical activity with their patients, as well as the benefits of physical activity participation for their patients; (2) create social pressure for talking about physical activity with patients by demonstrating to health care professionals that their peers are already doing it, and that people with

a disability want this information from their providers; and (3) demonstrate that health care professionals already have the skills they need to initiate a conversation about physical activity with their patients, and that it is easy to incorporate the conversation into routine patient-provider interactions.

These specific purposes were mapped on to the theoretical constructs of attitudes/beliefs, subjective norms/social influence, and perceived behavioural control/self-efficacy, respectively. Recognizing that these constructs are captured by numerous social cognitive theories of behaviour change, we nevertheless elected to adopt the TPB as the framework to guide the study. Stemming from the stakeholders' involvement during the intervention development process, the TPB was selected for a number of reasons. First, the TPB has been applied to large array of behavioural outcomes including physical activity, teaching/training, and health care professional practice behaviours. All of these behaviours were relevant throughout the different stages of the CMCL study (i.e., curriculum development, dissemination, implementation, and evaluation), so the TPB could be used consistently across the CMCL study as a whole. Second, the constructs within the TPB can be easily articulated to a multidisciplinary audience, so it was easy to explain the theoretical basis of the intervention to the stakeholders involved in the participatory curriculum development process. Third, there are well-developed guidelines for creating measures of the constructs within the TPB, thus facilitating valid and reliable measurement of the constructs. Furthermore, because there are only four constructs in the TPB (attitudes, subjective norm, perceived behavioural control, and intentions), it would be practical and feasible to administer questionnaires within the existing CMCL intervention protocol. Lastly, the TPB has been used to understand predictors of behaviour in both the behavioural science and implementation science/KT fields. In fact, the TPB is suggested to be an ideal theory for understanding knowledge mobilization and clinical behaviour change among health care professionals. Given these considerations, the TPB was considered the ideal framework for Studies 2.1 and 2.2.

Changing Minds, Changing Lives from the Top Down: An Investigation of the Dissemination and Adoption of a Canada-Wide Educational Intervention to Enhance Health Care Professionals' Intentions to Prescribe Physical Activity

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Abstract

Purpose The purposes of the current study were to (1) describe the restructuring and dissemination of a Canada-wide intervention curriculum designed to enhance health care professionals' prescription of physical activity to patients with physical disabilities, and (2) examine interventionists' social cognitions for, and their acceptance and adoption of, the new curriculum.

Methods A participatory curriculum development process was utilized, resulting in a theory- and evidence-based curriculum. Interventionists ($N=28$) were trained in curriculum delivery and most ($n=22$) completed measures of Theory of Planned Behavior (TPB) constructs assessing their cognitions for delivering the new curriculum at pre- and post-training and at 6-month follow-up. Interventionists also completed a Diffusion of Innovations (DOI) measure assessing their opinion of whether

the new curriculum met characteristics that would facilitate its adoption and use.

Results Interventionists reported strong TPB cognitions for curriculum use before training. Significant increases emerged for some TPB constructs ($p \leq 0.025$) from pre- to post-training, and significant decreases were seen in some TPB constructs ($p \leq 0.024$) between post-training and 6-month follow-up. The interventionists rated the new curriculum as high on all the DOI characteristics.

Conclusion The theory-driven, participatory development process facilitated interventionists' social cognitions towards and adoption of the new curriculum. Positive increases in TPB cognitions from pre- to post-training were not maintained at follow-up. Further research is needed to determine if these changes in cognitions are indicative of a curriculum "reinvention" process that facilitates long-term curriculum use. Understanding curriculum adoption and implementation is a crucial step to determining the potential population impact of the intervention.

Keywords Theory of Planned Behavior · Diffusion of Innovations · Curriculum development · Health care professionals · Leisure-time physical activity · Physical disability

Introduction

Of the 4.4 million Canadians that have a physical disability [1], only 3 % engage in leisure-time physical activity (LTPA) [2] of sufficient duration to yield health and quality of life benefits [3–7]. Accordingly, there have been significant efforts to develop resources aimed at increasing LTPA in people with disabilities (e.g., physical activity guidelines; [8, 9]). Further, while health care

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professionals (HCPs¹) have been identified as vital conduits for delivering LTPA information to people with disabilities [10], very few HCPs discuss and prescribe LTPA [11] as they often lack the knowledge, confidence, and resources to do so [12, 13]. Strategies to enhance HCP knowledge, skills, and resources necessary to adopt and implement national LTPA promotion initiatives may result in more LTPA prescriptions to patients and, consequently, greater LTPA participation and overall health among people with a physical disability.

The Canadian Paralympic Committee (CPC²)'s nationwide, presentation-based *Changing Minds, Changing Lives* (CMCL) intervention addresses the knowledge-to-practice gap related to LTPA among HCPs who work with people with a physical disability [14]. In 2011, the CPC and Spinal Cord Injury (SCI) Action Canada [15] collaborated to restructure the CMCL curriculum to reflect evidence-based best practices for behavior change interventions, such as including up-to-date research regarding rates and consequences of LTPA participation among this population and framing the curriculum within a behavior change theory [16]. Now, an evidence- and theory-based intervention, CMCL has the potential to indirectly impact LTPA among people with a physical disability in Canada by changing HCPs' cognitions and behaviors for discussing and prescribing LTPA. However, the dissemination of the CMCL curriculum is dependent on the behavior of the intervention delivery agents. As such, the purposes of this paper are to (1) describe the restructuring and dissemination of the new evidence- and theory-based CMCL curriculum and (2) examine the interventionists' social cognitions for, and their acceptance and adoption of, the new CMCL curriculum. Due to the descriptive nature of the first purpose, no hypotheses were made. For the second purpose, we hypothesized that interventionists would report significant increases in social cognitions to use the new CMCL curriculum immediately following their training and that these increases would be sustained over a 6-month period, reflecting interventionists' acceptance and adoption of the new curriculum.

Methods

This study includes a report of the following: (1) participatory curriculum development process; (2) training of the Provincial Coordinators—who schedule, deliver, and train Presenters to deliver CMCL presentations across Canada; (3) training of the

Presenters to use the new curriculum for CMCL presentations in their province; and (4) interventionists' (i.e., Provincial Coordinators and Presenters) cognitions for, and adoption of, the new CMCL curriculum. An institutional research ethics board approved the study protocol, and informed consent was obtained from participants in the study after the procedure had been fully explained to them.

Participatory Curriculum Development

After an initial 5 years of implementation in five Canadian provinces, the CPC established an Advisory Committee to review the CMCL intervention and engage in a participatory curriculum development process. This type of process was utilized as it has been shown to lead to increased acceptability and use of an intervention when it is put into real-world practice [17–19]. The Advisory Committee was comprised of five experienced and two newly hired CMCL Provincial Coordinators, HCPs who work with individuals with physical disabilities, opinion leaders in parasport development and LTPA participation among people with a physical disability in Canada, and behavior change and knowledge translation researchers from SCI Action Canada. Following 2 days of meetings in December 2010, it was decided that the CMCL curriculum required an up-to-date evidence base and a foundation in behavior change principles so as to maximize the impact of the CMCL intervention among HCPs. A researcher from SCI Action Canada with expertise in behavior change theories, knowledge mobilization principles, and the Canadian health care structure was engaged to lead the curriculum restructuring process.

Using the existing version of the CMCL curriculum as a foundation and with support from the CPC's Manager of Sport Development, the curriculum was restructured and expanded with a foundation in the Theory of Planned Behavior (TPB), which has been suggested to be an ideal framework for understanding and promoting knowledge mobilization among HCPs [20, 21]. The TPB posits that an individual's intention (or motivation) to perform a target behavior (e.g., prescribing LTPA) is influenced by his/her attitudes, subjective norms, and perceived behavioral control (PBC) for the behavior [22]. In turn, intention and PBC are direct predictors of behavior. By including up-to-date statistics and research evidence about Canadian LTPA participation among both the able-bodied and physically disabled populations, the curriculum was designed to raise awareness of the benefits of LTPA with the goal of strengthening HCPs' *attitudes* towards prescribing LTPA. Information demonstrating that HCPs are key influencers in the lives of their patients and are expected to play a role in promoting LTPA was included to enhance *subjective norms*. Strategies that HCPs can use for discussing LTPA (e.g., asking a few key questions during routine patient appointments and providing referrals to, and information on, LTPA resources)

¹ For the purposes of this paper, the term HCPs includes physicians, nurses, rehabilitation therapists, kinesiologists, and any other professional who provides LTPA advice to patients.

² The CPC is a non-profit, private organization dedicated to the development and promotion of a sustainable Paralympic sport system in Canada. The CPC aims to promote the success of athletes with a physical disability at all levels of *parasport* (i.e., parallel sport opportunities for people with a physical disability).

were featured to emphasize to HCPs that they currently have the skills and the control to encourage their patients to become active (i.e., to enhance their *PBC*). The curriculum was restructured and updated using a participatory model that included research and practice professionals. Importantly, this included all members of the CMCL Advisory Committee who were responsible for assessing and establishing solutions to barriers of both knowledge use among HCPs and presentation delivery among interventionists. This process focused on ensuring that the curriculum addressed Diffusion of Innovations (DOI) characteristics that would maximize the interventionists' decision to adopt the new curriculum (i.e., relative advantage over previous curriculum, minimal complexity, compatibility, trialability, and observability [23]).

The final curriculum consisted of a 30-slide PowerPoint presentation and a corresponding set of speakers' notes for each slide.³ To facilitate intervention fidelity and ease of implementation, the speakers' notes included an approximate time allocation, key discussion points, as well as additional information and complete references for responding to attendees' questions. A Presenter Checklist was also created to help ensure consistent curriculum delivery and to collect intervention implementation data (e.g., duration of session, number of HCPs present versus number of those invited to attend).

Training of the CMCL Provincial Coordinators

The updated curriculum was presented at a meeting with the seven Provincial Coordinators in April 2011. During this 3-h meeting, two areas were emphasized: (1) the specific content designed to impact HCPs' attitudes, subjective norms, PBC, and intentions to prescribe LTPA and (2) how the curriculum and speakers' notes were designed to meet the five DOI characteristics. Discussion also focused on strategies that could be used to train Presenters to deliver the new curriculum. To ensure alignment with other organizational activities, the PowerPoint slides were corporate branded by the CPC prior to curriculum dissemination.

Training of the CMCL Presenters

Presenter recruitment criteria included being an active HCP and/or having an influential role in Canadian parasport. The number of CMCL Presenters recruited and trained by the Provincial Coordinators is representative of the number of presentations that are typically scheduled annually within a given province. Presenters were trained to use the new

curriculum between November 2011 and April 2012. All Presenters were trained by their Provincial Coordinator in a face-to-face (56 %) or telephone-delivered session (44 %) ranging from 30- to 120-min duration ($M=69.4$, $SD=31.9$). The majority of training sessions (69 %) occurred in a group. The Provincial Coordinators used a variety of training strategies, including a detailed discussion of the following: (1) revised content, (2) where adaptations can be made without losing the theory-base of the presentation, (3) how to relate the content to HCPs' practice, and (4) the technical and ease-of-use features of the new curriculum. Some Presenters also observed a CMCL presentation delivered by a Provincial Coordinator, while other Presenters delivered a mock presentation to their Provincial Coordinator prior to their first CMCL presentation to HCPs. Overall, the training varied minimally between provinces in terms of content, delivery mode, and duration.

Assessing Interventionists' Cognitions for the New Curriculum

Demographic characteristics of interventionists were collected. Prior to, immediately after, and 6 months following their training, interventionists completed a TPB questionnaire to assess their attitudes towards using the new curriculum, perceptions of pressure from important others (subjective norms) for using the new curriculum in its entirety, PBC to deliver the new curriculum, and intentions to use the new curriculum in its entirety. A measure of DOI characteristics was also administered immediately after training to assess interventionists' likelihood of adopting the new curriculum. Following the delivery of each CMCL presentation, interventionists completed a Presenter Checklist and collected Presentation Feedback (i.e., end-user evaluation) Forms from the presentation attendees. A description of the measures is presented next.

TPB Questionnaire Attitudes and *subjective norms* were assessed with items adapted from Ajzen [24], and *PBC* was assessed by items adapted from Rhodes and Courmeya [25]. All social cognition items were rated on a seven-point Likert scale. For TPB construct scales with more than two items, item scores were averaged to give an overall construct score. Table 1 lists the items, the response scale, and the internal consistency or correlation of the items for each scale.⁴

DOI Measure A seven-item measure was included to assess the interventionists' opinion of whether the new CMCL

³ An overview of the content of the new 30-slide curriculum can be found in Cripps, Tomasone, and Staples [14].

⁴ As an index of internal consistency of the measures, Cronbach's alpha (α) values were calculated when the scales had three or more items, and Pearson correlations (r) were calculated when the scales had only two items. Internal consistency is considered adequate if $\alpha \geq 0.7$ [28].

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Table 1 Questionnaire items assessing interventionists' social cognitions for using the new CMCL curriculum

Theory of Planned Behavior construct (# items) Items included in scale	Response scale	Internal consistency (α) or correlation (r)
Attitudes (6 items)		
Instrumental attitudes The new CMCL curriculum will help me implement the CMCL information, strategies, and resources at my next CMCL presentation.	1=Strongly disagree, 7=Strongly agree Anchors represent extremes (1/7) on 7-point Likert scale	$\alpha \geq 0.76$ for Provincial Coordinators; $\alpha \geq 0.88$ for Presenters
Affective attitudes Complete the statement, "At my next CMCL presentation, the new CMCL curriculum would be _____ to use." a. harmful/beneficial b. worthless/valuable c. difficult/easy d. unpleasant/pleasant e. unenjoyable/enjoyable		
Subjective norms (2 items [a, b] for Provincial Coordinators; 3 items [a–c] for Presenters) _____ want(s) me to use the new CMCL curriculum in its entirety at my next CMCL presentation. a. The Canadian Paralympic Committee b. Provincial Coordinators c. Other Presenters in my province	1=Strongly disagree, 7=Strongly agree	$r_s \geq 0.54$ for Provincial Coordinators; $\alpha \geq 0.83$ for Presenters
Perceived behavioral control (4 items [a–d] for Provincial Coordinators; 2 items [a, b] for Presenters) If you were really motivated and had all the resources that you needed, how confident are you in your ability to... a. ...tell HCPs about CMCL information, strategies, and resources at your next CMCL presentation? b. ...persuade HCPs to use CMCL information, strategies, and resources at your next CMCL presentation? c. ...teach Presenters about CMCL information, strategies, and resources for their next CMCL presentation? d. ...persuade Presenters to use CMCL information, strategies, and resources at their next CMCL presentation?	1=Not at all confident, 7=Completely confident	$\alpha \geq 0.83$ for Provincial Coordinators; $r_s \geq 0.77$ for Presenters
Intentions (1 item) What percentage of the new CMCL curriculum do you intend to use at your next CMCL presentation?	Specify a percentage of the new curriculum out of 100 %	N/A

The column indicating scale internal consistency (Cronbach's alpha) scores for the items on the scale and Pearson correlations between the items on the scale represent the lowest value across the three time points (pre-CMCL, post-CMCL, and 6-month follow-up)

CMCL Changing Minds, Changing Lives, HCPs health care professionals

curriculum met the DOI characteristics necessary for adoption. All items were scored on a seven-point scale ($1 = \text{strongly disagree}$, $7 = \text{strongly agree}$). Table 2 lists the items, the response scales, and the internal consistency or correlation of the items for each DOI characteristic included in the measure⁴. Averages were computed for DOI characteristics assessed with more than one item, and a summative DOI score was calculated by averaging all items.

Assessing Use of the New Curriculum

Presenter Checklists Following the delivery of a CMCL session, interventionists reported presentation duration and number of attendees.

Presentation Feedback As an indicator of end-user evaluation, data were collected from attendees at CMCL sessions. Attendees provided feedback about the CMCL presentation by responding to six items on a seven-point scale ($1 = \text{strongly disagree}$, $7 = \text{strongly agree}$). Example items include, "I learned a lot of new information at this presentation", "The information in the presentation was easy to understand", and "I would recommend this presentation to a colleague".

Statistical Analyses

Descriptive statistics were calculated for each study measure. In order to maximize power (due to missing data) and given the a

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Table 2 Questionnaire items assessing interventionists' opinion of whether the new curriculum met the Diffusion of Innovations characteristics

Diffusion of Innovations characteristic (# items) Items included in scale	Response scale	Internal consistency (α) or correlation (r)
Complexity (3 items)		
The new CMCL curriculum...	1=Strongly disagree, 7=Strongly agree	$\alpha s \geq 0.69$
a. ... is clear and easy to understand.		
b. ... is easy to use.		
c. ... does what we want it to – that is, increase HCPs' knowledge, attitudes, and behavior for prescribing physical activity and paraspport to their patients with a disability.		
Compatibility (2 items)		
The new CMCL curriculum...	1=Strongly disagree, 7=Strongly agree	$rs \geq 0.77$
a. ... is compatible with my values and norms.		
b. ... meets my needs as an interventionist.		
Trialability (1 item)		
The new CMCL curriculum can be easily adapted or modified to suit my own needs as a presenter.	1=Strongly disagree, 7=Strongly agree	N/A
Relative advantage (1 item; completed by those who had previously served as CMCL interventionist)		
The new CMCL curriculum is more effective than the old curriculum in increasing HCPs' knowledge and confidence to discuss and prescribe physical activity and paraspport to their patients with a disability.	1=Strongly disagree, 7=Strongly agree	N/A

The column indicating scale internal consistency (Cronbach's alpha) scores for the items on the scale and Pearson correlations between the items on the scale represent the lowest value across Provincial Coordinators and Presenters. Provincial Coordinators and Presenters who had not previously been a CMCL interventionist did not complete the Relative Advantage item; thus, the summative DOI score was calculated by averaging six items (for new CMCL interventionists) or seven items (for experienced CMCL interventionists). The internal consistency scores for the summative DOI score (averaged across all six or seven items) were $\alpha s \geq 0.81$

CMCL Changing Minds, Changing Lives, HCPs health care professionals

priori hypotheses for the TPB variables [26], separate repeated-measures ANOVAs were computed to identify significant changes in the TPB variables between pre-post, post-follow-up, and pre-follow-up, with α set at 0.05 for each comparison. Cohen's d was calculated as an index of effect size.

Results

Seven Provincial Coordinators were trained on the curriculum and they, in turn, trained 21 Presenters. Seven Provincial Coordinators and 15 Presenters completed study measures (see Table 3). Results for the TPB measures are shown in Tables 4 and 5. Both Provincial Coordinators and Presenters had positive attitudes, subjective norms, PBC, and intentions for using the new CMCL curriculum before training. Significant increases emerged for Provincial Coordinators' attitudes ($F(1,6)=11.228$; $p=0.015$; $d=1.38$) and PBC for delivering the new curriculum ($F(1,6)=8.854$; $p=0.025$; $d=1.13$) between pre- and post-training. Between post-training and follow-up, significant decreases were seen in Provincial Coordinators' attitudes for delivering the new curriculum

($F(1,6)=10.845$; $p=0.017$; $d=-1.35$) and intentions to use the new curriculum in its entirety ($F(1,6)=12.789$; $p=0.012$; $d=-1.91$) and in Presenters' PBC for delivering the new curriculum ($F(1,9)=7.364$; $p=0.024$; $d=-0.75$). No significant changes were seen in any TPB cognitions between pre-training and follow-up.

Scores for the DOI characteristics are presented in Table 6. Overall, the CMCL interventionists felt the new curriculum was minimally complex, compatible with their needs, easy to adapt and use on a trial basis, and had a relative advantage over the old curriculum.

Presenter Checklists were collected from 34 presentations delivered between November 2011 and August 2012. These 34 presentations were attended by 787 individuals (997 were invited), with attendance ranging from 10 to 80 individuals per session. The presentations lasted an average of 96.0 ($SD=19.3$) minutes, with durations ranging from 60 to 150 min.

Presentation Feedback forms were collected from 598 of the 787 attendees. Overall, attendees rated the CMCL information as new, interesting, easy to understand, credible, and important to them (all $M s \geq 6.2$ out of 7), and all attendees said they would recommend CMCL to a colleague.

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Table 3 Demographic characteristics of the CMCL interventionists in Canada

Characteristic	Provincial Coordinators <i>n</i> =7	Presenters <i>n</i> =15
Sex	4 male, 3 female	9 male, 6 female
Ethnicity	100 % Caucasian	100 % Caucasian
Age (<i>M</i> ± <i>SD</i> in years)	47.9±8.5	36.1±11.1
LTPA (<i>M</i> ± <i>SD</i> in days/week)	4.7±1.3	4.4±1.3
Involved in parasport ^a (<i>n</i>)	6	13
Province		
British Columbia	1	2
Alberta	1	1
Saskatchewan	1	2
Ontario	1	6
Newfoundland/Labrador	1	1
New Brunswick	1	3
Prince Edward Island & Nova Scotia	1	0
Current career (<i>n</i>)		
HCP	3	7
Teacher/educator	2	1
Government or non-government organization	2	5
In HCP training	0	2
Frequency with which you work with people with physical disabilities	“Frequently”	“Frequently” to “All the time”

CMCL Changing Minds, Changing Lives, HCP health care professional, LTPA leisure time physical activity

^a Intervention agents were involved in parasport as an athlete, coach, program developer, classifier, volunteer, or had multiple roles

Discussion

The CMCL Provincial Coordinators and Presenters had positive attitudes, subjective norms, PBC, and intentions to use the new curriculum prior to training. These findings suggest that adoption of the new curriculum by these interventionists was likely. Specifically, Rogers [23] reports that individuals move from simply being aware of an innovation, such as the new curriculum, to adopting it when positive attitudes,

normative beliefs, perceptions of control, and intentions are developed [23]. Further, the interventionists felt the new CMCL curriculum had characteristics that were essential for adoption in that it was rated as (1) having a relative advantage over the previous curriculum, (2) being compatible with the interventionists' values and needs, (3) not being overly complex, and (4) being easy to implement on a trial basis. In the present study, the high scores on these indicators of adoption suggest that interventionists' may

Table 4 CMCL Provincial Coordinators' TPB cognitions for adopting and delivering the new curriculum across Canada at pre- and post-training, and at 6-month follow-up

Construct	Training		Follow-up	Repeated-measures ANOVA			Effect sizes		
	Pre	Post		6-month	Pre-Post	Post-6mo	Pre-6mo	<i>d</i> _{pre-post}	<i>d</i> _{post-6mo}
Attitude	5.95±0.46	6.55±0.23	5.93±0.48	11.228 (0.015)*	10.845 (0.017)*	0.017 (0.901)	1.38	−1.35	−0.04
Subjective norms	6.14±0.94	6.71±0.39	6.50±0.71	2.400 (0.172)	0.659 (0.448)	0.843 (0.394)	0.65	−0.32	0.36
PBC	5.86±0.56	6.64±0.35	6.36±0.13	8.854 (0.025)*	3.692 (0.103)	5.600 (0.056)	1.13	−0.77	0.98
Intention	97.86±3.93	100.00±0	93.57±4.76	2.077 (0.200)	12.789 (0.012)*	3.484 (0.111)	0.55	−1.9	−0.71

All seven Provincial Coordinators completed the measures of TPB constructs at the three time points. Pre-, post-, and follow-up values for attitude, subjective norm, PBC, and intention are *M* ± *SD*. Attitudes, subjective norms and PBC means are out of 7. Intention means are a percentage of the new curriculum the Provincial Coordinator intended to use

CMCL Changing Minds, Changing Lives, PBC perceived behavioral control, TPB Theory of Planned Behavior

*Indicates statistically significant difference at *p*<0.05

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Table 5 CMCL Presenters' TPB cognitions for adopting and delivering the new curriculum across Canada at pre- and post-training, and at 6-month follow-up

Construct	Training		Follow-up	Repeated-measures ANOVA			Effect sizes		
	Pre	Post		F value (p value)					
			6-month	Pre-Post	Post-6mo	Pre-6mo	$d_{\text{pre-post}}$	$d_{\text{post-6mo}}$	$d_{\text{pre-6mo}}$
Attitude	5.89±0.89	5.97±0.87	5.38±0.92	0.533 (0.481)	3.450 (0.096)	1.059 (0.333)	0.10	-0.62	-0.51
Subjective norms	6.40±0.81	6.08±1.25	6.00±0.65	0.184 (0.678)	0.099 (0.763)	0.222 (0.654)	-0.62	-0.11	-0.84
PBC	6.17±0.78	6.20±0.65	5.65±0.63	0.169 (0.689)	7.376 (0.024)*	4.50 (0.067)	0.04	-0.75	-0.77
Intention	91.25±10.69	92.33±10.83	90.00±13.54	1.960 (0.189)	0.031 (0.864)	0.283 (0.609)	0.14	-0.27	-0.11

Measures of the TPB constructs were completed by 12, 15, and 10 Presenters at pre-training, post-training, and follow-up, respectively. Pre-, post-, and follow-up values for attitude, subjective norm, PBC, and intention are $M \pm SD$. Attitudes, subjective norms and PBC means are out of 7. Intention means are a percentage of the new curriculum the Presenter intended to use

CMCL Changing Minds, Changing Lives, PBC perceived behavioral control, TPB Theory of Planned Behavior

*Indicates statistically significant difference at $p < 0.05$

have decided to adopt the new CMCL curriculum prior to their training.

The high initial perceptions across TPB and DOI indicators may be the result of a self-selection bias (i.e., the interventionists would not have agreed to be trained and to deliver the new curriculum if they were not motivated to use it). However, it could also be the result of the participatory development process that was used for the new CMCL curriculum. First, involving interventionists (i.e., Provincial Coordinators) and potential intervention end users (i.e., HCPs on the Advisory Committee) in the intervention development process has been suggested to lead to increased acceptability and implementation of the intervention when it is put into practice [17–19]. Second, the new curriculum was designed with the DOI in mind. For example, the collaboration between researchers, intervention agents, and intervention end users was instrumental for creating solutions to barriers to curriculum delivery among interventionists and to knowledge use among HCPs, making it more likely that the intervention would be adopted at all levels. Third, rooting the new CMCL curriculum in the TPB, which has been described as an ideal framework for HCP knowledge mobilization [20, 21], provided structure to

the curriculum content, and allowed the presentation to tell a story that is meaningful to both interventionists and end users.

Interestingly, there was a significant decrease in Provincial Coordinators' attitudes and intentions and in Presenters' PBC between post-training and follow-up. During this 6-month period, interventionists moved from making a decision to adopt to the reality of implementing the curriculum—a shift in stage across the decision-making process reflecting the overt use of innovation by the adopter [23]. It is likely that once the Provincial Coordinators trained the Presenters and both groups of interventionists experienced using the new curriculum in practice, they may have become aware of additional barriers to adoption and/or implementation. The salience of these barriers at follow-up may have negatively impacted their cognitions regarding the use of the new curriculum in its entirety. Because the interventionists felt the new CMCL curriculum met the characteristics necessary for adoption (i.e., compatibility, trialability), they may have subsequently adapted the curriculum during implementation. This explanation is in line with Rogers' DOI framework [23] which suggests a "reinvention" process can occur during implementation. This can be a positive outcome for intervention delivery but may also diminish interventionists' attitudes, perceptions of control, and intentions to deliver the curriculum in its entirety. The significant decreases in the indicators of adoption (i.e., attitudes, PBC, intention) at follow-up may be indicative of the reinvention process that often occurs during the early implementation stage, and not of adoption failure. In fact, as suggested by Rogers' [23], a reinvention process early in the implementation stage may lead to higher curriculum sustainability, and thus implementation, over time. The influence of this potential reinvention process on intervention effectiveness warrants further investigation.

Regardless of the interventionists' adaptations to the curriculum, the Presentation Feedback Forms suggest that the CMCL intervention was well-received by 787 HCPs across Canada during the 10-month study period. This reach is an improvement from the number of HCPs who received the

Table 6 CMCL interventionists' ratings of the new curriculum with respect to the DOI characteristics

DOI characteristic ($M \pm SD$, out of 7)	Provincial coordinators $n=7$	Presenters $n=15$
Complexity ^a	5.83±0.62	5.79±0.99
Compatibility	6.00±0.71	5.94±1.25
Trialability	6.17±0.41	5.88±0.72
Relative advantage	5.83±0.75	5.70±0.67
Summative DOI score	5.93±0.50	5.84±0.91

CMCL Changing Minds, Changing Lives, DOI Diffusion of Innovations

^aComplexity is reversed scored, with higher scores indicating less complexity

CMCL intervention during the first 5 years of CMCL implementation (i.e., 600 HCPs per year; [14]). The implication of this increased reach is that more HCPs may discuss and prescribe LTPA to their patients with a physical disability. As part of the national CMCL program monitoring, research is underway to examine (1) the impact of the new curriculum on HCPs' cognitions with respect to discussing and prescribing LTPA among their patients with a physical disability and (2) the key implementation variables leading to changes in HCPs' cognitions in order to develop a list of best practices for CMCL curriculum delivery [27].

Study Strengths and Limitations

To our knowledge, this is the first study to describe the collaborative development and interventionist adoption of a theory- and evidence-based intervention aimed at increasing LTPA and parasport participation among Canadians with a physical disability. However, a limitation to the development and adoption process is that the new CMCL curriculum was designed for implementation in one context (i.e., professional development workshops for HCPs) without a formative evaluation of whether the curriculum addressed areas of importance and implementation barriers across various contexts [18]. Nevertheless, the new curriculum can act as a foundation for future iterations of the CMCL intervention.

A second limitation is the small sample size (22 interventionists completed study measures) relative to the number of analyses conducted, potentially making the analyses underpowered to detect significant changes and increasing susceptibility to type II error. However, as noted above, CMCL is a real-world program that recruits interventionists based on the demand for presentations in each province. The results of the current study are a preliminary investigation of the adoption and dissemination of the CMCL curriculum among interventionists. With increasing expansion and reach of the CMCL program in Canada, additional Provincial Coordinators and Presenters will be recruited, and the interventionist sample size will be increased; thus, future analyses examining the adoption and dissemination processes of the curriculum are expected to have greater statistical power.

Conclusion

The theory-driven, participatory CMCL curriculum development process likely facilitated the adoption and implementation of the new curriculum by the Provincial Coordinators and Presenters. Adoption and implementation of the curriculum among the interventionists are essential first steps to dissemination and subsequent evaluation of the impact of the CMCL intervention on HCPs' LTPA-prescribing cognitions and behavior.

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Conflict of Interest JRT and KAMG sat on the CMCL Advisory Committee when the intervention curriculum was being restructured. LD was the Manager of Sport Development at the Canadian Paralympic Committee during the study period. PAE has no conflicts of interest to report.

Informed Consent All procedures followed were in accordance with the ethical standards of the responsible committee on human experimentation (institutional and national) and with the Helsinki Declaration of 1975, as revised in 2000. Informed consent was obtained from all patients before being included in the study.

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CHAPTER 4:

“Changing Minds”:

Determining the effectiveness and key ingredients of an educational intervention to enhance health care professionals’ intentions to prescribe physical activity to patients with a physical disability

Preamble

Changing Minds: Determining the effectiveness and key ingredients of an educational intervention to enhance health care professionals' intentions to prescribe physical activity to patients with a physical disability is the second part of the second study in the dissertation series (Study 2.2). The study examines the effectiveness and short- and long-term maintenance of a CMCL seminar on HCPs' social cognitions to discuss LTPA. It also explores key implementation variables that predict changes in HCPs' social cognitions to generate a better understanding of the relationship between intervention implementation and effectiveness.

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Contribution of Study 2.2 to overall dissertation

Whereas Study 2.1 examined CMCL's development phase, Study 2.2 focuses on the implementation and evaluation phases of the intervention. In Study 2.2, the effectiveness and short- and long-term maintenance of the CMCL intervention are examined using a theory-based evaluation (i.e., changes in HCPs' Theory of Planned Behaviour social cognitions over time). Further, characteristics of implementation that vary across the delivery of the CMCL intervention are used to decipher whether there are "key ingredients" that predict changes in HCPs' theory-based cognitions for discussing LTPA with their patients with a disability. Overall, Studies 2.1 and 2.2 examine the use of behaviour change theory across all three stages of KT intervention research (development, implementation, and evaluation), and suggest that real-world implementation is important to understanding intervention effectiveness.

Following the reasoning presented in the preamble to Study 2.1, and stemming from the participatory curriculum development process and the theory-based evaluation among interventionists in Study 2.1, the Theory of Planned Behaviour was used for the theory-based evaluation in Study 2.2 to maintain consistency throughout the CMCL study as a whole.

RESEARCH

Open Access

'Changing Minds': determining the effectiveness and key ingredients of an educational intervention to enhance healthcare professionals' intentions to prescribe physical activity to patients with physical disabilities

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Abstract

Background: Healthcare professionals (HCPs) are vital conduits of leisure-time physical activity (LTPA) information; however, few discuss LTPA with their patients with disabilities. 'Changing Minds, Changing Lives' (CMCL) is a nationwide, theory- and evidence-based seminar aimed at increasing LTPA-discussion among HCPs by enhancing their attitudes, subjective norms, perceived behavioural control (PBC), and intentions. The purposes of the current study were to: examine the effectiveness and short- and long-term maintenance of a CMCL seminar on HCPs' social cognitions to discuss LTPA; and explore key implementation variables that predict changes in HCPs' social cognitions.

Methods: Prior-to, as well as immediately, one, and six months following a CMCL seminar, 97 HCPs ($M_{age} \pm SD = 36.23 \pm 10.42$; 69.0% female; 97.9% Caucasian; 38.1% rehabilitation therapists; years in profession = 11.56 ± 9.94) from five Canadian provinces completed questionnaires that assessed the Theory of Planned Behaviour constructs with regard to discussing LTPA with their patients with a physical disability. Key presenter characteristics and intervention delivery components were extracted from presenter demographic questionnaires and seminar checklists, respectively. Separate repeated-measures ANOVAs and post-hoc t-tests evaluated changes in HCPs' social cognitions. Hierarchical multiple regressions were conducted to predict intentions and to understand which implementation variables may help explain significant changes in social cognitions.

Results: Significant increases in HCPs' social cognitions for discussing LTPA were reported from pre- to post-seminar ($p < 0.002$); however, increases were not maintained at follow-up. PBC emerged as the strongest predictor of participants' post-CMCL intentions ($\beta = 0.45$, $p < 0.001$). Although several implementation characteristics were related to changes in perceptions, the number of seminars the presenter delivered was the only significant negative predictor of post-seminar PBC ($\beta = -0.18$, $p < 0.05$).

Conclusions: Future iterations of the CMCL intervention should include additional strategies to sustain improvements in HCPs' social cognitions over time. Future CMCL evaluations should measure additional implementation variables so that the key ingredients for 'Changing Minds' can continue to be investigated.

Keywords: Educational intervention, Healthcare professionals, Leisure-time physical activity, Physical activity prescription, Physical disability, Theory of Planned Behaviour

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Background

Among individuals with a physical disability, participation in leisure-time physical activity (LTPA) has been shown to be associated with numerous physical, psychological, social, and quality of life benefits [1-5]. However, only 3% of the 4.4 million Canadians with a physical disability engage in LTPA [6,7]. Despite recent efforts to develop informational resources to increase LTPA participation, such as physical activity guidelines [8,9], adults with a physical disability remain one of the most inactive segments of the population [6], in part due to a perception of a lack of accessible LTPA information [10]. The delivery of LTPA information is an essential component of strategies aimed at increasing LTPA participation in the disability community.

Individuals with physical disabilities have identified healthcare professionals (HCPs) – including physicians, nurses, rehabilitation therapists, and kinesiologists – as desired and credible messengers for delivering LTPA information [11,12]. However, very few HCPs discuss and prescribe LTPA [13] as they often lack the knowledge, confidence, and resources to do so [14,15]. To address these barriers, the Canadian Paralympic Committee offers ‘Changing Minds, Changing Lives’ (CMCL), a nationwide, seminar-mediated educational intervention designed to provide HCPs with the knowledge, strategies and resources needed to discuss and prescribe LTPA to their patients with physical disabilities [16]. Briefly, CMCL seminars are designed to be a single, hour-long session delivered by a HCP and a physically active individual with a physical disability. The seminar curriculum is embedded within a PowerPoint presentation and includes up-to-date research evidence and Canadian statistics regarding LTPA participation among both the able-bodied and physically disabled populations, information demonstrating that HCPs are key influencers in the lives of their patients and are expected to play a role in promoting LTPA, and strategies that HCPs can use for discussing LTPA (*e.g.*, asking a few key questions during routine patient appointments and providing referrals to, and information on, LTPA resources). CMCL encourages a variety of types of LTPA, including structured exercise, sport activities, and active play. Parasport – parallel sport opportunities for people with physical disabilities (*e.g.*, wheelchair basketball, sit-skiing) – is a particular focus of CMCL because the Canadian Paralympic Committee is dedicated to inspiring all Canadians with disabilities to get involved in sport. Presenters are encouraged to use the set curriculum and to adapt other seminar components for the local presentation context and resources available to them (*e.g.*, educational handouts about local LTPA options for people with a physical disability, and show-and-tell of adaptive LTPA equipment). (For more details about the content of the CMCL

seminars and how presenters are trained, please refer to references [16; Tomasone, Martin Ginis, Estabrooks & Domenicucci: ‘Changing Minds, Changing Lives’ from the top-down: An investigation of the dissemination and adoption of a nationwide educational intervention to enhance health care professionals’ intentions to prescribe physical activity, resubmitted]).

The CMCL curriculum used across Canada is evidence-based and founded in the Theory of Planned Behaviour (TPB) [Tomasone et al., resubmitted]. According to the TPB, an individual’s intentions (or motivation) to perform a target behaviour (*e.g.*, discussing and prescribing LTPA) is influenced by his/her attitudes, subjective norms, and perceived behavioural control (PBC) for the behaviour [17]. In turn, intentions and PBC are direct predictors of behaviour. The TPB has been suggested to be an ideal behaviour change framework for understanding and promoting knowledge mobilization among HCPs [18-20], as it accounts for a variety of factors known to influence professional behaviour across different HCP populations, behaviours and contexts. By targeting the TPB social cognitions (*e.g.*, attitudes, subjective norms, and PBC) to discuss and prescribe LTPA through an educational intervention like CMCL, it may be possible to alter HCPs’ LTPA prescription intentions. Theory has not been used extensively in implementation research. A recent systematic review of theory use in implementation studies (including educational interventions) found that only 22.5% of studies used theory; furthermore, only 6% of studies explicitly designed the intervention and tested hypotheses based on theory [21]. The present study makes a significant contribution to implementation research by using theory (TPB) to guide the development of the CMCL intervention and to develop and test hypotheses to evaluate the intervention’s effectiveness.

However, the challenge of implementing educational interventions, such as CMCL, in real-world practice is that implementation varies over time and across providers [22,23]. Identifying the key components associated with a greater likelihood of success in changing HCP cognitions and behaviour would assist with the development of more potent and cost-effective interventions [23,24], ultimately moving the science and practice of implementing HCP behaviour change interventions forward. Using a theory, such as the TPB, to hone in on the critical modifiable and non-modifiable intervention components that predict intervention effectiveness will extend previous work examining the relationship between implementation and effectiveness [23], as well as help isolate predictors of HCP behaviour change [25].

As such, the first purpose of the current study was to examine the effectiveness and short- and long-term maintenance of a theory- and evidence-based intervention on HCPs’ social cognitions for discussing and prescribing

LTPA to their patients with a physical disability. We hypothesized that HCPs would report significant increases in attitudes, subjective norms, PBC, and intentions to discuss LTPA with their patients with physical disabilities immediately following their attendance at a CMCL seminar. If significant increases in cognitions were seen, we also wanted to explore whether the TPB constructs could predict HCPs' intentions to discuss LTPA. As the TPB has been shown to predict HCPs' clinical behaviours other than LTPA prescription [18-20], we hypothesized that attitudes, subjective norms, and PBC would emerge as significant predictors of intentions. Given that CMCL is a single, seminar-mediated intervention without follow-up strategies known to enhance long-term behaviour change [26], we hypothesized that changes in HCPs' social cognitions would not be maintained at 1- and 6-month follow-up.

A secondary purpose was to explore the key implementation variables that predict changes in HCPs' social cognitions. In line with Durlak and DuPre's ecological framework for understanding effective implementation [23], we considered both presenter characteristics and intervention delivery components that may influence intervention effectiveness. Given the CMCL presenters' role in persuading attendees to discuss LTPA, we hypothesized that presenter characteristics would predict changes in HCPs' subjective norms. Given that CMCL was designed to relay information, resources and strategies for discussing LTPA with patients, we also hypothesized that intervention delivery components would predict changes in HCPs' attitudes and PBC for discussing LTPA with their patients with physical disabilities.

Methods

Participants

This process evaluation study was conducted within the existing delivery of the CMCL intervention program in Canada, with the research team and CMCL staff working together to implement the evaluation measures alongside CMCL's standard protocol. In line with existing delivery protocol, CMCL Provincial Coordinators from Canadian provinces contacted and organized seminars for interested healthcare institutions (e.g., community care access clinics, hospitals) in their province, and healthcare institutions invited their staff to participate in the seminars. Additional recruitment for the study outside the standard CMCL protocol was not conducted by the research team. The costs associated with the delivery of the CMCL intervention were covered by the Canadian Paralympic Committee. A total of 15 CMCL seminars were delivered to 324 HCPs across Canada during the study period (November 2011 to August 2012). Upon arrival at the seminar, each HCP received a copy of the letter of information/consent. Of the 324 attendees, 97 HCPs consented to participate in the current study

(29.9% participation rate). The majority of participants were female (67.0%) and Caucasian (97.9%). A large percentage of participants were from New Brunswick (32.0%) and worked as rehabilitation therapists (e.g., physical therapists, occupational therapists, recreational therapists; 38.1%). Participants' average age was 36.23 years (SD = 10.42) and had worked in their careers as HCPs for a mean of 11.56 years (SD = 9.94). Participants engaged in LTPA regularly ($M \pm SD = 4.35 \pm 1.71$ days/week); however, only 3.1% of participants were involved in parasport. At baseline (i.e., pre-CMCL seminar), a large percentage of participants reported working with patients with physical disabilities 'all the time' (53.6%). When working with these patients, most participants reported discussing LTPA 'frequently' (29.9%), but 'never' discussing parasport (40.2%). Complete demographic characteristics for participants are presented in Table 1.

Protocol

The study protocol was approved by the McMaster Research Ethics Board. Following training, presenters delivered CMCL seminars to HCPs across Canada. Full details concerning CMCL's development, behaviour change techniques, and causal processes targeted in the intervention are described in detail elsewhere [Tomasone et al., resubmitted]. Participants completed a demographic and professional information questionnaire. To assess CMCL effectiveness, immediately prior to and following the CMCL seminar, HCPs completed hardcopy measures assessing their social cognitions for discussing LTPA with their patients with a physical disability. To assess maintenance of change in social cognitions, participants were emailed a link to an online questionnaire at one and six months following their attendance^a. To gather information about CMCL intervention implementation components, presenters completed a Presenter Checklist following the delivery of each seminar.

Measures

Social cognitions for discussing LTPA with patients

Attitudes and subjective norms were assessed with items adapted from Ajzen [27], and PBC was assessed by items adapted from Rhodes and Courneya [28]. All social cognition items were rated on a 7-point Likert scale. For TPB construct scales with more than two items, item scores were averaged to give an overall construct score. Table 2 lists the items, response scale, and the internal reliability or correlation of the items for each scale included in the social cognition questionnaire.

Implementation variables

Ten different implementation variables were considered for the current study: three presenter characteristics and seven intervention delivery components.

Table 1 Healthcare professionals' demographic characteristics

Characteristic	HCPs in study N = 97
Gender	
Male	30 (30.9)
Female	65 (69.0)
Ethnicity (Caucasian)	95 (97.9)
Age (years)	36.23 ± 10.42
LTPA (days/week)	4.35 ± 1.71
Involved in parasport	3 (3.1)
Seminars delivered per province (#)	
British Columbia (2)	16 (16.5)
Saskatchewan (4)	15 (15.5)
Newfoundland/Labrador (3)	27 (27.8)
New Brunswick (4)	31 (32.0)
Prince Edward Island (1)	5 (5.2)
Type of HCP	
Physician	11 (11.3)
Physical therapist	27 (27.8)
Occupational therapist	8 (8.2)
Recreational therapist	2 (2.1)
Nurse	3 (3.1)
Educator	14 (14.4)
Other	30 (30.9)
Years in profession (years)	11.56 ± 9.94
Frequency of working with patients ^a	
Never	2 (2.1)
Rarely	10 (10.3)
Sometimes	16 (16.5)
Frequently	14 (14.4)
All the time	52 (53.6)
Frequency of discussing LTPA with patients ^a	
Never	4 (4.1)
Rarely	9 (9.3)
Sometimes	27 (27.3)
Frequently	29 (29.9)
All the time	22 (22.7)
Frequency of discussing parasport with patients ^a	
Never	39 (40.2)
Rarely	29 (29.9)

Table 1 Healthcare professionals' demographic characteristics (Continued)

Sometimes	16 (16.5)
Frequently	4 (4.1)
All the time	2 (2.1)

Note: HCPs: Healthcare professionals; LTPA: Leisure-time physical activity. All values are n (%) except for age, days of LTPA per week, and years in profession, which are M ± SD.

No seminars were delivered to HCPs in Alberta, Ontario, or Nova Scotia during the study period. Some participants declined to respond to certain questions. Hence, n < 97 for some variables.

^aFrequency specific to patients with physical disabilities.

Presenter characteristics data were obtained from a demographic questionnaire that interventionists completed during their CMCL training session [Tomasone *et al.*, resubmitted]. Intervention delivery components data were obtained from Presenter Checklists which served as both a 'roadmap' for consistent delivery of the CMCL curriculum and as an implementation data collection tool^b. Table 3 provides the operationalization and summary of the implementation variables. As a reliability check, the first author attended and completed a Presenter Checklist for two CMCL seminars delivered by two different presenters. For checklist items included in the current study (n = 7), agreement between the researcher and Presenters was high (86% and 100%).

Statistical analyses

Data handling

All data were screened for outliers and normality using established guidelines [29]. Complete TPB questionnaire data were available for 96%, 91%, 26% and 40% of the 97 HCPs at pre, post, one, and six months, respectively. Missing value analysis indicated that data were missing at random for all demographics and TPB variables at all four time points except for HCPs' profession length. Specifically, the six HCPs who did not provide their profession length had lower intentions post-CMCL than the HCPs who provided the number of years they had been practicing. Since this variable was not missing at random, and there was a large amount of missing data at one and six months (74% and 60%, respectively), missing data were imputed using multiple imputation methods prior to conducting analyses. Multiple imputation is an appropriate and respected method for dealing with large amounts of missing data because it can be used to incorporate auxiliary information about the missing data into the final analysis (*e.g.*, profession length [30]), and it gives standard errors and p-values that incorporate missing data uncertainty [31]. In total, 10 imputation data sets were created, as recommended by Rubin [32], and subsequent analyses were conducted separately on each

Table 2 Questionnaire items assessing healthcare professionals' social cognitions for discussing leisure-time physical activity with their patients

Theory of planned behaviour construct (# items)	Response scale	Internal reliability score (α) or correlation (r)
Items included in scale		
Attitudes (5 items)		αs ≥ 0.81
<i>Instrumental attitudes</i>	1 = Strongly disagree, 7 = Strongly agree	
1. Attending this CMCL presentation will help me discuss physical activity and parasport to my patients with a physical disability.		
<i>Affective attitudes</i>	anchors represent extremes (1/7) on 7-point Likert scale	
2. Complete the statement, 'Discussing physical activity and parasport to my patients with a physical disability would be _____':		
a. Harmful/beneficial		
b. Worthless/valuable		
c. Difficult/easy		
d. Unpleasant/pleasant		
Subjective norms (1 item)	1 = Strongly disagree, 7 = Strongly agree	N/A
1. Other health care professionals that I work with think I should discuss physical activity and parasport with my patients with a physical disability.		
Perceived behavioural control (2 items)	1 = Not at all confident, 7 = Completely confident	rs ≥ 0.44 ps ≤ 0.03
If you were really motivated and had all the resources that you needed, how confident are you in your ability to...		
1. ...discuss physical activity and parasport with your patients with a physical disability?		
2. ...persuade your patients with a physical disability to participate in physical activity and parasport?		
Intentions (3 items)	1 = Strongly disagree, 7 = Strongly agree	αs ≥ 0.82
1. In the next four weeks, I intend to seek out additional information about physical activity and parasport for my patients/clients with a physical disability.		
2. In the next four weeks, I intend to seek out additional information to use to persuade my patients with a physical disability to engage in physical activity and parasport.		
3. In the next four weeks, I intend to persuade my patients with a physical disability to engage in physical activity and parasport.		

Note. CMCL: 'Changing Minds, Changing Lives.' The column indicating scale internal reliability (Cronbach alpha) scores for the items on the scale and Pearson correlations between the items on the scale represent the lowest value across the four time points (pre-CMCL, post-CMCL, 1-month follow-up, 6-month follow-up). All internal reliability scores were acceptable.

dataset; however, for simplicity of reporting, only pooled results are included in the Results section^c.

Changes in social cognitions over time

Separate repeated measures ANOVAs were performed for each of the four TPB cognitions over the four time points. Significant univariate effects were followed up by paired sample t-tests to identify significant changes in the TPB variables between pre-post, pre-1 month, pre-6 month, post-1 month, post-6 month, and 1–6 month. Alpha was adjusted using the Bonferroni

method for the multiple comparisons ($\alpha = 0.05/6$ comparisons per TPB cognition = 0.0083). Cohen's d was calculated as an index of effect size.

Using the TPB to predict intentions to discuss LTPA

In accordance with Ajzen's TPB [17], a hierarchical regression analysis was conducted to predict intentions with attitudes and subjective norms entered in the first block, and PBC entered in the second block. A TPB regression predicting intentions was conducted for any time point at

Table 3 Operationalization and summary of the ten implementation variables considered in predicting change in social cognitions

Implementation variables	Abbreviation	Continuous variable	Dichotomous variable*	
		Range	Yes	No
<i>Presenter characteristics</i>				
Seminar number using the new CMCL curriculum	CMCL#	1–4		
Years the presenter has been part of CMCL staff	CMCLyears	0-5		
Whether the presenter is a HCP themselves	HCPpresenter		66	26
<i>Intervention delivery components</i>				
Number of attendees present	Attendees	8–77		
Duration (minutes)	Duration	60–120		
Parasport athlete present at seminar to share his/her experience with the role his/her HCP played in his/her LTPA success	Athlete		85	7
Parasport equipment available for viewing and use by attendees	Equipment		42	50
Educational resources about LTPA for people with a physical disability distributed to attendees	Resources		87	5
Inclusion of audio-visual component (e.g., photos, videos) not part of standard CMCL curriculum	AVadded		14	78
Partner with community organization	Partner		21	71

Note. AV: Audiovisual; CMCL: 'Changing Minds, Changing Lives'; HCP: Healthcare professional; LTPA: Leisure-time physical activity. Data for the presenter characteristics were extracted from presenter demographic questionnaires completed prior to interventionist training. Data for the intervention delivery components were extracted from the Presenter Checklists that were completed for 14 of the 15 seminars delivered to HCPs during the study period.

*Number of participants exposed to each implementation variable over the 14 seminars for which Presenter Checklists are available. The seminar that is missing a Presenter Checklist had five participants attend; hence, frequencies in the last column add up to 92.

which any implementation variables emerged as significant predictors of the TPB constructs.

Using implementation variables to predict change in social cognitions

Residualized change scores were calculated for each TPB cognition at any time point that was significantly different from its pre-seminar value. Continuous implementation variables that were significantly correlated with a change score were included as predictors of that TPB cognition in subsequent regression models. Following independent t-tests, categorical implementation variables whose presence resulted in a significant difference in a change score were included as predictors of that TPB cognition in subsequent regression models.

Hierarchical multiple regressions were performed to predict each TPB cognition at time points that significantly differed from baseline. The pre-seminar value of the cognition was entered first, presenter characteristics were entered second, and intervention delivery components were entered last. Implementation variables were entered into their own block so that changes in R^2 values could be calculated for each variable.

Results

Changes in social cognitions over time

Pooled descriptive statistics for the TPB variables at each time point are presented in Table 4. Mauchly's Test of Sphericity indicated that the assumption of sphericity had

been violated for all TPB variables; thus, a Greenhouse-Geisser correction was used. There was a significant effect of time on all TPB variables (see Table 4 for ANOVA results). Despite initially high values for each social cognition (all $M_s \geq 4.35$ out of 7), follow-up paired samples t-tests revealed significant increases in attitudes, subjective norms, PBC, and intentions to discuss LTPA and parasport from pre- to post-CMCL seminar (all $ps \leq 0.002$). Significant decreases in all four TPB cognitions were seen between post-CMCL and 6-month follow-up (all $ps \leq 0.005$); however, these follow-up values were not significantly different from baseline ($p \geq 0.14$). Significant decreases in attitudes and intentions to discuss LTPA and parasport with patients with a physical disability were also seen between post-CMCL and 1-month follow-up ($ps \leq 0.006$). See Table 4 for paired samples t-test results.

Using the TPB to predict intentions to discuss LTPA post-seminar

The results of the hierarchical regression analysis predicting intentions are presented in Table 5. In the first step, both post-seminar attitudes ($\beta = 0.27$, $p < 0.05$) and subjective norms ($\beta = 0.38$, $p < 0.001$) were significant predictors of intentions, accounting for 31% of the variance ($\text{Adj}R^2 = 0.30$). In the second step, post-seminar PBC accounted for an additional 10% of explained variance and was a significant predictor ($\beta = 0.45$, $p < 0.001$). Subjective norms remained a significant predictor ($\beta = 0.34$, $p < 0.001$) but attitudes did not ($\beta = -0.03$, $p > 0.05$).

Table 4 Changes in healthcare professionals' social cognitions over time

Construct	Descriptive statistics				Repeated-measures ANOVA	Paired samples t-tests					
	Time					Cohen's <i>d</i>					
	Pre	Post	1-month	6-month		Pre-post	Pre-1 mo	Pre-6 mo	Post-1 mo	Post-6 mo	1mo-6 mo
Attitudes	5.84 ± 0.86	6.32 ± 0.07	5.41 ± 0.18	5.58 ± 0.17	33.7***	0.76**	−0.54	−0.25	−0.95**	−0.80**	0.15
Subjective norms	4.70 ± 0.19	5.30 ± 0.16	5.02 ± 0.24	4.53 ± 0.22	7.57**	0.35**	0.15	−0.09	−0.14	−0.44**	−0.33
PBC	4.61 ± 0.14	5.77 ± 0.09	5.45 ± 0.28	4.74 ± 0.21	34.98***	1.15**	0.61*	0.08	−0.28	−0.90**	−0.47
Intentions	4.35 ± 0.13	5.31 ± 0.14	4.51 ± 0.27	3.95 ± 0.25	25.79***	1.00**	0.11	−0.22	−0.53**	−0.80**	−0.30

Note. PBC: Perceived behavioural control. Descriptive statistics ($M \pm SE$) and repeated-measures ANOVA *F*-values and *p*-values are pooled across the 10 multiple imputation data sets.

*indicates test value reached statistical significance at $p \leq 0.05$.

**indicates test value reached statistical significance at $p \leq 0.0083$ (Bonferroni correction for multiple comparisons used for *t*-tests).

***indicates test value reached statistical significance at $p < 0.001$.

The overall regression model was significant, accounting for 41% of the variance in post-seminar intentions ($\text{Adj}R^2 = 0.39$, $F(1, 93) = 15.18$, $p < 0.001$).

Using implementation variables to predict change in social cognitions

From pre- to post-seminar, participants had a significantly lower attitude change score if they attended a seminar where an audiovisual component was added ('AVadded'; $t(90) = 2.18$, $p = 0.03$). Longer seminars ('duration') were negatively associated with attitude change ($r = -0.24$, $p = 0.02$) and PBC ($r = -0.23$, $p = 0.03$). The number of seminars that the presenter had delivered using the new curriculum ('CMCL#') was also negatively correlated with PBC ($r = -0.23$, $p = 0.03$). No other correlations were significant from pre- to post-CMCL seminar. No implementation variables emerged as being significantly related to a change in TPB cognitions from post-seminar to 1- or 6-month follow-up.

Predicting change in attitudes and PBC

Significant predictors of changes in attitudes and PBC between pre- and post-seminar were then entered into separate hierarchical regression models to predict each post-seminar TPB variable. The model predicting post-seminar attitudes accounted for 39% of the variance ($\text{Adj}R^2 = 0.37$); however, pre-seminar attitudes emerged as the only significant predictor ($\beta = 0.60$, $p < 0.001$) of post-

seminar attitudes. The final model predicting post-seminar PBC accounted for 40.9% of the variance ($\text{Adj}R^2 = 0.39$) with both pre-seminar PBC ($\beta = 0.58$, $p < 0.001$) and the number of seminars ('CMCL#'; $\beta = -0.18$, $p < 0.05$) emerging as significant predictors of participants' perceptions of control following the seminar. Complete regression results for predicting participants' post-seminar attitudes and PBC can be found in Tables 6 and 7, respectively.

Discussion

Following a single, seminar-mediated educational intervention, HCPs reported significant increases in their attitudes, subjective norms, PBC, and intentions to discuss LTPA with patients with physical disabilities; however, these increases in social cognitions were not maintained at 1- and 6-months follow-up. Participants' PBC emerged as the strongest predictor of post-seminar intentions to discuss LTPA with patients with physical disabilities. Contrary to our hypotheses, intervention delivery components did not emerge as significant predictors of attitudes and PBC, and presenter characteristics did not emerge as significant predictors of subjective norms, at post-seminar. Only the number of seminars that the presenter had delivered emerged as a significant negative predictor of post-seminar PBC.

Despite HCPs' strong attitudes, subjective norms, PBC, and intentions for LTPA prior to participating in a CMCL seminar, significant increases were seen for all

Table 5 Hierarchical multiple regression analysis predicting healthcare professionals' intentions immediately following the CMCL-seminar

Steps/predictors	R^2	$\text{Adj}R^2$	R^2 change	<i>F</i> change	<i>df</i>	β_1	β_2
1. Attitudes						0.27*	-0.03
Subjective norms	0.31	0.30		21.64**	2,94	0.38**	0.34**
2. PBC	0.41	0.39	0.10	15.18**	1,93		0.45**

Note. PBC: Perceived behavioural control.

* $p < 0.05$; ** $p \leq 0.01$. β_1 represents the standardized beta coefficients for regression Equation 1. β_2 represents the standardized beta coefficients for regression Equation 2.

Table 6 Hierarchical multiple regression analysis predicting healthcare professionals' attitudes immediately following the CMCL seminar

Steps/predictors	R ²	AdjR ²	R ² change	F change	df	β ₁	β ₂	β ₃
1. Attitudes (pre)	0.35	0.34		48.23**	1,90	0.59**	0.62**	0.60**
2. AVadded	0.38	0.37	0.03	4.64**	1,89		-0.18*	-0.14
3. Duration	0.39	0.37	0.01	6.01**	1,88			-0.22

Note. AV: Audiovisual.

p* < 0.05; *p* ≤ 0.01. β₁ represents the standardized beta coefficients for regression Equation 1. β₂ represents the standardized beta coefficients for regression Equation 2, and β₃ represents the standardized beta coefficients for regression Equation 3.

four TPB cognitions following the seminar. These results are encouraging given that the 15 seminars delivered during the study period used a recently revised CMCL curriculum that is framed around the TPB [Tomasone et al., resubmitted]; hence, the curriculum appears to be effectively targeting the TPB constructs. As hypothesized, the findings from the current study suggest that CMCL is effective for increasing HCPs' social cognitions for discussing LTPA immediately following their participation in a CMCL seminar.

In line with our hypothesis, the significant increases in participants' social cognitions were not maintained at one and six-month follow-up. This is consistent with previous reviews demonstrating that traditional seminar-based educational interventions are not particularly effective at maintaining change in physicians' [25] and allied healthcare professionals' [33] behaviour over time. In the current study, the theoretical determinants of behaviour were not sustained at either follow-up point, suggesting that a single CMCL seminar is not sufficient for short- or long-term maintenance of social cognitions. The CMCL intervention may benefit from the inclusion of additional knowledge translation strategies (e.g., audit and feedback, point of decision prompts, email reminders; [26]) or 'booster' sessions to preserve HCPs' strong social cognitions for discussing LTPA over time.

Post-seminar attitudes, subjective norms, and PBC accounted for 40.9% of the variance in HCPs' intentions. In contrast, previous research has shown that the TPB constructs can only account for 11.6% to 30.0% of the variance in intentions to engage in various clinical behaviours [19]. Our results speak to the relevance of the TPB for explaining intentions to discuss LTPA in clinical settings. PBC emerged as the social cognition with the

largest impact on intentions. This finding is of interest, as post-seminar PBC was the only cognition to be predicted by an implementation variable. The assessment of barriers and facilitators to discussing LTPA in day-to-day practice would provide insight into how the CMCL intervention can be modified to maintain HCPs' PBC following the CMCL seminar.

While several presenter characteristics and intervention delivery components were related to changes in social cognitions between pre- and post-seminar, the only implementation variable that emerged as a significant predictor of any social cognition was the number of seminars that a presenter had delivered. This finding seems counter-intuitive since it would be expected that presenter experience with the new curriculum would lead to higher quality seminar delivery and, thus, be positively related with participants' outcomes. However, the CMCL presenters were trained to use the new CMCL curriculum in a single session, prior to their first delivery of a CMCL seminar [Tomasone et al., resubmitted]. Following training, on-going consultation and problem-solving with the presenters may have improved implementation over time, as demonstrated in previous research [23]. It is possible that experienced presenters ventured further away from the set curriculum and, therefore, did not adequately deliver the material designed to target the TPB constructs. Also, as previously reported [Tomasone et al., resubmitted], presenters reported a decrease in PBC for delivering the curriculum over the study period. While this decrease in PBC may be an indication of a curriculum reinvention process [34], it could also indicate a waning of presenters' confidence for delivering the new curriculum with increasing seminar delivery number. For example, Durlak and DuPre have

Table 7 Hierarchical multiple regression analysis predicting healthcare professionals' perceived behavioural control immediately following the CMCL seminar

Steps/predictors	R ²	AdjR ²	R ² change	F change	df	β ₁	β ₂	β ₃
1. PBC (pre)	0.36	0.35		45.24**	1,90	0.60**	0.59**	0.58**
2. CMCL#	0.40	0.38	0.04	5.96**	1,89		-0.20*	-0.18*
3. Duration	0.41	0.39	0.01	1.48**	1,88			-0.10

Note. CMCL: 'Changing Minds, Changing Lives'; PBC: Perceived behavioural control.

p* < 0.05; *p* ≤ 0.01. β₁ represents the standardized beta coefficients for regression Equation 1. β₂ represents the standardized beta coefficients for regression Equation 2, and β₃ represents the standardized beta coefficients for regression Equation 3.

identified providers' self-efficacy (similar to PBC) for delivering an intervention as a factor influencing implementation and, hence, subsequent outcomes among intervention recipients [23]. Future research should examine presenters' PBC immediately prior to each CMCL seminar in order to assess the impact of providers' PBC on attendees' PBC.

Adding an audiovisual component to the CMCL intervention was negatively related to, and a significant predictor of, post-seminar attitudes when pre-seminar attitudes was the only variable included in the regression model. During the participatory curriculum development process [Tomasone et al., resubmitted], the CMCL curriculum underwent a thorough review process and now includes evidence-based best-practices for behaviour change interventions [35]. The inclusion of additional delivery components, such as images or videos, may detract from the message or flow of the curriculum, cause the presenter to rush through certain theory-based components in order to accommodate the added component, and/or increase the seminar duration. Indeed, seminar duration was a negative correlate of both attitudes and PBC post-seminar. A common barrier reported by HCPs is a perceived lack of time during their work day [36]; thus, HCPs may feel annoyed or get anxious to leave a lengthy educational seminar, feelings that could undermine the impact of the seminar. The fact that duration was not a significant predictor of either cognition suggests that it may not necessarily be duration alone that impacts cognitive outcomes, but how the seminar time is used. For example, a presenter may stumble through slides or lose focus, increasing seminar duration while also leading attendees to feel like their limited time is being wasted. Presenter skill and proficiency for seminar delivery was not examined in the current study but is an interesting avenue for future research that uses implementation variables to predict intervention outcomes.

Study strengths and limitations

Previous research examining the impact of implementation on intervention outcomes has been correlational or comparative (e.g., comparing those who received intervention outcomes vs. those who did not [23]). To our knowledge, this is one of the first studies to use implementation variables to predict intervention outcomes to help generate an understanding of the mechanisms by which HCPs' social cognitions change. In their review, Durlak and DuPre report that there are at least 23 factors that might affect implementation [23]; therefore, examining the variables that enhance an intervention's effectiveness is important so that an intervention can continue to make an impact as its reach increases, and so that key implementation components are included in future, more cost-efficient iterations of the intervention [22]. Further, examining implementation variables alongside the TPB social cognitions has

provided a generalizable framework for future exploration of the causal mechanisms of change in HCPs' cognitions [18,25,37]. The theoretically-informed approach used in the current study can be adopted by other researchers and knowledge translation practitioners in the development, dissemination and evaluation of nationwide initiatives aimed at educating HCPs.

Despite these strengths, there are some limitations to the current study. First, the low response rate and potential self-selection bias may influence the study's internal validity. The participants in the current study represent only 30% of the HCPs who attended the 15 CMCL seminars during the study period. However, Eccles and colleagues reported a 21 to 48% response rate on theory-based questionnaires over a series of five studies examining clinical behaviours among HCPs [19], suggesting that the response in the current study is typical in studies of HCPs. In addition, the HCPs opted into participating, introducing a potential self-selection bias. The participants were an active sample (reported engaging in LTPA on at least four days of the week, on average) and reported discussing LTPA with their patients with a physical disability at least 'sometimes', if not 'frequently' or 'all the time'. The representation of non-participating HCPs was not measured, so there is no way to discern whether these findings extend to all CMCL attendees. Nevertheless, findings from Bower and colleagues indicate that HCPs who participate in continuing education select the opportunities that appeal to them [38], suggesting that all HCPs' who attended the CMCL seminars may already value a physically active lifestyle for both themselves and their patients.

Another limitation is that prescription behaviour (i.e., discussion of LTPA) was not assessed in the current study due to the logistical feasibility of nationwide monitoring, as well as patient privacy and confidentiality concerns [37]. However, a large effect size for change in intentions from pre- to post-seminar was seen ($d = 1.00$). A review of studies examining the relationship between intentions and clinical behaviour shows that intentions accounts for 15% to 40% of the variance in HCP behaviour, making intention a reasonable proxy measure for behaviour change in theory-based interventions aimed at HCPs [37].

Conclusions

The theory- and evidence-based seminars were effective at increasing HCPs' social cognitions for discussing LTPA with their patients with physical disabilities immediately following the seminar, but not at the 1- and 6-month follow-ups. The TPB cognitions were able to account for 40.9% of the variance in HCPs' intentions to discuss LTPA. While the number of seminars delivered by the presenter, as well as adding an audiovisual component and

increasing seminar duration, were negatively related to changes in cognitions from pre- to post-seminar, the only implementation variable that emerged as a predictor of cognitions (PBC in particular) was the number of seminars that the presenter had delivered. It is suggested that subsequent iterations of the CMCL intervention include additional strategies to sustain improvements in HCPs' social cognitions over time. Future evaluations of the CMCL intervention should measure additional implementation variables, such as presenter self-efficacy at time of presentation and proficiency of delivery, so that the key ingredients for 'Changing Minds' can continue to be investigated.

Endnotes

^aThree email attempts were made for each participant at 1-month follow-up. Due to the low response rate at this time point ($n = 25$, 26%), the protocol was adjusted at 6-months follow-up so that three email attempts were followed by three telephone attempts to contact the HCPs. This increased the response rate of the 6-month questionnaire to 40% ($n = 39$).

^bPresenter Checklists were completed for 14 of the 15 seminars delivered during the study period. Note that both the presenter demographic questionnaire and Presenter Checklists are available from the first author.

^cPooled results were obtained by averaging the corresponding F - and t -values, regression coefficients, and R^2 values that were not pooled by SPSS [32,39]. Standard errors were pooled using the equations outlined in Baraldi and Enders [39]. These pooled standard errors were used to determine the significance of the pooled F -tests, t -tests, and regression models.

Abbreviations

CMCL: 'Changing Minds, Changing Lives'; HCPs: Healthcare professionals; LTPA: Leisure-time physical activity; PBC: Perceived behavioural control; TPB: Theory of Planned Behaviour.

Competing interests

JRT and KMG sat on the 'Changing Minds, Changing Lives' Advisory Committee when the intervention curriculum was being restructured. LD was the Manager of Sport Development at the Canadian Paralympic Committee during the study period. PAE has no competing interests to report.

Authors' contributions

JRT conceived of the study, participated in its design and execution, and was responsible for data collection, synthesis and analyses. KMG, PAE, and LD participated in the study's design and coordination. JRT and KMG were directly involved in the preparation of this manuscript. All authors read and approved the final manuscript prior to submission.

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CHAPTER 5:

Get in Motion 2.0:

**The relationship between the implementation and effectiveness
of a real-world leisure-time physical activity telephone counseling service
for adults with spinal cord injury**

Preamble

Get in Motion 2.0: The relationship between the implementation and effectiveness of a real-world leisure-time physical activity telephone counseling service for adults with spinal cord injury is the last study in the dissertation series. The study examines the effectiveness of the second phase of the Get in Motion (GIM) service on clients' leisure-time physical activity (LTPA) intentions and behaviour. This study also explores potential implementation correlates of change (i.e., intervention dose, content, and perceived quality).

The manuscript is not currently submitted for publication to a journal and has been formatted for this dissertation.

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Contribution of Study 3 to overall dissertation

In Studies 2.1 and 2.2, the utility of theory and KT frameworks/principles across the phases of intervention development, implementation, and evaluation was demonstrated. Study 3 examines the second phase of the GIM service, which had been previously developed to be theory- and evidence-based. By using methodologically rigorous monitoring of implementation, Study 3 addresses the “monitoring knowledge use” stage in the action cycle of the Knowledge-to-Action framework (Graham et al., 2006), thereby allowing for the exploration of the relationships between implementation and effectiveness. Study 3 furthers our understanding of the relationship between implementation and effectiveness of real-world LTPA-enhancing telephone counseling service, and suggests “key ingredients” that could be targeted in future refinements of the GIM intervention.

Although not explicitly discussed in the manuscript, the GIM service has an underlying foundation in the Health Action Process Approach (HAPA) model (Schwarzer, 2008). GIM clients are classified as non-intenders, intenders, or actors depending on their intentions to engage in LTPA and their actual LTPA behaviour. The strategies used during counseling sessions are designed to target the HAPA constructs that are relevant to a client in his/her given stage. For example, clients who do not yet have an intention to engage in LTPA are classified as non-intenders, and counseling strategies are used to focus on enhancing task self-efficacy, risk perceptions, and outcome expectancies. For more information about GIM's foundation in evidence and theory, please refer to Arbour-Nicitopoulos, Tomasone, Latimer-Cheung, and Martin Ginis (2014).

Abstract

Get in Motion (GIM) is an evidence- and theory-based telephone-counseling service implemented under real-world conditions that promotes leisure-time physical activity participation (LTPA) among Canadian adults with spinal cord injury (SCI). The first phase of GIM (June 2008-June 2011) was shown to be effective at sustaining intentions for, and increasing participation in, LTPA; however, it is unclear how the first phase of the service led to these outcomes. The purpose of the current study was to explore the implementation correlates of change in LTPA intentions and behaviour among clients who enrolled in the second phase of the GIM service (September 2011-January 2014). The counselor tailored counseling session frequency, duration, and content to meet clients' ($n = 46$; 50.0% male; 50.0% paraplegia; 51.46 ± 12.36 years old; 17.00 ± 17.59 years post injury) interests, needs, and LTPA preferences. Implementation information about intervention dose and content was monitored using Counseling Session Checklists. Clients' were asked to self-report their intentions for and actual aerobic and strength-training LTPA participation at baseline, 2-, 4-, and 6-months. Clients who completed the 6-month service were also asked to report their perceptions of the quality of the service. Results demonstrated that the second phase of GIM was effective at sustaining LTPA intentions and increasing time spent in moderate-to-vigorous strength-training and total LTPA among clients. Increases in clients' moderate-to-vigorous aerobic LTPA were significantly positively related to intervention dose and content (both

informational and behavioural strategies). Clients' perceptions of the credibility of the service was also significantly positively related to changes in moderate-to-vigorous aerobic LTPA over the 6-month service. This study provides additional knowledge that will contribute to the refinement of GIM as it enters its third action cycle.

Among people with spinal cord injury (SCI), engaging in leisure-time physical activity (LTPA) – physical activity that one chooses to engage in one's spare time, such as exercising or playing sports (Godin & Shephard, 1985) – has been shown to impart physical (Hicks et al., 2011; Wolfe et al., 2010), psychological (Martin Ginis, Jetha, Mack, & Hetz, 2010), social (Boschen et al., 2008), and quality of life benefits (Sweet, Martin Ginis, & Tomasone, 2013; Tomasone, Wesch, Martin Ginis, & Noreau, 2013). Despite accumulating research evidence about these benefits, approximately 50% of adults with SCI do not engage in LTPA (Martin Ginis et al., 2010). A commonly reported barrier to LTPA participation is a lack of resources and services that translate LTPA research evidence to this group (Rimmer et al., 2004); thus, the implementation of evidence-based LTPA-enhancing information, programs and services in the SCI community remains a priority.

Knowledge-to-Action (KTA) Framework

The Knowledge-to-Action (KTA) framework (Graham et al., 2006) provides a conceptual approach that is useful for implementing research evidence in a practical setting. This framework is divided into two processes – knowledge creation and knowledge application (action cycle) – with each process encompassing a number of stages (Figure 1; Graham et al., 2006). The process of knowledge creation is represented by a knowledge funnel wherein research evidence gets distilled through the stages of knowledge inquiry (e.g., primary

studies), to knowledge syntheses, to knowledge tools/products. Throughout the three stages of knowledge creation, knowledge can be tailored to meet the knowledge users' needs, so that research evidence leaving the knowledge funnel is as applicable to end-users as possible. Following knowledge creation, knowledge tools/products enter the action cycle, where knowledge is applied in practice. In the action cycle, knowledge tools/products that address a specific problem are selected and adapted to the local context where they will be applied. Barriers and facilitators to knowledge use are then addressed before specific intervention strategies are selected, tailored, and implemented to facilitate knowledge use in practice. Once implemented, knowledge use should be monitored and outcomes should be evaluated to determine if the tool/product is leading to expected changes, or if a modification of the tool/product is necessary. The last stage of the action cycle is determining whether knowledge use is maintained, which subsequently feeds back to the start of the action cycle. Importantly, knowledge creation and knowledge application can influence one another throughout the KTA process; that is, emerging research evidence can lead to refinements in the action cycle, and findings from the action cycle can lead to the generation of new research evidence.

Knowledge Creation of LTPA Interventions

Examples of knowledge tools/products that can be derived from the process of knowledge creation are evidence-based resources or interventions that

target theory-based determinants of LTPA (Martin Ginis et al., 2012). A number of such interventions already exist in the SCI community. For example, knowledge products such as the Physical Activity Guidelines for Adults with SCI (Martin Ginis, Hicks, et al., 2011), the SCI Get Fit Toolkit (Arbour-Nicitopoulos et al., 2013), and Active Homes manuals and videos (Latimer-Cheung et al., 2013) have been developed to provide people with SCI with recommendations for how much LTPA to do, information about the benefits of and opportunities for LTPA, and suggestions for engaging in home-based strength-training LTPA, respectively. While effective at altering theory-based determinants of behavior (e.g., attitudes, self-efficacy, perceived behavioural control; e.g., Michie, Johnston, Francis, Hardeman, & Eccles, 2008), LTPA informational interventions are not particularly effective at changing actual LTPA behaviour. This is true in both the general (Kahn et al., 2002) and SCI populations (Bassett & Martin Ginis, 2011; Foulon, Martin Ginis, Benedict, Latimer, & Sinden, 2013). However, informational interventions may be effective when combined with behavioural intervention approaches that teach people skills to initiate and maintain LTPA participation.

Two randomized controlled trials (RCTs) have examined the efficacy of providing people with informational resources and then teaching them theory-based behavioural strategies to increase their LTPA (Arbour-Nicitopoulos, Martin Ginis, & Latimer, 2009; Latimer, Martin Ginis, & Arbour, 2006). Both RCTs first gave participants the same LTPA information (e.g., basic LTPA instruction

guide, as well as a pamphlet with tips for initiating an LTPA routine). The first RCT utilized an 8-week action planning intervention, and found that participants in the experimental condition sustained their LTPA intentions, increased their confidence to schedule LTPA, and increased their LTPA behaviour compared to participants in the control condition (Latimer et al., 2006). The second RCT compared two groups of participants who were taught to engage in either action planning alone or action and coping planning combined (Arbour-Nicitopoulos et al., 2009). While both groups increased their LTPA behaviour over the 10-week study period, participants taught to create both action and coping plans reported significantly greater confidence to schedule LTPA and overcome LTPA-related barriers, as well as greater LTPA behaviour, than participants who were only taught to form action plans. These results suggest that teaching people with SCI a greater number of behavioural strategies in a single intervention may lead to greater increases in both theory-based determinants of and actual LTPA participation.

Action Cycle of LTPA Interventions

LTPA-enhancing interventions do not achieve their full potential if they are not taken out of knowledge creation and put into action beyond the original research context in which they were developed (Brownson & Jones, 2009; Owen, Glanz, Sallis, & Kelder, 2006; Sallis, Owen, & Fotheringham, 2000). In June 2008, the two RCTs described above (Arbour-Nicitopoulos et al., 2009; Latimer

et al., 2006) were translated into Get in Motion (GIM), a nationwide LTPA telephone-counseling service that is offered at no cost to Canadian adults with SCI. GIM is an evidence- and theory-based knowledge product/service designed to provide LTPA information (Arbour-Nicitopoulos et al., 2013; Latimer-Cheung et al., 2013; Martin Ginis, Hicks, et al. 2011) and to teach behavioural skills (Arbour-Nicitopoulos et al., 2009; Latimer et al., 2006) shown to be efficacious for enhancing theory-based determinants of LTPA participation in the SCI community (Martin Ginis et al., 2013; Martin Ginis, Latimer, et al. 2011). In line with the first four stages of the action cycle (identify, review, select knowledge; adapt knowledge to local context; assess barriers to knowledge use; select, tailor, implement interventions; Graham et al., 2006; Figure 1), the original 8- and 10-week RCT protocols (Latimer et al., 2006 and Arbour-Nicitopoulos et al., 2009, respectively) were adapted during the development of GIM. First, the main barriers to LTPA participation in the SCI community were addressed by providing knowledge of how and where to be active, and by teaching skills that will help clients increase and maintain LTPA motivation and behaviour (Cowan, Nash, & Anderson, 2013). Second, the protocols were modified to the community-based context by offering the service for 6 months. This adaptation aligns with research indicating that community-based telephone-delivered LTPA interventions lasting at least six months are more effective than interventions of shorter duration (Eakin, Lawler, Vandelanotte, & Owen, 2007).

From its inception in June 2008 to June 2011, GIM was implemented as a real-world service across Canada (Arbour-Nicitopoulos, Tomasone, Latimer-Cheung, & Martin Ginis, 2014). Our preliminary evaluation showed that clients' LTPA intentions were sustained throughout the service, and more clients were active at the end of the service than at the beginning. These results suggest that GIM is effective at promoting LTPA intentions and behaviour in the SCI community; however, questions remain as to how the service leads to these outcomes. The present study addressed these issues.

Where One Action Cycle Ends, Another Begins

Because GIM is implemented under “real-world conditions”, the frequency and duration of counseling sessions are adjusted to accommodate individual clients' needs and schedules, resulting in some clients receiving greater exposure to the service than others. Further, the counselor tailors the discussion of informational and behavioural strategies according to individual client interests, motivations, and barriers to LTPA. Moreover, clients' perceptions of the quality of GIM may influence their level of participation in the service. Thus, intervention dose, content, and perceived quality can vary among clients. Each of these implementation variables reflects how GIM is used in practice, and may be “key ingredients” that influence the service's effectiveness (Durlak & DuPre, 2008; Dusenbury, Brannigan, Falco, & Hansen, 2003). Understanding the relationship between these variables and the service's effectiveness in a real-

world setting would help identify how the implementation of GIM impacts LTPA-related outcomes among clients, and would inform future refinements of the service (Dusenbury et al., 2003).

Intervention dose, content and perceived quality may be potential mechanisms by which an LTPA-enhancing intervention achieves its outcomes (Rabin, Brownson, Kerner, & Glasgow, 2006). In the broader LTPA telephone-counseling literature, a positive relationship between intervention dose and behavioural outcomes has been established (Goode, Reeves, & Eakin, 2011). For example, a previous study of a community-based telephone-counseling service for adults with Type 2 diabetes and hypertension found a positive relationship between intervention dose and multiple behavioural outcomes (LTPA, fat intake, fibre intake; Goode et al., 2011); however, the relationship between counseling session content and the service's effectiveness was not investigated. While reviews have identified positive relationships between intervention content (e.g., behaviour change techniques) and outcomes in controlled efficacy studies (Greaves et al., 2011; Michie, Abraham, Whittington, McAteer, & Gupta, 2009), additional research is needed to understand how intervention content and quality influence the effectiveness of LTPA-enhancing interventions in an applied setting. Research examining these variables requires rigorous monitoring of implementation throughout the intervention; the present study addressed this gap in the literature.

Objectives

The purpose of this study was to explore the implementation correlates of change in LTPA intentions and behaviour among GIM clients who enrolled in the second phase (i.e., second action cycle) of the GIM service (September 2011 to January 2014). During this phase, an enhanced monitoring and evaluation protocol was implemented so that questions regarding the relationship between implementation and effectiveness could be examined. To address our research questions, we first examined whether clients' LTPA intentions and behaviour changed throughout their enrollment in the service. Based on our previous research (Arbour-Nicitopoulos et al., 2009; Arbour-Nicitopoulos et al., 2014; Latimer et al., 2006), we hypothesized that over their 6-month enrolment in GIM, clients would report (a) strong intentions at baseline that would be sustained throughout enrolment, and (b) an increase in moderate-vigorous intensity LTPA behaviour.

Second, we explored whether the following implementation variables were related to changes in clients' LTPA intentions and behaviour: (1) dose (i.e., the number and duration of counseling sessions), (2) content (i.e., number of times and duration of discussion of informational vs. behavioural strategies), and (3) clients' perceived quality of the service. Based on findings from community-based telephone counseling interventions in other populations (Goode, Reeves, & Eakin, 2012), we hypothesized that intervention dose would be related to increases in LTPA intentions and behaviour. In the absence of previous LTPA

implementation literature examining the influence of real-world intervention content and perceived quality on effectiveness, no hypotheses were put forth for the relationship between these variables and changes in intentions and behaviour.

Methods

Procedure

The GIM service and data collection procedures were approved by the McMaster University Research Ethics Board.

Participants. Between September 2011 and January 2014, GIM was advertised through the SCI Action Canada website, LTPA-related community events hosted by SCI Action Canada or their partner organizations, articles written for SCI-related publications (e.g., SCI Ontario's Outspoken magazine) and websites (e.g., PAR-QoL website), and word of mouth. Promotion and enrollment of clients were ongoing, and 46 clients enrolled in GIM during this period. These clients had a mean age of 51.46 years ($SD = 12.36$) and were injured on average 17.00 years ($SD = 17.59$) prior to their enrollment in the service. Half of the clients were male, had paraplegia, and used a power wheelchair as their primary mode of mobility outside their home (all $ns = 23$, 50.0%). The majority of clients had obtained post-secondary education (college, undergraduate or graduate degree, or professional program; $n = 31$, 67.4%), were married ($n = 24$, 52.5%), and were from Central Canada (Ontario or Quebec; $n = 25$; 54.3%). The most commonly reported causes of injury were sports/recreation/falls ($n = 13$, 28.2%) and motor vehicle accidents ($n = 12$,

26.1%). See Table 1 for complete demographic information for the clients.

Overall, the 46 clients were representative of the Canadian adult SCI population on all measured demographic variables except for sex, primary mode of mobility, and geographic location (Canadian Paraplegic Association, 2000; Farry & Baxter, 2010; Noreau et al., 2011). Compared to the Canadian SCI population, a greater proportion of the GIM clients were females (50% vs. 19% of Canadian SCI population), power wheelchair users (50.0% vs. 23.0% of Canadian SCI population), and residents from Central Canada (54.3% vs. 28.0% of the Canadian SCI population; Canadian Paraplegic Association, 2000).

Enrollment procedures. Interested potential clients contacted the GIM Program Coordinator directly via postal mail, e-mail, or a toll-free telephone number. During a phone interview, the Coordinator assessed individuals' eligibility to participate in the service (i.e., currently residing in Canada, at least 18 years of age, traumatic or non-traumatic SCI) and provided eligible clients with more information about the enrollment procedures and the protocol of the 6-month service. Individuals were given the opportunity to ask questions about the service before enrolling. All clients who enrolled provided informed consent for the Coordinator to collect demographic information and for the counselor to keep a record of counseling sessions. After collecting demographic information, the Coordinator mailed a Welcome Package to the client which included the Physical Activity Guidelines for Adults with SCI (Martin Ginis, Hicks, et al., 2011), the SCI Get Fit Toolkit (Arbour-Nicitopoulos et al., 2013), two elastic resistance

bands (Thera-Band®) and instruction guide, an exercise safety tip sheet, tips and strategies for meeting LTPA goals, and an activity intensity classification chart (Martin Ginis, Latimer, Hicks & Craven, 2005). The client's first (baseline) counseling session was scheduled by the Coordinator to be approximately two weeks from date of enrollment to ensure that the client would have a chance to review the Welcome Package prior to speaking with the counselor.

Clients were then invited to participate in an ongoing quality evaluation study of the GIM service. Those interested in completing additional questionnaires prior to and at 2-, 4-, and 6-months after their first counseling sessions provided verbal consent and selected whether they would like to have their questionnaires administered via a telephone interview or electronically through Fluid Surveys. A research assistant then took over the data collection procedures for clients who enrolled in the evaluation study.

Telephone-based counseling. All counseling sessions were delivered over the phone by a single exercise counselor who was a registered Kinesiologist and had extensive experience in developing and implementing community-based LTPA programs for persons with SCI. Specific to GIM, the counselor initially received professional training in motivational interviewing and behaviour change theories, then met monthly with members of the research team (JRT, KAN) to support and troubleshoot implementation, as well as to discuss emerging evidence and theory about LTPA participation among adults with SCI.

Counseling sessions were scheduled at a mutually-convenient time for both the client and counselor. The standard protocol for counseling session frequency was weekly for the first two months, biweekly for months 2 to 4, and then monthly for months 4 to 6 in order to gradually wean clients from dependency on the counselor towards independent self-regulation of LTPA behaviour (Brawley, Arbour-Nicitopoulos, & Martin Ginis, 2013). However, clients were given the opportunity to self-select this standard frequency or another frequency that met their individual needs, interests and schedule.

The intervention strategies used during the counseling sessions can be classified as either informational or behavioural (Kahn et al., 2002; refer to Table 2 for a list of strategies and how they are used in GIM). The counselor tailored the strategies discussed to meet an individual client's interests, motivations and barriers with respect to LTPA. For example, in a given session, if a client expressed uncertainty about how much LTPA s/he should be doing or how to do it safely, then the counselor focused the conversation on providing the client with this information. If a client expressed difficulty scheduling LTPA into their week or overcoming barriers, then the counselor directed the conversation towards teaching behavioural strategies. The duration of each counseling session was dependent on the number of topics that were discussed during each session as well as the number of questions that the client had about a given strategy. To keep track of content and duration for every counseling session a client received, the

counselor completed a Counseling Session Checklist (described in the next section).

If a counseling session fell within a two week period of 2-, 4-, or 6-months since a client's first counseling session, the LTPA behaviour measure was administered at the beginning of the session in order to: (1) provide the counselor with feedback about a client's current LTPA behaviour, which could then be used to tailor the remaining content of the session, and (2) ensure that LTPA participation from all clients enrolled in the service could be tracked. Clients could choose to discontinue the service at any time. Clients who completed their 6-month enrollment were contacted by the Program Coordinator after their last counseling session to complete a Client Reflection.

Measures

LTPA intentions. Clients' intentions to engage in LTPA were assessed at baseline (before their first counseling session), as well as at 2-, 4-, and 6-months after enrollment. Two items followed the stem, "In the next two months, I intend to engage in...": (1) "At least 20 minutes of moderate-to-vigorous aerobic activity on at least two days of the week", and (2) "At least 3 sets of 8-10 repetitions of moderate-to-vigorous strength-training activity for each muscle group at least two days per week". These items were used in previous studies examining LTPA intentions in the SCI community (Arbour-Nicitopoulos et al., 2009; Arbour-Nicitopoulos et al., 2014; Latimer & Martin Ginis, 2005; Latimer et al., 2006), but

were modified to reflect clients' intentions to meet both the aerobic and strength-training recommendations outlined in the Physical Activity Guidelines for Adults with SCI (Martin Ginis, Hicks, et al., 2011). Clients were asked to rate their level of agreement with the two items on a 7-point Likert-type scale (1=*strongly disagree*, 7=*strongly agree*), with higher values indicating greater intentions to engage in moderate to heavy LTPA. The two items were analyzed separately, as well as averaged to give an overall intention measure ($rs \geq .59$).

LTPA behaviour. The 7-day, self-report LTPA Questionnaire for People with SCI (LTPAQ-SCI; Martin Ginis & Latimer, 2007) was used to assess clients' LTPA behaviour. The LTPAQ-SCI has shown acceptable test-retest reliability and construct validity in previous research (Martin Ginis, Phang, Latimer, & Arbour-Nicitopoulos, 2012); however, this measure was modified in the current study to assess both aerobic activity and strength-training activity, in order to correspond with the LTPA recommendations outlined by the Physical Activity Guidelines for Adults with SCI (Martin Ginis, Hicks, et al., 2011). Clients were read the definition of mild-, moderate-, and heavy-intensity aerobic LTPA and recalled the number of days, over the past seven days, that they performed aerobic LTPA at each intensity. They were then asked to recall how many minutes they usually spent doing aerobic LTPA at that intensity. The aerobic scale was scored by calculating the total number of minutes of aerobic activity performed at each intensity (number of days of aerobic activity x number of minutes of aerobic activity) over the past week. Minutes of moderate and heavy/vigorous intensity

aerobic activity were summed to give a total number of minutes of aerobic moderate-vigorous physical activity (MVPA) performed in a given week. The same process was completed for strength-training MVPA performed in a given week. Total MVPA for the week was calculated by summing aerobic and strength-training MVPA. For the current study, only moderate-vigorous LTPA was examined as activity at these intensities is required for people with SCI to achieve fitness benefits (Hicks et al., 2011).

Counseling Session Checklist. The Counseling Session Checklist served as: (1) a roadmap for the counselor to follow during the session, (2) a record of client's needs, interests, and preferences with respect to their motivation for participating in both LTPA and the service, and (3) a tool to collect data about the implementation of the service (i.e., type and duration of strategies discussed with the client during each session). To ensure the Checklist could be adopted and implemented in practice (Tomasone, Martin Ginis, Estabrooks & Domenicucci, 2014a), the counselor was involved in the creation, pilot testing, and refinement of the Checklist. Please see Appendix C.4 for a copy of the Counseling Session Checklist.

To address our research question, information about six different implementation variables was extracted from the Checklists. Two variables assessed intervention dose: (1) number of sessions the client received and (2) duration of each session. Four variables assessed intervention content: (1) number of times informational strategies were discussed, (2) time spent discussing

informational strategies, (3) number of times behavioural strategies were discussed, and (4) time spent discussing behavioural strategies. To track time spent on a strategy, the counselor indicated the percentage of total call duration that was spent on a given strategy, which was then converted to minutes (i.e., percentage of total call duration spent on strategy x total call duration = time spent on strategy). The total number of times and time spent on both informational and behavioural strategies were summed for each session, and then summed across each two month period of counseling.

The first author received permission from five different clients at different points in the service to listen in on a counseling session (five sessions total) and completed a reliability check of counselor-completed Checklists for these sessions. The level of agreement between the researcher and counselor for strategies discussed was 100%, and intraclass correlations for the percentage of session duration spent on given strategies were $\geq .987$ across the five sessions.

Client Reflection. To assess perceived quality of implementation, clients were asked to rate the following five items on a 7-point Likert-type scale (1=*strongly disagree*, 7=*strongly agree*): “The information and resources that the counselor provided were: (1) interesting; (2) easy to understand; (3) credible; and (4) personally important to me”; and (5) “I learned a lot of new information from the GIM counselor”.

Statistical Analysis

Data were screened for outliers and missing data using established guidelines (Tabachnick & Fidell, 2007). Three LTPA outliers (values >3 *SDs* above the mean) were identified (one for baseline aerobic MVPA, one for baseline strength-training MVPA, and one for 6 month aerobic MVPA; each outlier was reported by a different client) and adjusted to a value that was 3 *SDs* above the mean. Due to the large number of clients who discontinued their enrollment in the service between baseline and 2 months (see Figure 2), 11 (31.4%) clients had intentions data and 16 (38.1%) clients had behaviour data at only one time point (i.e., baseline), ruling out the use of missing value imputation techniques as there was a moderate amount of missing data from a relatively small sample size (Tabachnick & Fidell, 2007).¹

Based on the standard GIM session frequency (weekly for the first two months, biweekly for months 2 to 4, and then monthly for months 4 to 6), the number of counseling sessions should be greatest between baseline and 2-months (eight sessions) and lowest between 4-6 months (two sessions). Indeed, an ANOVA revealed that the average number of sessions that the clients actually received between baseline-2 months was significantly greater than the average number of sessions received between both months 2-4 and 4-6 ($ps < .001$), but there were no significant differences between the number of sessions between

¹ Because clients who discontinued their enrolment would have also received the fewest calls, assuming no change and conducting an intent-to-treat analysis would over-estimate associations between calls completed and outcomes. Thus, no missing data imputation techniques were conducted.

months 2-4 and 4-6 ($p=.39$). Thus, for simplicity and to minimize loss of data in subsequent paired comparisons, the 2-4 month and 4-6 month counseling periods were collapsed into a single 2-6 month period.

Descriptive statistics were calculated for demographic variables, LTPA intentions (aerobic, strength-training, and average), LTPA behaviour (aerobic, strength-training, and total MVPA), the six implementation variables from the Counseling Session Checklists, and Client Reflection variables. To examine changes in LTPA intentions and behaviour, separate repeated measures ANOVAs were performed, and significant ANOVAs were followed up by post-hoc paired t -tests to determine where significant changes occurred. Cohen's d was calculated as an index of effect size for changes in intentions and behaviour between time points. Effect sizes were interpreted as small, medium, and large-sized effects using Cohen's conventions of d s of 0.20, 0.50, 0.80 (Cohen, 1992). To examine the correlates of change in LTPA intentions and behaviour, change scores were calculated for aerobic, strength-training and average/total intentions and MVPA between baseline-2 months, 2-6 months, and baseline-6 months. Bivariate correlations were then calculated between change scores and measures of implementation dose, content, and perceived quality.

Results

Client Flow

Four clients discontinued the service before their baseline counseling session. Of the 42 clients who received counseling, 25 completed all 6 months of

counseling, with the greatest number of clients discontinuing participation between baseline and 2 months ($n = 13$).² Figure 2 shows the number of clients and the data available for these clients at baseline, 2-, 4-, and 6-months. Demographic characteristics of (a) clients who dropped out between baseline and 2 months ($n = 13$) versus clients who continued on to months 2-6 of service ($n = 29$), and (b) clients who dropped out at any point between baseline and 6 months ($n = 21$) versus clients who completed the 6 month service ($n = 25$) were compared using independent samples *t*-tests for continuous variables, and chi-square analysis for dichotomized variables (see Table 1). No significant demographic differences between these groups of clients emerged (all $ps \geq .10$).

LTPA Intentions

Because the LTPA intention measure was administered by a research assistant as part of the ongoing quality evaluation study, and not all clients were interested in completing these additional questionnaires, the sample size for the intention measure at a given time point is less than the number of clients enrolled in the service (see Figure 2).

² Of the 13 clients who discontinued participation between baseline and 2 months, three could not be contacted by the counselor. The other 10 clients provided the following reasons for discontinuing: moved to a different country ($n = 3$), more interested in local/face-to-face resources ($n = 3$), personal situation ($n = 2$), and health complications not related to LTPA participation ($n = 2$). Of the four clients who discontinued between months 2-6, two could not be contacted by the counselor, and the other two experienced health complications not related to LTPA participation.

As hypothesized, clients' baseline intentions for engaging in aerobic, strength-training, and total LTPA were high ($M \pm SD \geq 6.14 \pm 1.44$, out of 7) and did not change over the course of the 6 month service (all $F(2,30) \geq 0.690$, $ps \geq .24$). Table 3 lists all descriptive statistics, F -statistics and Cohen's d for LTPA intentions over the 6-month period.

LTPA Behaviour

Significant time effects were seen for changes in time spent in strength-training and total MVPA over the 6-month period (all $F(2,40)s \geq 3.679$, $ps \leq .03$). Post-hoc paired sample t -tests revealed significant increases in time spent in strength-training and total MVPA between baseline and 2 months ($ds \geq .30$) and between baseline and 6 months ($ps \leq .017$; $ds \geq .43$). No significant changes in time spent strength-training or total MVPA were seen between 2-6 months ($ps \geq .23$). No significant changes in aerobic MVPA emerged over enrollment; however, small effect sizes for increases in aerobic MVPA emerged between baseline-2 months ($d = .29$) and between baseline-6 months ($d = .20$).

Implementation Correlates of Change in LTPA Intentions and Behaviour

Measures of dose and content. Regarding dose, during the first two months of the service, GIM clients had an average of 3.22 ($SD = 1.98$) counseling sessions and an average session duration of 58.39 minutes ($SD = 36.98$). Regarding content, informational strategies were discussed 7.35 times ($SD = 6.88$)

for an average total of 17.31 minutes ($SD = 17.33$). Behavioural strategies were discussed 5.96 times ($SD = 4.09$) for an average total of 17.50 minutes ($SD = 14.91$). The means for all measures of implementation dose and content were greater between baseline-2 months than 2-6 months ($ps \leq .02$). Table 4 provides descriptive statistics for the measures of dose and content during the service.

When examining the type of content that was discussed, paired samples t -tests revealed that there were no significant differences between time spent discussing informational versus behavioural strategies between baseline-2 month and 2-6 months. There were no significant differences between the number of times that informational and behavioural strategies were discussed between baseline-2 months; however, informational strategies were discussed significantly more times than behavioural strategies between 2-6 months ($t(45) = 3.815, p < .001$).

Changes in aerobic MVPA between baseline-6 months were significantly related to total session duration, total number of sessions, and the number of times that informational and behavioural strategies were discussed over the 6 month period ($.398 \leq rs \leq .534; ps < .05$; see Table 5).³ Thus, clients who reported the greatest changes in aerobic MVPA over the 6 month service also had the greatest

³ Measures of intervention dose were also significantly related to measures of intervention content ($ps < .01$; see Table 5). We created a mediation model to determine whether the relationship between dose and changes in behaviour were operating through how that time was spent (i.e., measures of intervention content). The indirect effects of content on changes in behaviour were not significant and thus results are not reported. However, we were likely underpowered to detect a significant effect as the total sample size in the mediation model was 25 clients.

intervention dose, and discussed a greater number of both informational and behavioural strategies with the counselor. No other correlations were statistically significant.

Measures of perceived quality. The 20 clients who completed the Client Reflection had positive perceptions of the information and resources provided (all $M_s \geq 6.00$ out of 7; see Table 4). Clients' ratings of credibility were significantly related to changes in aerobic MVPA, as well as total session duration, total number of sessions, and number of times behavioural strategies were discussed ($p_s < .05$). Thus, clients who felt the counselor and service were highly credible: (1) reported the greatest increases in their aerobic MVPA over the service, (2) had the greatest exposure to the counselor (intervention dose), and (3) discussed behavioural strategies more frequently.⁴ No other correlations were significant. See Table 5 for complete correlational results.

Discussion

In line with Graham and colleagues' (2006) KTA framework, this study incorporated monitoring of intervention use so that the relationship between the service's implementation and changes in clients' LTPA intentions and behaviour

⁴ Clients' perception of the personal importance of the content discussed during counseling sessions was significantly related to total session duration, total number of sessions, and number of times behavioural strategies were discussed over the 6 month service ($p_s < .01$). We ran a series of hierarchical linear regressions to test whether changes in intentions and behaviour could be predicted by the significantly correlated variables of dose, content and perceived quality. Due to issues of multicollinearity between the predictor variables, neither stepwise nor enter methods of regression allowed for further examination of the predictors of changes in intentions and MVPA.

during the second phase of the GIM service (September 2011 to January 2014) could be explored. As hypothesized, clients had strong intentions for engaging in LTPA when they enrolled in the service that were sustained over their participation in the service. Further, clients' self-reported time spent on strength-training and total MVPA increased during the first two months and was sustained over months 2-6 of the service. While changes in clients' aerobic MVPA did not achieve statistical significance, a small effect size was seen over the first two months. Furthermore, changes in aerobic MVPA were significantly, positively related to several measures of intervention dose, content, and perceived quality.

LTPA Intentions and Behaviour

Our hypothesis with respect to clients' LTPA intentions was confirmed – clients reported strong intentions for engaging in LTPA at baseline, and these strong intentions were sustained throughout their participation in the service. Given how the GIM service was promoted (websites, events, newsletters, and word of mouth), only clients who were interested in gaining support for LTPA participation would have contacted the GIM Program Coordinator; thus, it is not particularly surprising that clients reported strong LTPA intentions when they enrolled. The maintenance of these positive LTPA intentions over their enrolment is in line with previous experimental findings of LTPA telephone counseling in the SCI population (Latimer et al., 2006) and with the previous effectiveness evaluation of the GIM service (Arbour-Nicitopoulos et al., 2014),

suggesting that telephone-based counseling can sustain clients' motivation for engaging in LTPA under real-world conditions.

Our hypothesis with respect to changes in LTPA behaviour was partially confirmed. Specifically, clients reported significant increases in time spent on strength-training and total MVPA between baseline and 2 months, as well as between baseline and 6 months. There were no significant changes in aerobic MVPA. The magnitude of change in total MVPA between baseline and 2 months ($d = .36$) is comparable with the small to medium-sized increases observed in our previous RCTs ($ds = .38$ and $.55$; Latimer et al., 2006 and Arbour-Nicitopoulos et al., 2009, respectively). These findings suggest that the GIM service is just as effective at increasing moderate-to-vigorous LTPA behaviour under real-world conditions as it is in controlled, experimental conditions.

The initial increase in clients' strength-training and total MVPA in the first two months of the service was maintained over months 2-6. Interestingly, the majority of dropouts occurred during the first two months of the service. Other community-based LTPA telephone counseling programs have also reported a high drop-out rate during the early stages of the intervention (e.g., up to one third of participants drop-out after first counseling call; Goode, Reeves, Owen, & Eakin, 2013). Together, these findings suggest that the first two months of counseling may be a crucial period for eliciting behaviour change and minimizing dropouts among GIM clients. These findings are in contrast to two systematic reviews of telephone-delivered LTPA and/or dietary behaviour change interventions across a

range of populations that indicate that interventions of longer duration (i.e., delivered over a greater number of months) have greater effectiveness (Eakin et al., 2007; Goode et al., 2012). The discrepancy in these findings may be due to the differences in the scope of the interventions and the populations targeted. The GIM service aims to increase a single behaviour (LTPA) rather than a variety of complex health behaviours (LTPA and dietary behaviours combined; Eakin et al., 2007; Goode et al., 2012), and it is easier for clients to focus on changing one behaviour at a time (Medical Research Council, 2008). Also, individuals with SCI frequently experience a range of secondary complications (e.g., pressure sores, illness, pain; Anson & Shepherd, 1996) that may hinder ongoing participation in LTPA above and beyond the barriers to LTPA commonly reported by the general population (e.g., weather, time; Salmon, Owen, Crawford, Bauman, & Sallis, 2003). The longer the intervention duration, the more likely individuals with SCI may drop out because of the LTPA barriers they face; thus, in line with our findings, interventions implemented over fewer months may be more effective for this population. Future iterations of the GIM service should focus on maximizing client adherence and changes in LTPA behaviour during the first two months of the service.

Despite a lack of significant increases in clients' aerobic MVPA throughout the service, small effect sizes emerged. When clients' aerobic MVPA is compared to the Physical Activity Guideline recommendations for aerobic activity (moderate-to-vigorous aerobic activity twice per week = 40 minutes of

aerobic MVPA/week; Martin Ginis, Hicks, et al., 2011), on average, clients went from not meeting aerobic recommendations at baseline (average 38.10 mins/week) to surpassing the recommendations at 2 and 6 months (63.04 and 51.04 minutes/week, respectively). Furthermore, secondary analysis of the aerobic MVPA data revealed that compared to the 19.0% of clients who met aerobic recommendations when they enrolled in GIM, the percentage of clients meeting aerobic recommendations was significantly greater at 2 months (73.1%, McNemar $\chi^2 = 11.267, p = .008$) and 6 months (52.0%, McNemar $\chi^2 = 3.000, p = .05$). Thus while not statistically significant, the average increases in clients' aerobic MVPA are of clinical significance, as a greater percentage of clients were engaging in amounts of aerobic MVPA that are associated with fitness benefits at the 2- and 6-month points (Hicks et al., 2011).

Implementation Correlates of Change in LTPA Intentions and Behaviour

Changes in aerobic MVPA between baseline and 6 months were significantly positively related to intervention dose. These findings align with reports of LTPA telephone counseling programs among the general population that have found that the completion of a higher number of calls is associated with greater increases in clients' physical activity levels (Goode, Reeves, & Eakin, 2012). Thus, the current study confirms that there is a positive relationship between counseling dose and increases in LTPA behaviour among the SCI population.

Upon examination of content delivered during the counseling sessions, the number of times that the counselor discussed both informational and behavioural strategies was related to changes in aerobic MVPA over the 6 month period. Rather than adhering to a set implementation protocol, the GIM counselor tailored counseling session content to reflect clients' individual LTPA interests, motivations and barriers. Since the provision of LTPA information is highly desired among people with SCI (Rimmer et al., 2004; Wolfe et al., 2010), it is not surprising that the GIM clients who discussed informational strategies a greater number of times with the counselor were more likely to report increases in their LTPA behaviour. With regard to behavioural strategies, findings from Latimer and colleagues (2006) and Arbour-Nicitopoulos and colleagues (2009) suggest that teaching behavioural skills (specifically action planning and coping planning) during telephone-based counseling leads to increases in LTPA behaviour among people with SCI. Therefore, including both informational and behavioural strategies in telephone-based counseling appears conducive to increasing aerobic MVPA behaviour.

The only Client Reflection variable that emerged as a correlate of 6-month change in aerobic MVPA was clients' perceptions of the credibility of the content provided. Previous research has suggested that people with SCI want to receive physical activity information from a credible source, such as a trained exercise counselor (Faulkner et al., 2010; Letts et al., 2011). Clients who felt they were receiving credible information from a credible source may have been more willing

to adopt and apply this content, making them more likely to increase their LTPA levels (c.f., Diffusion of Innovations; Rogers, 2003). However, it should be noted that the Client Reflection data were collected only from individuals who completed the 6-month service, and clients' perceptions of credibility may have impacted whether or not they chose to continue their participation in the service. As discussed above, clients who received a greater number of counseling sessions and had greater total session durations were more likely to report changes in their LTPA levels. In the future, administering the Client Reflection to clients who choose to discontinue their participation would enhance our understanding of how credibility may impact the effectiveness of the GIM service.

Strengths and Limitations

This study demonstrates that the GIM service can effectively sustain clients' LTPA intentions and increase clients' LTPA behaviour at a magnitude that is comparable to controlled, experimental findings (Abour-Nicitopoulos et al., 2009; Latimer et al., 2006), extending the literature on translating LTPA-enhancing telephone-based interventions to practical settings (Goode et al., 2012). This study also provides evidence that the service's effectiveness is robust across systematic replications of the service (i.e., first and second phases of GIM; Arbour-Nicitopoulos et al., 2014), and thus makes an important contribution to translational research on health-promoting interventions (Kessler & Glasgow, 2011).

To our knowledge, this study is the first to examine the relationship between the implementation and effectiveness of a real-world telephone-based LTPA counseling service. By rigorously monitoring implementation (i.e., with the Counseling Session Checklists), we were able to address the “monitoring knowledge use” stage in the action cycle of the KTA framework (Graham et al., 2006), thereby allowing us to explore the relationships between intervention dose, content, perceived quality and changes in clients’ LTPA intentions and behaviour. This was not possible in our previous evaluation of the GIM service (Arbour-Nicitopoulos et al., 2014). It should be noted that, similar to Goode and Eakin’s study (2013), initial and ongoing collaboration between the service’s staff and research team was crucial for the successful implementation, monitoring, and evaluation of the program.⁵

Another strength of the current study is the identification of implementation variables as correlates of LTPA behaviour change for an evidence- and theory-based LTPA telephone counseling service applied under real-world conditions. The identified key implementation variables (i.e.,

⁵ The research team included the principal investigators of both of the original RCTs (Professor level), the director of a community-university research alliance that supports LTPA participation among people with SCI (Professor level), and a doctoral student whose dissertation centered on the translation and dissemination of the GIM service in Canada. The research team was instrumental in providing support during the development of data collection procedures, counselor and research assistant training in intervention and evaluation protocols, and ongoing support for intervention delivery and data collection. Two members of the research team met monthly with the counselor and data collection research assistants. The doctoral student was also available for weekly consultations via email or telephone with the counselor and research assistant when issues arose outside of scheduled meeting times.

correlates of change) can be specifically targeted to enhance the effectiveness of future iterations of the GIM service in the same or additional contexts (Bonetti et al., 2005; Durlak & DuPre, 2008; Tomasone, Martin Ginis, Estabrooks, & Domenicucci, 2014b; Wandersman et al., 2008). To date, the GIM service protocol manual has been shared with, and adopted by, three additional contexts (one in Quebec, Canada, one in the United Kingdom, one in Sweden); as such, the methodology and results from the current study will be shared with these organizations/researchers so that these other adopters are aware of how to monitor service implementation correlates of LTPA behaviour change. This study provides additional research evidence that will help these settings adapt and evaluate the GIM service in their local context, thereby initiating another action cycle and broadening our understanding of how to apply the KTA framework for the implementation of a real-world intervention across multiple settings.

Despite these strengths, several limitations to the study should be noted. First, LTPA behaviour data were self-reported by clients and collected by the interventionist. Self-reported LTPA participation is considered one of the only valid ways to assess LTPA levels among people with SCI (Tanhoffer, Tanhoffer, Raymond, Hills, & Davis, 2012); nevertheless, clients may have over-reported their LTPA levels at 2-, 4-, and 6-months because they anticipated that the counselor would want them to have higher LTPA levels as they progress in the service. However, as noted in the Methods section, the collection of LTPA data by the counselor was strategic in order for the counselor to monitor clients'

progress and adjust counseling to suit the clients' changing needs and LTPA levels. Further, because within-person change in behaviour was the outcome of interest, error in data collection (i.e., over-reporting LTPA) should be consistent across individuals over the study period. A second limitation was that the small sample size and high multicollinearity among the correlates of change left us underpowered to conduct mediational analyses to further investigate whether the implementation of a specific type of intervention strategy (information vs. behavioural) was a potential mechanism/mediator by which exposure to the service leads to changes in LTPA intentions and behaviour. The examination of mediating mechanisms is a suggested avenue for future research. Finally, we were able to examine intervention dose, content, and perceived quality of the service as potential implementation variables that may influence changes in LTPA intentions and behaviour, but there are likely other implementation variables that influence GIM's effectiveness that were not examined in the current study. Nevertheless, as Meyers, Durlak, and Wandersman (2012) have noted, rigorous designs that encompass all of the possible influential variables are impossible to execute when studying implementation in real-world contexts. Thus, this study begins to uncover some of the key correlates of the service's effectiveness by focusing on intervention dose, which has been shown to influence telephone-based intervention outcomes in the general population, as well as intervention content, which has been shown to influence theory-based determinants of LTPA participation among people with SCI.

Conclusion

As an evidence- and theory-based intervention that operates under real-world conditions, GIM is effective at sustaining LTPA intentions and increasing time spent on strength-training and total moderate-to-vigorous LTPA among clients. By carefully monitoring implementation, we found that measures of intervention dose, content, and perceived credibility were related to changes in clients' aerobic LTPA levels. Findings from the current study suggest that the first two months of the service are a critical period for both enhancing LTPA participation among the SCI population and for minimizing dropouts from the service, and that the provision of both informational and behavioural strategies are important for increasing clients' aerobic LTPA levels. Overall, this study provides additional knowledge that will contribute to the refinement of GIM as it enters its third action cycle.

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Table 1.

Demographic characteristics of the clients who enrolled in *Get in Motion* between September 2011 and January 2014 ($N=46$) and comparison to those who discontinued ($n = 21$) versus completed ($n = 25$) their 6-months in the service.

Variable ($n, \%$)	Enrolled	Discontinued	Completed
	$n = 46$	$n = 21$	$n = 25$
Age (years), $M \pm SD$	51.46 \pm 12.36	49.90 \pm 10.72	52.50 \pm 13.89
Years post-injury , $M \pm SD$	17.00 \pm 17.59	15.25 \pm 17.18	17.71 \pm 18.19
Sex			
Male	23 (50.0)	13 (61.9)	10 (40.0)
Female	22 (47.8)	8 (38.1)	14 (56.0)
Level of injury			
Paraplegia	23 (50.0)	9 (42.9)	14 (56.0)
Tetraplegia	21 (45.7)	11 (52.4)	10 (40.0)
Cause of injury			
Vehicular	12 (26.1)	4 (19.0)	7 (28.0)
Sports/recreation/falls	13 (28.2)	5 (23.8)	8 (32.0)
Medical/surgical complications	8 (17.4)	3 (38.1)	5 (20.0)
Other	13 (28.2)	8 (38.1)	5 (20.0)
Primary mode of mobility			
Manual chair	13 (28.3)	5 (23.8)	8 (32.0)
Power chair	23 (50.0)	11 (52.4)	12 (48.0)
Gait aid/Walk independently	10 (21.7)	5 (23.8)	5 (20.0)
Marital status			
Single	14 (30.4)	8 (38.1)	6 (24.0)
Married/common law	24 (52.2)	12 (57.1)	12 (48.0)
Divorced/widowed/separated	8 (17.3)	1 (4.8)	7 (28.0)
Highest level of education			
Post-secondary	31 (67.4)	13 (61.9)	18 (72.0)
High school/other	15 (32.6)	7 (38.1)	7 (28.0)
Geographic location			
Western Canada	19 (67.4)	9 (42.9)	10 (40.0)
Central Canada	25 (54.3)	11 (52.4)	14 (56.0)
Eastern Canada	2 (4.3)	1 (4.8)	1 (4.0)

Note. All values are given as n (%) except age and years post injury, which are $M \pm SD$. $ns < 46, 21$, and 25 for some variables in the second, third, and fourth columns, respectively, due to non-responding.

There were no significant differences between the 21 dropouts and 25 completers for any demographic variable (all $ps \geq .13$).

Table 2.

Informational and behavioural strategies used during *Get in Motion* counseling sessions.

Type of strategy	How strategy is used in the GIM service
Informational strategies	
Physical Activity Guidelines for Adults with SCI [^]	Counselor provides recommendations for how much, how hard, and how often to engage in aerobic and strength-training LTPA to achieve fitness benefits.
Intensity classification ^{^^}	Counselor describes how to determine whether they are working at a mild, moderate, or heavy intensity depending on how their body feels.
Safety tips for LTPA	Counselor talks about the benefits of warming up before and cooling down after exercising.
Activity classification	Counselor answers questions about whether specific activities are classified as aerobic or strength-training LTPA.
Helpful resources	Counselor specifies websites or local facilities that may be useful to clients' LTPA needs, interests, and preferences.
Behavioural strategies	
Goal-setting	Counselor teaches how to set smart, measurable, realistic, and timely goals towards meeting the Physical Activity Guidelines for Adults with SCI [^] .
Action planning ^{^^^}	Counselor teaches client to develop a concrete plan for scheduling LTPA into their week by specifying when, where, and how they will be active.
Coping planning/barrier management ^{^^^^}	Counselor prompts client to think about potential barriers to meeting action plan and to strategize ways to overcome their barriers.

Note. GIM, Get in Motion; LTPA; leisure-time physical activity; SCI, spinal cord injury.

The following studies refer to the use of the given intervention strategies among the SCI population, as opposed to the original references for the intervention strategies: [^] (Martin Ginis et al., 2011); ^{^^} (Martin Ginis et al., 2005); ^{^^^} (Latimer et al., 2006; Arbour-Nicitopoulos et al., 2009); ^{^^^^} (Arbour-Nicitopoulos et al., 2009).

Table 3.
Changes in clients' LTPA intentions and behaviour over enrollment in the *Get in Motion* service.

Outcome	Descriptive Statistics				Repeated-measures ANOVA	Post hoc paired Samples <i>t</i> -tests		
	Baseline	2-months	6-months			[Cohen's <i>d</i>]		
INTENTIONS (out of 7)								
Aerobic	(<i>n</i> =35) 6.34±1.19	(<i>n</i> =24) 6.63±1.24	(<i>n</i> =18) 6.28±1.48		0.690	[0.28]	[-0.56]	[-0.05]
Strength	6.14±1.44	6.21±1.35	5.50±1.86		1.364	[0.06]	[-0.56]	[-0.39]
Average	6.24±1.66	6.42±1.25	5.89±1.51		1.506	[0.15]	[-0.68]	[-0.25]
MVPA BEHAVIOUR (mins per week)								
Aerobic	(<i>n</i> =42) 38.10±93.80	(<i>n</i> =26) 63.04±43.88	(<i>n</i> =25) 51.04±65.80		2.673	[0.29]	[-0.19]	[0.20]
Strength	23.98±39.17	33.27±41.47	42.52±44.53		3.679*	-2.219 ⁺ [0.30]	-1.247 [0.23]	-2.799** [0.44]
Total	61.24±110.79	96.31±69.34	93.56±100.40		4.555*	-3.834 ⁺⁺ [0.36]	.280 [-0.03]	-2.329 ⁺ [0.43]

Note. MVPA, moderate-vigorous physical activity. Post-hoc paired samples *t*-tests were not examined for the repeated-measures ANOVAs that were not significant; hence, there are no *t*-values in those cells.

* $p \leq .05$, ⁺ $p \leq .017$ (Bonferroni correction for multiple comparisons applied to *t*-tests), ** $p \leq .01$, ⁺⁺ $p \leq .001$.

Table 4.

Descriptive statistics for implementation dose and content between baseline-2 months and 2-6 months.

Implementation variable	Baseline-2 months <i>M</i> ± <i>SD</i> (range)	2-6 months <i>M</i> ± <i>SD</i> (range)	<i>t</i> -value (<i>p</i> -value)
Sessions			
Number	3.18±1.98 (0-7)	2.76±2.47 (0-7)	1.420 (.16)
Total duration (min)	58.39±36.98 (0-146.00)	36.26±35.93 (0-97.00)	4.700 (<.001) ⁺⁺
Informational strategies			
Number	7.35±6.88 (0-37)	4.85±4.85 (0-14)	2.487 (.02) [*]
Duration (min)	17.31±17.33 (0-63.80)	10.53±11.88 (0-36.70)	3.306 (.002) ^{**}
Behavioural strategies			
Number	5.96±4.09 (0-15)	3.50±3.43 (0-11)	4.848 (<.001) ⁺⁺
Duration (min)	17.50±14.91 (0-47.30)	10.28±11.35 (0-40.50)	4.149 (<.001) ⁺⁺

Note. Durations are in minutes. Degrees of freedom for *t*-tests were 45.

^{*} $p \leq .05$, ^{**} $p \leq .01$, ⁺⁺ $p \leq .001$.

Table 5.

Descriptive statistics and correlations between changes in behaviour and implementation dose, content, and perceived quality between baseline and 6 months.

Variable	M±SD	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1. ΔAerobic MVPA	10.48±64.96	--													
2. ΔStrength MVPA	22.84±40.79	-.145	--												
3. ΔTotal MVPA	33.32±71.52	.826 ++	.439 *	--											
4. Total duration	103.11±71.66 (0-248)	.479 *	-.215	.312	--										
5. Total sessions	5.93±4.01 (0-13)	.534 **	-.278	.327 ++	.925 ++	--									
6. Info duration	29.99±27.99 (0-103.60)	.222	-.188	.095 ++	.775 **	.782 **	--								
7. Info times	13.63±10.83 (0-41)	.398 *	-.295	.193 ++	.765 ++	.841 ++	.824 ++	--							
8. Behav duration	29.34±24.81 (0-81.34)	.226	-.156	.116 **	.848 **	.873 ++	.803 **	.819 ++	--						
9. Behav times	10.17±7.16 (0-25)	.458 *	-.141	.336 ++	.895 ++	.688 ++	.524 *	.789 ++	.874 ++	--					
10. New information	6.00±1.59 (2-7)	.135	-.251	-.008	-.103	-.243	-.282	.114	-.184	-.006	--				
11. Interesting	6.50±0.69 (5-7)	.417	-.366	.189	.130	-.047	-.080	.321	.066	.234	.724 ++	--			
12. Easy to understand	6.55±0.76 (4-7)	.116	-.137	.035	.242	.148	.145	.227	.333	.306	.010	-.106	--		
13. Credible	6.65±0.49 (6-7)	.532 *	-.543	.202 *	.462 *	.574 **	.394 **	.271	.370 *	.447 *	.271 *	.447 *	-.021	--	
14. Personally important	6.60±0.68 (5-7)	.414	-.030	.360 **	.565 **	.679 ++	.372	.377	.351	.570 **	.389	.383	.244	.506 *	--

Note. Δ , change in type of MVPA over 6 months in (minutes/week); MVPA, moderate-vigorous physical activity. Items 4-9 represent the six variables of implementation dose and content extracted from the Counseling Session Checklists. “Info” represents informational strategies and “Behav” represents behavioural strategies discussed during counseling sessions. Durations are in minutes. Ranges for implementation variables are indicated in brackets. Items 10-14 represent clients’ perceived quality of implementation (five items from the Client Reflection) and are scored out of 7.

* $p < .05$, ** $p < .01$, ++ $p < .001$.

Figure 1. The Knowledge-to-Action framework (Graham et al., 2006).

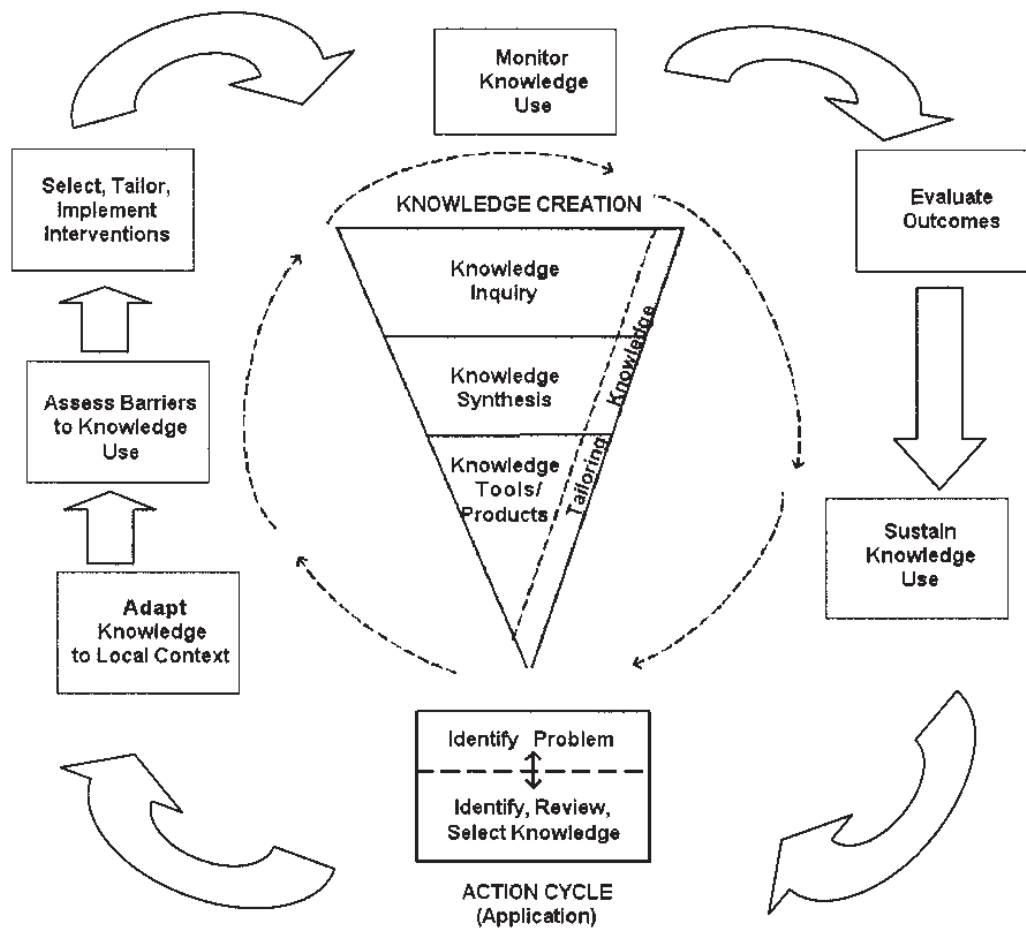
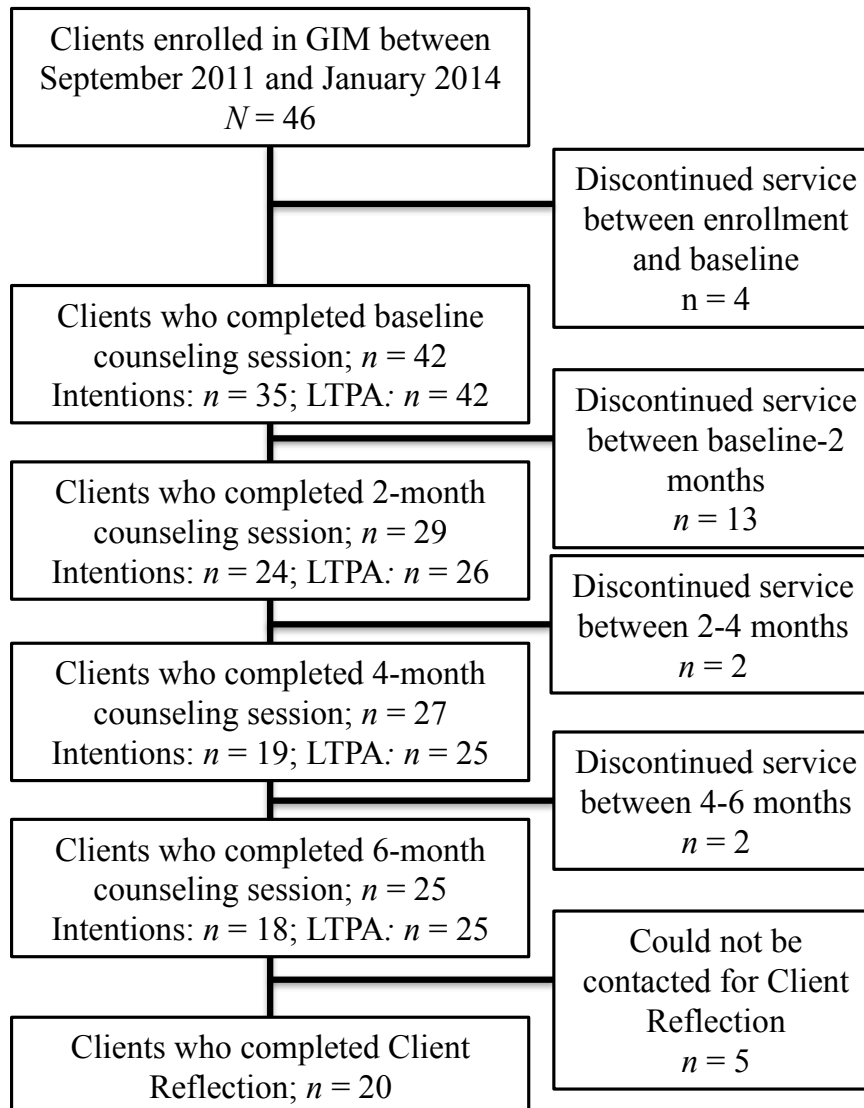


Figure taken from Graham et al. (2006). Lost in knowledge translation: Time for a map? *The Journal of Continuing Education in the Health Professions*, 26, 13-24. doi: 10.1002/chp.47. Reproduced with permission from John Wiley and Sons provided by the Copyright Clearance Center (April 23, 2014).

Figure 2. Client enrollment and participation in the *Get in Motion* service between September 2011 and January 2014, and amount of data available for the clients throughout the service.



Note. GIM, Get in Motion; LTPA, leisure-time physical activity.

CHAPTER 6:
GENERAL DISCUSSION

The general purpose of this dissertation was to test the utility of theories across the development, implementation, and evaluation of three real-world, nationwide knowledge translation (KT) interventions in the physical disability community. First, two educational interventions designed to target health care professionals (HCPs) who work with patients with physical disabilities were examined (Studies 1, 2.1 and 2.2). Second, an informational and behavioural intervention designed directly for end-users (i.e., adults with spinal cord injury (SCI)) was examined (Study 3). Together, these studies contribute valuable information to our understanding of how to use theory when developing, implementing, and evaluating behaviour change interventions targeting both HCPs and end-users in the physical disability community. Further, the studies contribute to our understanding of the relationships between the development, implementation, and evaluation phases of KT interventions. The theoretical and practical implications, future research directions, and additional limitations of this dissertation are discussed in this final chapter.

6.1 THEORETICAL IMPLICATIONS

The studies in this dissertation highlight implications for the use of theory for real-world interventions in both the health behaviour change and KT fields. First, if an intervention is to change more than knowledge, it should have a foundation in behaviour change theory so that it has the potential to alter theoretical determinants of behaviour. As demonstrated in Study 1, following the

completion of the “*ABCs of AD*” educational module, HCP trainees reported significant increases in their knowledge of the autonomic dysreflexia (AD) clinical practice guidelines (CPGs), but not in their Theory of Planned Behaviour (TPB; Ajzen, 1991) social cognitions (e.g., attitudes, subjective norm, perceived behavioural control (PBC), and intentions) towards the use of the AD-CPGs. These findings were not particularly surprising given that the “*ABCs of AD*” module was designed to present the best-available research evidence (e.g., AD-CPGs and a systematic review about AD management), but the module did not explicitly target theory-based determinants of behaviour (e.g., the TPB social cognitions). Translating research evidence is at the foundation of KT interventions and is important for enhancing knowledge and the use of knowledge; however, knowledge alone is insufficient for behaviour change in clinical practice (Davis, Thomson, Oxman, & Haynes, 1995; Ferris, von Gunten, & Emanuel, 2011). Hence, the incorporation of behaviour change theory into interventions may increase HCPs’ motivation for changing their clinical behaviours (Eccles et al., 2005; Grimshaw, Eccles, Walker, & Thomas, 2002).

The second theoretical implication is that it *IS* possible to incorporate behaviour change theory in real-world interventions *if* KT frameworks/principles guide theory application during an intervention’s development phase. As shown in Studies 2.1 and 3, two KT principles should be integrated during an intervention’s development phase to maximize theory application in a practical setting. The first principle is to use a KT framework to guide intervention

development (CIHR, 2012) so to augment the acceptability and feasibility of theory in practice. For example, Study 2.1 integrated characteristics from the Diffusion of Innovations (DOI; Rogers, 2003) framework into the *Changing Minds, Changing Lives* (CMCL) curriculum. Focusing on the DOI characteristics that facilitate adoption (e.g., minimal complexity, relative advantage over previous curriculum, compatibility with interventionists' needs, and easy to adapt and use) while selecting the intervention strategies that would target theory-based determinants of behaviour likely bolstered interventionists' intentions to use the new CMCL curriculum. Study 3 integrated the Knowledge-to-Action (KTA) framework (Graham et al., 2006) to guide the refinement of the *Get in Motion* (GIM) service in Canada. By addressing each of the stages in the KTA's action cycle during the service's re-development phase (Graham et al., 2006), Study 3 demonstrated that intervention strategies that have been shown to be efficacious at altering leisure-time physical activity (LTPA) intentions and behaviour in an experimental setting can be implemented under real-world conditions.

The second KT principle is to involve stakeholders (CIHR, 2012; Graham & Tetroe, 2007) when deciding which theory-based intervention strategies would be feasible to deliver, and effective to change end-users' behaviour, in a given setting for given population. Although the content and intervention strategies included in a real-world effectiveness intervention should be informed by research evidence (Flay, 1986), the local knowledge and practical experience of key stakeholders should also be considered when developing interventions (Glanz &

Bishop, 2010; Graham et al., 2006). Previous research has suggested that involving stakeholders in a participatory curriculum development process leads to increased acceptability and use of the intervention in the real world (Estabrooks, Bradshaw, Dzewaltowski, & Smith-Ray, 2008; Klesges et al., 2005; Wandersman & Florin, 2003).

As seen in Study 2.1, the inclusion of relevant stakeholders (i.e., interventionists, HCPs) in the CMCL participatory curriculum development process was instrumental for identifying intervention barriers and facilitators, and for proposing solutions to the identified barriers. Interventionists were instrumental for providing insight into strategies that could be used to facilitate the adoption of the curriculum (i.e., ensure the curriculum met the DOI characteristics). For instance, the interventionists suggested that Speaker's Notes accompany the set curriculum to provide interventionists with a resource to assist with the delivery of the curriculum's theory-based content. Similarly, HCPs involved in the participatory development process recommended practical intervention strategies that could be feasibly implemented for discussing LTPA in clinical practice. In particular, HCPs suggested that a series of simple "Yes/No" questions could initiate discussion about LTPA in a patient-provider interaction. This strategy was subsequently integrated into the curriculum by suggesting that interventionists model the behaviour during the seminar, as modeling has the potential to increase end-users' PBC for engaging in the behaviour (Michie, Johnston, Francis, Hardeman, & Eccles, 2008). The specific intervention

strategies included in the curriculum as a result of the participatory process likely facilitated increases in (a) interventionists' TPB cognitions for using the curriculum in practice, and (b) HCPs' TPB cognitions to discuss LTPA with patients. Overall, the integration of KT frameworks/principles with behaviour change theory during the intervention's development phase likely enhanced the delivery of theory during the implementation phase.

This dissertation also contributes to what is known about theory-use in real-world interventions by demonstrating that theory-based evaluations can be supplemented by examining implementation alongside theory to decipher the intervention's "key ingredients" that are related to, or that can predict changes in, theory-based determinants of behaviour. The implementation of a real-world intervention can vary over time and space (Durlak, 2010; Durlak & Dupre, 2008), and this dissertation demonstrates that the variability inherent to real-world interventions can be used to identify intervention components that are more likely to change theory-based constructs and/or behaviour. For instance, in Study 2.2, implementation variables were used to predict changes in HCPs' social cognitions for discussing LTPA with patients with physical disabilities. The number of presentations delivered by a presenter emerged as a negative predictor of HCPs' PBC; thus, presenter experience with the new theory-based curriculum is a "key ingredient" of implementation that influences CMCL's potential for enhancing HCPs' intentions for discussing LTPA. Study 2.2 represents one of the first studies to go beyond correlational and comparative research and actually use

implementation variables to predict intervention outcomes (Durlak & DuPre, 2008).

The “key ingredients” of implementation were also examined in Study 3, wherein the relationships between intervention dose, content, perceived quality and changes in GIM clients’ LTPA intentions and behaviour were explored. Findings from Study 3 revealed that the first two (of six) months of the service may be crucial for promoting LTPA behaviour change and minimizing intervention dropouts among people with SCI, and that providing both informational and behavioural intervention strategies are related to increases in clients’ aerobic LTPA participation during the service. Study 3 represents the first study to examine the relationships between intervention content, perceived quality and effectiveness of a real-world, evidence- and theory-based, telephone-delivered LTPA counseling service. As a whole, examining implementation alongside theory has deepened our understanding of the intervention components and strategies that are likely to change theory-based behavioural determinants in a real-world setting, and has identified features that can be targeted in future refinements of these interventions. The findings in this dissertation may prompt more researchers to consider the “key ingredients” of effectiveness when designing and implementing theory-based interventions under real-world conditions.

Finally, this dissertation advances both the health behaviour change and implementation science literatures by demonstrating that the TPB can be used to

predict HCPs' intentions to discuss LTPA with patients in a clinical setting.

Other studies have found that the TPB can be used to predict HCPs' intentions for a number of clinical behaviours (Eccles et al., 2012); however, Study 2.2 is the first study to demonstrate the utility of the TPB for discussing LTPA in a clinical context. This finding is a significant contribution to research on the promotion of LTPA in the physical disability community as HCPs have been identified as preferred and credible sources of LTPA information for this population (Faulkner et al., 2010; Letts et al., 2011). This finding also contributes to the promotion of LTPA among the general population as there has been a burgeoning interest in exercise as a form of medicine, and researchers have suggested that HCPs are important spokespeople for this message (Sallis, 2009). With regard to advancing implementation science literature, the identification of the TPB as being useful for predicting an additional clinical behaviour (i.e., discussing LTPA with patients) supports previous suggestions that the TPB is an ideal theory for KT efforts among HCPs (Eccles et al., 2005; Eccles et al., 2012; Godin et al., 2008) and expands the field's understanding of how to target changes in HCPs' clinical behaviour (Grimshaw et al., 2002).

6.2 PRACTICAL IMPLICATIONS

Based on the above theoretical contributions, this dissertation provides a number of practical implications for the development and refinement of real-world behaviour change interventions. First, explicitly using theory throughout

the research process may bolster the intervention's influence on increases in social cognitive determinants of behaviour and the target behaviour itself. As evidenced in Studies 2.1, 2.2 and 3, overtly targeting theory-based constructs in the interventions' development phase made it possible to make a priori hypotheses based on theory. By explicitly testing theory in this way, it was possible to observe changes in both theory-based determinants of behaviour (Study 2.2) and behaviour itself (Study 3) among intervention end-users. When selecting behaviour change strategies, intervention developers should draw on KT literature to ensure that the strategies included in the intervention target specific constructs in the specified theory (e.g., Michie et al., 2008). For instance, future versions of the "*ABCs of AD*" module would likely benefit from engaging end-users through the inclusion of medical roundtables or case study discussions (Grol & Grimshaw, 2003). Michie and colleagues (2008) suggest that these intervention strategies map onto theory-based construct domains equivalent to the cognitions of attitudes, subjective norms, and PBC; hence, including these strategies may target the determinants of behaviour specified by the TPB. Notwithstanding, as noted above, the practicality of using specific evidence-based strategies in a given context is also an important consideration.

Second, KT frameworks can serve as a guide for developing and refining LTPA-enhancing interventions in an applied setting, and should be incorporated along with theory to increase the acceptability and feasibility of a given intervention in its real-world context. Glanz and Bishop (2010) have suggested

that planning and evaluation frameworks can be used in the development of health behaviour change interventions in practice. This dissertation specifically shows that the DOI and KTA frameworks can bolster the implementation of real-world interventions in the physical disability community. Using the DOI framework (Rogers, 2003) as a guide for intervention development in Study 2.1 improved the uptake of the CMCL curriculum by interventionists and augmented intervention outcomes among end-users. The KTA framework (Graham et al., 2006) was valuable for guiding both the translation of previous efficacy studies into real-world intervention (first phase of GIM; Arbour-Nicitopoulos, Tomasone, Latimer-Cheung, & Martin Ginis, 2014) and the refinement of the intervention (second phase of GIM, Study 3). The application of KT frameworks may accelerate the translation of theory-based interventions into real-world practice and should be used by intervention developers.

Third, the inclusion of stakeholders throughout the phases of the research process ensures the feasibility of intervention implementation and evaluation strategies in practice. To illustrate this point, the CMCL Presenter Checklist was developed by both experienced interventionists and researchers, and served not only as a roadmap for intervention delivery among interventionists but also as a practical data collection tool for the implementation of CMCL seminars (Studies 2.1 and 2.2). As another example, the GIM counselor contributed to the development of the implementation monitoring tool for Study 3 (Counseling Session Checklists) so as to increase its feasibility in practice. During the

intervention development phase, the counselor pilot tested the tool to ensure its seamless integration into GIM once the second phase of service started. Throughout the implementation phase, the counselor used this tool to record implementation data so to keep track of clients' progress in the service, and also so that the relationship between implementation and effectiveness could be examined during the evaluation phase. The counselor's involvement was also important throughout data analysis and interpretation as his experience with the GIM clients and the day-to-day nuances of the service provided context to the statistical findings. Together, Studies 2.1, 2.2, and 3 emphasize the value of practicing integrated KT throughout the three phases of real-world research to enhance the acceptability, feasibility, and success of the intervention in its practical setting (CIHR, 2012; Graham & Tetroe, 2007). Indeed, this dissertation provides a template for developing, implementing, and evaluating community-partnered research about real-world, nationwide behaviour change interventions in the physical disability community.

A final practical implication of this dissertation is that the implementation of real-world interventions should be monitored in order to decipher the intervention components that are most likely to lead to effectiveness. Doing so would permit a better understanding of how to generalize and replicate implementation interventions, and provide research-based recommendations for developing more potent and cost-effective behaviour change interventions. The findings regarding the “key ingredients” of Study 2.2 are currently being applied

by the Canadian Paralympic Committee as they expand and refine the CMCL program to additional end-user groups (e.g., teachers, parents, and disability service organizations). The correlates of change identified in Study 3 are being applied by SCI Action Canada as the GIM service enters its next action cycle and expands its reach to clients across Canada with physical disabilities other than SCI.

As illustrated, the studies in this dissertation infer a number of practical implications that can be adopted by other researchers and KT practitioners in the development, implementation and evaluation of real-world, nationwide, behaviour change initiatives. In summary, these practical implications provide a set of best-practices for KT interventions for both the physical disability and general populations.

6.3 FUTURE DIRECTIONS

In recent years, there has been a call for LTPA behavioural scientists to move interventions from research to real-world settings in order to maximize their reach and impact (Owen, Glanz, Sallis, & Kelder, 2006); however, translating interventions into practice does not frequently occur because the real-world is hard to control and many variables can influence intervention outcomes. This dissertation bridges the experimental-to-real-world intervention gap by demonstrating that LTPA behaviour change and KT frameworks/principles are complementary and can be integrated alongside each other to translate and

disseminate LTPA evidence to a wide range of audiences. While the findings from the four studies provide a set of best-practices for both LTPA behaviour change and implementation scientists to conduct similar investigations of national KT interventions, additional research would expand our understanding of bridging theory and real-world practice.

First, researchers should continue to investigate the relationship between the implementation and effectiveness of an intervention. The studies in this dissertation that examined this relationship captured 10 and seven implementation variables (Study 2.2 and 3, respectively) that could be related to intervention effectiveness. Durlak and DuPre (2008) suggest there are at least 23 potential implementation factors that could influence intervention outcomes. While the dissertation studies contribute to our understanding of the implementation-effectiveness relationship in LTPA-promoting interventions, future studies should consider the impact of additional variables, both among and beyond those suggested by Durlak and DuPre (2008). This work will require development and testing of appropriate implementation monitoring tools. The Checklists (e.g., Presenter Checklists and Counseling Session Checklists in Study 2.2 and 3, respectively) used in this dissertation can serve as a template for the development of additional measures of implementation, but the Checklists may not be feasible for all contexts and populations. The further development of implementation monitoring tools provides impetus for future work to continue to integrate stakeholders throughout the research process. Additionally, future research

should identify and test potential mechanisms (e.g., mediators) of effectiveness (changes in theory-based determinants of behaviour or behaviour itself) to explore whether effectiveness operates through specific implementation variables. By rigorously monitoring the implementation of theory-based interventions and testing their potential mechanisms of change in real-world practical settings, theory and practice are more likely to converge within interventions.

Second, the utility of the TPB for predicting HCPs' behaviour, and not just intentions, for discussing LTPA should be explored. Although HCPs' intentions have been suggested to be a reasonable proxy for HCP behaviour (Eccles et al., 2006), the gap between intentions and behaviour likely remains (Conner & Sparks, 2005). To facilitate this work, explicit use of the TPB should be incorporated during the intervention development phase, and KT frameworks should be used as a guide for intervention design. For example, the KTA framework (Graham et al., 2006) suggests that barriers and facilitators to discussing LTPA should be examined in the specific context (i.e., clinical practice). The inclusion of appropriate intervention strategies selected to lessen the impact of barriers and take advantage of facilitators may help to close the intention-behaviour gap. Further, the TPB can predict behaviour change at an individual-level, but cannot account for the additional levels of influence on clinical behaviour (e.g., patient, organizational, and policy; Cabana et al., 1999; Davis & Taylor-Vaisey, 1997; Gaddis, Greenwald, & Huckson, 2007). Therefore, further integration of theories and principles between the behaviour change and KT fields may provide a deeper

understanding of theory-use for LTPA-enhancing interventions in the clinical context.

6.4 LIMITATIONS

This dissertation has examined the utility of one behavioural theory (the TPB; Studies 1, 2.1, and 2.2) in two KT interventions and one behavioural model (the Health Action Process Approach; Study 3) in one KT intervention in the physical disability community in Canada. It has also examined how incorporating two KT frameworks (the DOI and KTA frameworks; Studies 2.1 and 3, respectively) during the intervention development stage may have bolstered subsequent implementation and evaluation of the interventions. While the theories and frameworks selected have extended our understanding of how to include both organizing schema in real-world interventions, it should be noted that there are a number of other behavioural theories and KT/implementation science frameworks that could have been examined. Although the approach used in this dissertation has provided insight into a set of best-practices for intervention development, implementation, and evaluation, the individual studies have additional limitations, beyond those mentioned in the manuscripts, that should be acknowledged.

The “*ABCs of AD*” module in Study 1 was designed to target emergency health care professionals, rather than trainees who were the participants in the study. Compared to professionals, trainees may have a different perspective with

respect to adopting and implementing a specific CPG when they are several years from professional practice and unfamiliar with CPGs in general. This perspective may be reflected in the strength of their social cognitive determinants for using the AD-CPGs; thus, it is unclear whether professionals would also report a lack of significant changes in TPB social cognitions following completion of the module. A second limitation of Study 1 is that a theory-based evaluation was administered without knowing which social cognitive determinants of behaviour may be impacted by exposure to the module. While changes in trainees' attitudes, subjective norms, PBC, and intentions were not observed, it is possible that changes in other social cognitions from other behavioural theories may have been impacted and observed if another theory was used in the evaluation stage.

In Study 2.2, the ability to identify the “key ingredients” of implementation was limited due to the small sample size ($n = 97$ HCPs), precluding the use of more sophisticated statistical techniques like hierarchical linear modeling. While the regression technique used in the study identified presenter experience as a “key ingredient” of CMCL effectiveness, hierarchical linear modeling would have teased apart the effect of nested variables that could be influencing changes in HCPs' social cognitions. For example, presenter experience may be related to whether or not an audiovisual component was added above the set curriculum, as a given presenter may always include additional pictures and/or a video. The analysis used in Study 2.2 does not consider the nested structure of the CMCL data (social cognitions at four time points nested

within individual HCPs nested within presentations) and thus cannot delineate the individual impact of the implementation variables on intervention outcomes. A second limitation to Study 2.2 is that presenters' fidelity to the CMCL curriculum could not be reliably assessed. Due to the logistics of a nationwide intervention evaluation, it was not possible to audio or video record every CMCL session during the study period. However, in an attempt to assess whether the curriculum was delivered as intended, presenters were asked to send in a hardcopy of the curriculum slides that they used for each presentation. While this allowed us to have a general sense of whether the full curriculum was used, it does not give an indication of whether the specific content was delivered with adequate detail. Understanding intervention fidelity is important to interpreting effectiveness and should be measured in future real-world intervention evaluations.

Due to the relatively small number of clients who enrolled in the second phase of the GIM service, the analysis in Study 3 is also limited by sample size. Also, the number of clients who discontinued the service led to missing data between baseline and 6 months, further reducing statistical power. Along with the high multicollinearity between implementation variables, it was challenging to distinguish the “key ingredients” of the service's implementation.

6.5 CONCLUSION

This dissertation has expanded our understanding of the use of theory across the development, implementation, and evaluation of real-world behaviour

change interventions in the physical disability community. The importance of integrating behaviour change theory and KT frameworks/principles within the research process was explored, and proved to be beneficial in the understanding the relationship between intervention implementation and effectiveness. It is anticipated that these findings will be an important catalyst for using theory throughout the development, implementation, and evaluation of LTPA-enhancing KT interventions, as well as for moving behaviour change interventions from research to real-world practice, among both the physical disability and general populations.

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CHAPTER 7:
CHALLENGES AND LESSONS LEARNED

The aim of this final chapter is to reflect on some of the unique challenges that I faced while conducting real-world research for this dissertation. By highlighting three challenges and sharing the practical lessons that I learned, I aim to demonstrate how my observations “behind the scenes” (i.e., those that are not reported within the study manuscripts) will guide me as I move forward with a research program embedded in a real-world context.

The first challenge I faced was working with stakeholders who may not have knowledge about or experience with conducting rigorous theory- and evidence-based research. However, by working first hand with stakeholders, I recognized that their experiential and contextual knowledge was invaluable for establishing intervention feasibility. The stakeholders’ practical knowledge complemented my research knowledge and benefitted the intervention and the research overall. I also learned that patience is a virtue. The rate at which I wanted the work to be done did not always align with the stakeholders’ needs or timelines. I had to learn to be flexible and accept small steps towards progress. In the end, these small steps added up. Establishing a common language was also an important lesson. Once the stakeholders and I understood each other’s languages, our progress was facilitated because we realized that we were working towards the same goal of intervention success.

The second challenge I faced was feeling as though I had minimal control over implementation and data collection, something that is challenging for a researcher trained to maintain rigor and control in her work. Once I accepted that

real-world studies are not like controlled experimental studies, I realized it was this variability that made my research interesting and different. That led me to develop monitoring tools like the checklists used in Studies 2 and 3 so that I could capture and make sense of the variability. I learned that clarity and ongoing communication between the research team and stakeholders can go a long way to ensure that everyone involved is on the same page in terms of research expectations and protocols. Through this communication, I also realized that the stakeholders were interested in the research for different but complementary reasons from the research team. Once I understood the stakeholders' motivation for engaging in the research, I was able to help motivate them to maintain their commitment to implementation and data collection.

I also faced a challenge in Studies 2 and 3 whereby I was engaging in KT practice and KT science at the same time. For example, in Study 2, I was a stakeholder in the participatory curriculum development process, the goal of which was to enhance KT practice (i.e., increase the use of research knowledge in a practice). However, at the same time, I was observing and critically appraising how the process might impact subsequent adoption and acceptance of the curriculum. I was a participant in my own research, and I did not just sit back and observe outcomes and analyze data. I learned how important it is to embed research within the existing structure of KT practice so that research does not interfere with the intent or spirit of the intervention. I also learned the value of

bringing KT practice into the development of future solutions-based research questions, and how understanding practice can give context to research results.

Overall, these lessons will inform my approach to real-world research and serve as a guide as I continue my career as a researcher.

APPENDIX A: STUDY 1 MATERIALS

- A.1 Demographic Questionnaire
- A.2 Autonomic Dysreflexia Knowledge Test
- A.3 Theory of Planned Behaviour Questionnaire
- A.4 Module Feedback Survey

Appendix A.1:
Demographic Questionnaire

1. Please enter your age: _____ years
2. Sex (please select):
 - A. Male
 - B. Female
 - C. Not specified
3. Which of the following describes your ethnicity? (please select)
 - A. White
 - B. Native Canadian
 - C. Black
 - D. Asian
 - E. Other: _____
4. What program of study are you in? (please select):
 - A. Primary Care Paramedic
 - B. Advanced Care Paramedic
 - C. Practical Nursing
 - D. BSc Nursing
5. What year of your program are you in? (please select)
 - A. 1 (first year)
 - B. 2 (second year)
 - C. 3 (third year)
 - D. 4 (fourth year)
6. Have you ever had experience with a patient with spinal cord injury? (YES/NO)
7. How would you rate your knowledge of Autonomic Dysreflexia? (please select one)
 - A. Excellent
 - B. Good
 - C. Fair
 - D. Poor
 - E. None

Appendix A.2

Autonomic Dysreflexia Knowledge Test

1. What is Autonomic Dysreflexia (AD)? (Check one)
 - ☐ A group of spontaneous stereotypical reflexes mediated by the nervous system in individuals with central nervous system injury
 - ☐ A sudden rise in blood pressure and associated symptoms from noxious or non-noxious stimuli that trigger sympathetic hyperactivity of the spinal cord
 - ☐ A failure of the autonomic system (e.g. postural hypotension)
 - ☐ Age-related hypertension

2. The typical resting systolic blood pressure (BP) for a person with a chronic tetraplegia will be: (Check one)
 - ☐ 120 mmHg
 - ☐ 130 mmHg
 - ☐ 115 mmHg
 - ☐ 90 mmHg

3. In a person with spinal cord injury (SCI), the lowest spinal cord segment associated with the occurrence of AD is: (Check one)
 - ☐ C6
 - ☐ T6
 - ☐ T12
 - ☐ T1

4. A 20 year-old male with C6 complete tetraplegia complains of a pounding headache and nasal congestion shortly after being put to bed. His home care nurse is concerned and brings him into the ER with: temperature 37 °C, pulse 60 bpm, BP 190/100 mmHg. He has no prior history of hypertension.

Your initial steps/recommendations are to: (Check one)

- ☐ Prescribe hydrochlorothiazide 25 mg, po daily to start in the morning
- ☐ Prescribe acetaminophen for the headache and increase vital sign monitoring to every 4 hours
- ☐ Order electrolytes, electrocardiogram, and renal scan to evaluate hypertension and monitor the blood pressure frequently to determine if further therapy is indicated
- ☐ Sit him up in bed, loosen any tight clothing or restrictive equipment, and empty his bladder
- ☐ Prescribe no therapy since BP commonly varies in tetraplegics
- ☐ None of the above

5. To your knowledge, which of the following signs or symptoms would an individual with a SCI experience during an episode of AD? (Check all that apply)
- ☐ Sudden decrease in blood pressure
 - ☐ Sudden increase in blood pressure
 - ☐ Sudden low heart rate
 - ☐ Headache
 - ☐ Flushed Skin below the lesion
 - ☐ Flushed Skin above the lesion
6. Indicate the two most common causes of AD? (Use numbers 1 and 2; 1 = most common)
- _____ Skin (Pressure sores and Ingrown toenails)
 - _____ Menses
 - _____ Gastrointestinal (Constipation, Hemorrhoids)
 - _____ Uterus Contractions during Labour
 - _____ Blood Clots (Legs or Lungs)
 - _____ Bladder (Distention, Infection, Tests)
 - _____ Broken bones or fractures
 - _____ Kidney Stones
7. Is medication indicated to lower your patient's BP as part of managing their AD? (YES/NO)
8. If yes to above, what would this medication be? (Check the most appropriate medications)
- ☐ Captopril
 - ☐ Nifedipine (Adalat, Procardia)
 - ☐ Nitroglycerine
 - ☐ Ramipril (Altace)
 - ☐ Atenolol (Tenormin)
 - ☐ Hydrochlorothiazide (Hydrodiuril)
9. In a person with a SCI, that has experienced a severe untreated episode of AD, which of the following complications could occur? (Check all that apply)
- ☐ Seizure
 - ☐ Intracranial hemorrhage
 - ☐ Angina
 - ☐ Myocardial infarction
 - ☐ Renal failure
 - ☐ Death

10. Following implementation of the AD management protocol, you should:

(Check one)

- ☐ Discharge the patient home once systolic BP reaches 150 mmHg or lower
- ☐ Monitor BP and patient q 30 minutes for 24 hours
- ☐ Monitor BP and heart rate for at least 2 hours after BP normalizes to the expected BP for that individual's injury level
- ☐ None of the above

11. Once you identify and treat/remove the trigger for AD, you may expect the following: (Check one)

- ☐ The patient becomes hypotensive
- ☐ The patient may lose consciousness
- ☐ The patient complains of dizziness and lightheadedness
- ☐ All of the above
- ☐ None of the above

Appendix A.3 Theory of Planned Behaviour Questionnaire

Please answer the questions below using the scales provided. Please indicate your response for EVERY question by checking the appropriate number.

1. I think that following the Autonomic Dysreflexia clinical practice guidelines would be:

<i>extremely</i>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<i>extremely</i>
<i>unsatisfying</i>	1	2	3	4	5	6	7	<i>satisfying</i>

<i>extremely</i>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<i>extremely</i>
<i>inappropriate</i>	1	2	3	4	5	6	7	<i>appropriate</i>

<i>extremely</i>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<i>extremely</i>
<i>unhelpful</i>	1	2	3	4	5	6	7	<i>helpful</i>

<i>extremely</i>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<i>extremely</i>
<i>irresponsible</i>	1	2	3	4	5	6	7	<i>responsible</i>

<i>extremely</i>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<i>extremely</i>
<i>bad</i>	1	2	3	4	5	6	7	<i>good</i>

2. Using the Autonomic Dysreflexia clinical practice guidelines would help me treat patients with spinal cord injury.

<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
1	2	3	4	5	6	7
<i>Strongly</i>			<i>Neither</i>			<i>Strongly</i>
<i>disagree</i>			<i>agree nor</i>			<i>agree</i>
			<i>disagree</i>			

3. I am confident that I can follow the Autonomic Dysreflexia clinical practice guidelines when treating patients with spinal cord injury.

<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
1	2	3	4	5	6	7
<i>Strongly</i>			<i>Neither</i>			<i>Strongly</i>
<i>disagree</i>			<i>agree nor</i>			<i>agree</i>
			<i>disagree</i>			

4. The decision to use the Autonomic Dysreflexia clinical practice guidelines is in my personal control.

<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
1	2	3	4	5	6	7
<i>Strongly</i>			<i>Neither</i>			<i>Strongly</i>
<i>disagree</i>			<i>agree nor</i>			<i>agree</i>
			<i>disagree</i>			

5. Whether I follow the Autonomic Dysreflexia clinical practice guidelines is entirely up to me.

<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
1	2	3	4	5	6	7
<i>Strongly disagree</i>			<i>Neither agree nor disagree</i>			<i>Strongly agree</i>

6. Other health care professionals want me to follow the Autonomic Dysreflexia clinical practice guidelines.

<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
1	2	3	4	5	6	7
<i>Strongly disagree</i>			<i>Neither agree nor disagree</i>			<i>Strongly agree</i>

7. Patients with spinal cord injury want me to follow the Autonomic Dysreflexia clinical practice guidelines.

<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
1	2	3	4	5	6	7
<i>Strongly disagree</i>			<i>Neither agree nor disagree</i>			<i>Strongly agree</i>

8. The people I work with want me to follow the Autonomic Dysreflexia clinical practice guidelines.

<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
1	2	3	4	5	6	7
<i>Strongly disagree</i>			<i>Neither agree nor disagree</i>			<i>Strongly agree</i>

9. I intend to follow the Autonomic Dysreflexia clinical practice guidelines when treating patients with spinal cord injury.

<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
1	2	3	4	5	6	7
<i>Strongly disagree</i>			<i>Neither agree nor disagree</i>			<i>Strongly agree</i>

10. I will try to use the Autonomic Dysreflexia clinical practice guidelines when treating patients with spinal cord injury.

<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
1	2	3	4	5	6	7
<i>Strongly disagree</i>			<i>Neither agree nor disagree</i>			<i>Strongly agree</i>

Appendix A.4 Module Feedback Survey

1. How many minutes did you spend completing the "ABCs of AD" online module?
_____ minutes

2. What components of the module did you complete? (Check all that apply)

- ☐ Introduction
- ☐ Getting Started
- ☐ Module 1 – Defining AD
- ☐ Module 2 – Diagnosis
- ☐ Module 3 – Signs & Symptoms
- ☐ Module 4 – Management

3. I learned a lot of new information in the module.

O	O	O	O	O	O	O
1	2	3	4	5	6	7
Strongly disagree						Strongly agree

4. The information in the module was interesting.

O	O	O	O	O	O	O
1	2	3	4	5	6	7
Strongly disagree						Strongly agree

5. The information in the module was easy to understand.

O	O	O	O	O	O	O
1	2	3	4	5	6	7
Strongly disagree						Strongly agree

6. The information in the module was credible.

O	O	O	O	O	O	O
1	2	3	4	5	6	7
Strongly disagree						Strongly agree

7. The module was personally important to me.

<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
1	2	3	4	5	6	7
Strongly disagree						Strongly agree

8. I would recommend this module to a colleague.

<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
1	2	3	4	5	6	7
Strongly disagree						Strongly agree

APPENDIX B: STUDY 2 MATERIALS

- B.1 Demographic Questionnaire for Interventionists
- B.2 Theory of Planned Behaviour Questionnaire for Interventionists
- B.3 Diffusion of Innovations Measure
- B.4 Presenter Checklist
- B.5 Presentation Feedback Questionnaire
- B.6 Demographic Questionnaire for Health Care Professionals
- B.7 Theory of Planned Behavior Questionnaire for Health Care Professionals

Appendix B.1
Demographic Questionnaire for Interventionists

DEMOGRAPHIC INFORMATION

1. Sex (please circle): Male Female Not specified
2. Date of Birth: ____ / ____ / ____ (yyyy/mm/dd)
3. Which of the following describes your ethnicity? (please circle)
 White Native Canadian Black Asian Other: _____
4. On average, how many days per week do you engage in leisure time physical activity (that is, activity that you choose to do during your free time)?
 ____ days per week.
5. Are you currently involved in parasport in any capacity? (please circle)
 a) Yes Please specify: _____
 b) No
6. How long have you been a CMCL interventionist? ____ years and ____ months

PROFESSIONAL INFORMATION

1. What is your profession? (please circle)
 - a) Physician/Physiatrist (MD)
 - b) Nurse
 - c) Physiotherapist
 - d) Recreation therapist
 - e) Occupational therapist
 - f) Kinesiologist
 - g) Researcher
 - h) Trainee Please specify for what profession: _____
 - i) Other Please specify: _____
2. How long have you been practicing in your profession?
 ____ years and ____ months
3. How often do you work with individuals with a physical disability? (please circle)
 - a) Never
 - b) Rarely
 - c) Sometimes
 - d) Frequently
 - e) All the time

Appendix B.2

Theory of Planned Behaviour Questionnaire for Interventionists

These questions ask you about using the new CMCL curriculum at your next CMCL presentation. “New CMCL curriculum” refers to the new PowerPoint presentation (released for use in November 2011) and all of the information, strategies, and resources contained in it, as is. That is, we want to know your opinion of the curriculum in its entirety. “Your next CMCL presentation” refers to the next CMCL session that is scheduled in your province for which you are responsible for coordinating and/or presenting. Indicate your answer by checking/colouring in the circle that best represents your response.

1. If you were really motivated and had all the resources that you needed, how confident are you in your ability to **tell health care professionals** about CMCL information, strategies, and resources at your next CMCL presentation?

<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
1	2	3	4	5	6	7
Not at all confident						Completely confident
2. If you were really motivated and had all the resources that you needed, how confident are you in your ability to **persuade health care professionals** to use CMCL information, strategies, and resources at your next CMCL presentation?

<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
1	2	3	4	5	6	7
Not at all confident						Completely confident
3. If you were really motivated and had all the resources that you needed, how confident are you in your ability to **teach other CMCL presenters** about CMCL information, strategies, and resources for their next CMCL presentation? (for Provincial Coordinators only)

<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
1	2	3	4	5	6	7
Not at all confident						Completely confident
4. If you were really motivated and had all the resources that you needed, how confident are you in your ability to **persuade other CMCL presenters** to use

CMCL information, strategies, and resources for their next CMCL presentation? (completed by Provincial Coordinators only)

<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
1	2	3	4	5	6	7
Not at all confident					Completely confident	

5. The new CMCL curriculum will help me implement CMCL information, strategies, and resources at my next CMCL presentation.

<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
1	2	3	4	5	6	7
Strongly disagree					Strongly agree	

6. At my next CMCL presentation, the new CMCL curriculum would be _____ to use.

<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
1	2	3	4	5	6	7
Harmful					Beneficial	

<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
1	2	3	4	5	6	7
Worthless					Valuable	

<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
1	2	3	4	5	6	7
Difficult					Easy	

<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
1	2	3	4	5	6	7
Unpleasant					Pleasant	

<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
1	2	3	4	5	6	7
Unenjoyable					Enjoyable	

7. What percentage of the new CMCL curriculum do you intend to use at your next CMCL presentation? _____%

8. The Canadian Paralympic Committee wants me to use the new CMCL curriculum in its entirety at my next CMCL presentation.

<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
1	2	3	4	5	6	7
Strongly disagree						Strongly Agree

9. Provincial Coordinators want me to use the new CMCL curriculum in its entirety at my next CMCL presentation.

<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
1	2	3	4	5	6	7
Strongly Agree						Strongly Disagree

Appendix B.3

Diffusion of Innovations Measure

Please answer the following questions about the new CMCL curriculum. “New CMCL curriculum” refers to the new PowerPoint presentation (released for use in November 2011) and all of the information, strategies, and resources contained in it, as is. That is, we want to know your opinion of the curriculum in its entirety.

1. Have you been a CMCL presenter in the past? If **yes**, please answer the following question. If **no**, please continue to question 2.
The new CMCL presentation is more effective than the old presentation in increasing health care professionals’ knowledge and confidence to discuss and prescribe physical activity and paraspport to their patients/clients with a disability.

O	O	O	O	O	O	O
1	2	3	4	5	6	7
Strongly Disagree						Strongly Agree

2. The new CMCL presentation is compatible with my values and norms.

O	O	O	O	O	O	O
1	2	3	4	5	6	7
Strongly Disagree						Strongly Agree

3. The new CMCL presentation and resources meet my needs as an interventionist.

O	O	O	O	O	O	O
1	2	3	4	5	6	7
Strongly Disagree						Strongly Agree

4. The new CMCL presentation is clear and easy to understand.

O	O	O	O	O	O	O
1	2	3	4	5	6	7
Strongly Disagree						Strongly Agree

5. The new CMCL presentation is easy to use.

O	O	O	O	O	O	O
---	---	---	---	---	---	---

1	2	3	4	5	6	7
Strongly						Strongly
Disagree						Agree

6. The new CMCL presentation does what we want it to – that is, increase health care professionals' knowledge, attitudes, and behaviour for prescribing physical activity and parasport to their patients/clients with a disability.

O	O	O	O	O	O	O
1	2	3	4	5	6	7
Strongly						Strongly
Disagree						Agree

7. The new CMCL presentation can be easily adapted or modified to suit your own needs as a presenter.

O	O	O	O	O	O	O
1	2	3	4	5	6	7
Strongly						Strongly
Disagree						Agree

Appendix B.4

Presenter Checklist

Please complete the following Presenter Checklist as you plan, organize and lead a *Changing Minds, Changing Lives* workshop. These checklists are important to the Canadian Paralympic Committee for the ongoing quality assessment of the *Changing Minds, Changing Lives* program.

PRE-EVENT: Allow yourself approximately 2-3 months to organize the presentation.

- ☐ Evaluate how many participants can attend the workshop by talking with your peers to see if enough interest is generated to attend. A minimum of 10 participants for the workshop is recommended.
- ☐ Prepare and promote workshop using posters, email, flyers, and send a copy of notice to CPC for further promotion of event.
- ☐ Press release is encouraged to invite media to write about benefits of Parasport participation and increase awareness. Media should also be invited to visit the program, wherever possible.
- ☐ Book facility and notify CPC if you need a copy of the 3rd Party Liability Insurance Form.
- ☐ Book and confirm AV equipment and LCD projector.
- ☐ Book an athlete for interactive Paralympic sport equipment show & tell.
- ☐ Ensure that you have Paralympic sport equipment for the show & tell.
- ☐ Workshop material order form (Fax to CPC).
- ☐ Modify PowerPoint presentation to fit your mandate, time limit, and suit your audience.
- ☐ Rehearse PowerPoint presentation using the Speakers Notes.
- ☐ Print Session Registration Sheet with full contact information (name, title, organization, mailing address, telephone number and email address). Be sure you have enough boxes for the number of participants you are expecting.
- ☐ Print and staple double-sided copies of the “Participant Evaluation Package” for participants. Be sure you have enough copies for the number of participants you are expecting. Please bring 5 extra copies of each in case extra people show up.
- ☐ Confirm attendance of participants and email reminder of workshop 3 days prior.
- ☐ Follow up 2 days prior to event to confirm all logistics.
- ☐ Approximate amount of time spent preparing for the event.
_____ hours and _____ minutes

WORKSHOP

- ☐ Date: ____ / ____ / ____ (yyyy/mm/dd)
- ☐ Location: _____ City: _____
- ☐ Province: _____
- ☐ Main contact name and his/her position: _____
- ☐ Main contact number/email: _____
- ☐ Supply educational resources for the participants at the table when they arrive.
- ☐ Ensure all participants receive a “Participant Evaluation Package” and ask them to read the Information Letter and fill out the Pre-Presentation Questionnaire while they wait for presentation to start.
- ☐ Start time of presentation/workshop: _____ AM/PM
- ☐ Welcome everyone and pass around Session Registration Sheet.
- ☐ Explain goal and benefits of the workshop.
- ☐ Deliver power point presentation.
- ☐ Introduce athlete and do a demo of the sport he or she is involved in – be it sledge hockey, boccia balls, wheelchair sports, etc.
- ☐ Ensure athlete mentions how sport has impacted/contributed to other areas of life.
- ☐ Mention sport opportunities available for persons with a disability in your community.
- ☐ Answer questions from audience.
- ☐ End time of presentation/workshop: _____ AM/PM
- ☐ Remind participants to complete Post-Presentation Questionnaires and Presentation Feedback in their Evaluation Package at end of workshop to evaluate presenter and workshop. Ask participants to hand-in their Evaluation Package before they leave even if they did not complete the package.
- ☐ Remind participants that even if they are not participating in the CMCL Quality Assessment Study, CPC would appreciate if they filled out the last two pages of the package (Presentation Evaluation).
- ☐ Ensure participants have “take aways”/educational resources.
- ☐ Clean up facility.

POST-EVENT: Before you leave workshop/presentation site, please complete the following:

- ☐ Approximate number of attendees invited: _____
- ☐ Approximate number of attendees present: _____
- ☐ Profession of attendees present: _____
- ☐ Duration of workshop/presentation (based on start and end times above): _____ minutes
- ☐ Did you have an athlete presentation?
 - If yes, athlete's full name: _____
 - Sport: _____
 - Level of sport participation: ☐ High Performance
☐ Development
☐ Grass Roots
- ☐ Did you have equipment to show & tell?
- ☐ Did you partner with another organization for this presentation?
(i.e., you partnered with a sport organization to do a sport demonstration after the CMCL presentation)
 - If yes, organization's name: _____
 - Organization's role: _____
- ☐ Any other presentation component that you added?

- ☐ What resources did you distribute?

POST-EVENT: Within 3 days of the presentation/workshop, please complete the following:

- ☐ Approximate amount of time spent doing administrative duties after event: _____ hours and _____ minutes
- ☐ Mail the following items to the CPC at the address below:
 - **Session Registration**
 - **Completed Participant Evaluation Packages**
 - **Completed Presenter Checklist (i.e., this document)**
 - **A hardcopy of the slides you used for the presentation**

Changing Minds, Changing Lives
Canadian Paralympic Committee National Office
225 Metcalfe Street, Suite 310
Ottawa, ON, K2P 1P9

Appendix B.5
Presentation Feedback Questionnaire

The information gathered in these last two pages is important for the Canadian Paralympic Committee to hear your feedback about today's presentation. Please return these pages to the presenter once you have finished.

9. I learned a lot of new information at this presentation.

<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
1	2	3	4	5	6	7
Strongly disagree						Strongly agree

10. The information in the presentation was interesting.

<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
1	2	3	4	5	6	7
Strongly disagree						Strongly agree

11. The information in the presentation was easy to understand.

<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
1	2	3	4	5	6	7
Strongly disagree						Strongly agree

12. The information in the presentation was credible.

<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
1	2	3	4	5	6	7
Strongly disagree						Strongly agree

13. The presentation was personally important to me.

<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
1	2	3	4	5	6	7
Strongly disagree						Strongly agree

14. I would recommend this presentation to a colleague.

<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
1	2	3	4	5	6	7
Strongly disagree						Strongly agree

Appendix B.6
Demographic Questionnaire for Health Care Professionals

DEMOGRAPHIC INFORMATION

1. Sex (please circle): Male Female Not specified
2. What is your age? _____ years
3. Which of the following describes your ethnicity? (please circle)
White Native Canadian Black Asian Other: _____
4. City you work in: _____ Province: _____
5. How many days per week do you engage in leisure time physical activity (that is, activity that you choose to do during your free time)? _____ days per week
6. Are you currently involved in parasport in any capacity? (please circle)
 - a) Yes Please specify: _____
 - b) No
7. Have you ever attended a CMCL presentation/workshop in the past? (please circle)
 - a) Yes Date of the presentation? _____
 - b) No

PROFESSIONAL INFORMATION

1. What is your profession? (please circle)
 - a) Physician/Physiatrist (MD)
 - b) Nurse
 - c) Physiotherapist
 - d) Recreation therapist
 - e) Occupational therapist
 - f) Kinesiologist
 - g) Researcher
 - h) Trainee Please specify for what profession: _____
 - i) Other Please specify: _____
2. How long have you been practicing in your profession? ____ years and ____ months

3. How often do you work with individuals with a physical disability? (please circle)
- | | | |
|-----------|---------------|-----------------|
| a) Never | c) Sometimes | e) All the time |
| b) Rarely | d) Frequently | |
4. How often do you discuss physical activity with your patients/clients with a physical disability? (please circle)
- | | | |
|-----------|---------------|-----------------|
| a) Never | c) Sometimes | e) All the time |
| b) Rarely | d) Frequently | |
5. How often do you discuss parasport with your patients/clients with a physical disability? (please circle)
- | | | |
|-----------|---------------|-----------------|
| a) Never | c) Sometimes | e) All the time |
| b) Rarely | d) Frequently | |

Appendix B.7

Theory of Planned Behavior Questionnaire for Health Care Professionals

These questions ask you about your current thoughts and feelings about discussing physical activity and parasport to your patients/clients with a physical disability. Please indicate your answer by checking/colouring in the circle that best represents your response.

1. If you were really motivated and had all the resources that you needed, how confident are you in your ability to **discuss** physical activity and parasport with your patients with a physical disability?

<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
1	2	3	4	5	6	7
Not at all			Completely			
confident			confident			

2. If you were really motivated and had all the resources that you needed, how confident are you in your ability to **persuade** your patients with a physical disability to participate in physical activity and parasport?

<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
1	2	3	4	5	6	7
Not at all			Completely			
confident			confident			

3. Other health care professionals that I work with think I should discuss physical activity and parasport with my patients with a physical disability.

<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
1	2	3	4	5	6	7
Strongly			Strongly			
disagree			agree			

4. Attending this CMCL presentation/workshop will help me discuss physical activity and parasport to my patients with a physical disability.

<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
1	2	3	4	5	6	7
Strongly			Strongly			
disagree			agree			

5. Discussing physical activity and parasport to my patients with a physical disability would be:

<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
1	2	3	4	5	6	7
Harmful						Beneficial

<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
1	2	3	4	5	6	7
Worthless						Valuable

<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
1	2	3	4	5	6	7
Difficult						Easy

<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
1	2	3	4	5	6	7
Unpleasant						Pleasant

6. In the next four weeks, I intend to seek out additional information about physical activity and parasport for my patients with a physical disability (e.g., types of activity, how much activity, guidelines, ways to get involved in parasport).

<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
1	2	3	4	5	6	7
Strongly disagree						Strongly agree

7. In the next four weeks, I intend to seek out additional information to use to persuade my patients with a physical disability to engage in physical activity and parasport (e.g., ways to persuade people to be active and get involved).

<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
1	2	3	4	5	6	7
Strongly disagree						Strongly agree

8. In the next four weeks, I intend to persuade my patients with a physical disability to engage in physical activity and parasport.

<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
1	2	3	4	5	6	7
Strongly agree						Strongly agree

APPENDIX C: STUDY 3 MATERIALS

- C.1 Client Demographic/Enrollment Questionnaire
- C.2 LTPA Intentions Questionnaire
- C.3 LTPA Behaviour Questionnaire
- C.4 Counseling Session Checklist
- C.5 Client Reflection Questionnaire

Appendix C.1
Client Demographic/Enrollment Questionnaire

Client ID: _____
Name: _____ Date: _____
Home Phone: _____ Email Address: _____
Mailing Address: _____
Postal Code: _____
Birth Date: _____ Age: _____ Sex: [M] [F]
Date of SCI: _____ Level of SCI: _____ Cause: _____

What is your primary mode of mobility outside your home?

Manual wheelchair	<input type="checkbox"/>	Braces	<input type="checkbox"/>
Power wheelchair	<input type="checkbox"/>	Cane	<input type="checkbox"/>
Walker	<input type="checkbox"/>	Walk independently	<input type="checkbox"/>

Which of the following describes your ethnicity? (circle)

White Native Canadian Black Asian
Other: _____

What is the highest level of education you have completed? (circle)

Highschool College University Post Graduate
Other: _____

What is your marital status? (circle)

Single Common Law/Married Divorced/Widowed/Separated

Appendix C.2
LTPA Intentions Questionnaire

For the following question, please indicate how strongly you agree or disagree with the statement on a scale from strongly disagree, 1, to strongly agree, 7.

In the next 2 months, I intend to...

Engage in at least 20 minutes of moderate to heavy intensity AEROBIC LTPA two times per week.	1	2	3	4	5	6	7
Engage in 3 sets of 8-10 repetitions of STRENGTH-TRAINING exercises for each muscle group two times per week.	1	2	3	4	5	6	7

Appendix C.3

LTPA Behaviour Questionnaire

These next questions ask about the time you spent engaging moderate and heavy intensity leisure time physical activity (LTPA) in the last 7 days. LTPA is physical activity that you choose to do during your free time, such as exercising, playing sports, gardening, and taking the dog for a walk (necessary physical activities such as physiotherapy, grocery shopping, pushing/wheeling for transportation are not considered LTPA). First, please tell me about the AEROBIC activities you do in your leisure time. This includes the leisure time activities that typically increase heart rate and breathing. These leisure time activities include but are not limited to exercise and sport.

1. **Mild intensity aerobic LTPA** requires very light physical effort; mild intensity activities make you feel like you are working a little bit, but you can keep doing them for a long time without getting tired...

During the last 7 days, on *how many days* did you do mild intensity aerobic LTPA? _____

On those days, *how many minutes* did you usually spend doing mild intensity aerobic LTPA? _____

2. **Moderate intensity aerobic LTPA** requires some physical effort; moderate intensity activities make you feel like you are working somewhat hard, but you can keep doing them for a while without getting tired...

During the last 7 days, on *how many days* did you do moderate intensity aerobic LTPA? _____

On those days, *how many minutes* did you usually spend doing moderate intensity aerobic LTPA? _____

3. **Heavy intensity aerobic LTPA** requires a lot of physical effort. These activities make you feel like you are working really hard, almost at your maximum. You cannot do these activities for very long without getting tired. These activities may be exhausting.

During the last 7 days, on *how many days* did you do heavy intensity aerobic LTPA? _____

On those days, *how many minutes* did you usually spend doing heavy intensity aerobic LTPA? _____

Now, please tell me about the STRENGTH-TRAINING you do during your leisure time. These exercises should work your major muscles groups. This includes exercises such as lifting weights or using elastic resistance bands.

4. **Mild intensity strength training** requires very light physical effort. Mild intensity activities make you feel like you are working a little bit, but you can keep doing them for a long time without getting tired.

During the last 7 days, on *how many days* did you do mild intensity strength training? _____

On those days, *how many minutes* did you usually spend doing mild intensity strength training? Please only report the time you are active. Do not include the time you spend recovering between exercises. _____

5. **Moderate intensity strength training** requires some physical effort. Moderate intensity activities make you feel like you are working somewhat hard, but you can keep doing them for a while without getting tired.

During the last 7 days, on *how many days* did you do moderate intensity strength training? _____

On those days, *how many minutes* did you usually spend doing moderate intensity strength training? Please only report the time you are active. Do not include the time you spend recovering between exercises. _____

6. **Heavy intensity strength training** requires a lot of physical effort. Heavy intensity activities make you feel like you are working really hard, almost at your maximum. You cannot do these activities for very long without getting tired. These activities may be exhausting.

During the last 7 days, on *how many days* did you do heavy intensity strength training? _____

On those days, *how many minutes* did you usually spend doing heavy intensity strength training? Please only report the time you are active. Do not include the time you spend recovering between exercises _____

Appendix C.4 Counseling Session Checklist

Session #: _____ Date: _____ Counselor: _____

Start time: _____ End time: _____ Duration of session: _____ minutes

What was discussed during today's counseling session? (please check all that apply and indicate percentage of total counseling session spent on each strategy; indicate specific details for your own notekeeping)

- Goal setting
 - Last session's goal?
■
 - Did you meet goal? Why or why not?
■
 - Modify or adapt goal between now and next counseling session?
■
- PA guidelines
 -
- PA intensity classification
 -
- Safety tips
 - Warm-up:
 - Cool-down:
 -
- Types of activities
 -
- Scheduling/action planning
 -
- Barriers to PA and coping planning

Barrier to PA	Coping plan
No accessible facility nearby	
Lack of transportation	
No exercise buddy/social support	

No one to help with exercise	
Time	
Pain	
Fatigue	
Lack of motivation	
Other	

- Helpful resources directed to....
 -

Next session booked for: _____

Appendix C.5
Client Reflection Questionnaire

15. I learned a lot of new information from the Get In Motion counselor.

<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
1	2	3	4	5	6	7
Strongly Disagree						Strongly Agree

16. The information and resources the counselor provided were interesting.

<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
1	2	3	4	5	6	7
Strongly Disagree						Strongly Agree

17. The information and resources the counselor provided were easy to understand.

<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
1	2	3	4	5	6	7
Strongly Disagree						Strongly Agree

18. The information and resources the counselor provided were credible.

<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
1	2	3	4	5	6	7
Strongly Disagree						Strongly Agree

19. The information and resources the counselor provided were personally important to me.

<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
1	2	3	4	5	6	7
Strongly Disagree						Strongly Agree

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