MODERATION ANALYSIS OF THE EFFECTS OF GOAL CONFLICT AND TRAIT
SELF-CONTROL ON THE INENTION-BEHAVIOUR RELATIONSHIP

INVESTIGATING THE EFFECTS OF GOAL CONFLICT AND TRAIT SELF-CONTROL ON THE INTENTION-BEHAVIOUR RELATIONSHIP IN EMERGING ADULTHOOD

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## Abstract

**Background:** The transition into emerging adulthood is a major developmental period in one's life in which rapid declines in physical activity (PA) are documented. While many emerging adults possess intentions to engage in regular PA, evidence suggests acting on these intentions represents a significant challenge. Obtaining a deeper understanding of the factors associated with the process of translating emerging adult's PA intentions into action may be integral in building a healthier adult population. The purpose of the study was to investigate the effects of two potential moderators of the PA intention-behaviour relationship: goal conflict and trait self-control, in a sample of emerging adults.

**Methods:** The study sample was comprised of 132 participants ($M_{age} = 17.80 \pm 0.46$; 64% female) drawn from a larger prospective cohort study (ADAPT Study). All participants completed two online questionnaires, approximately four weeks apart. Measures of PA intention strength, goal conflict and trait self-control were assessed at time 1. At time 2, participants completed a measure of self-reported moderate-to-vigorous physical activity (MVPA) engagement. Four moderation analyses were performed to assess the independent and combined effects of goal conflict and trait self-control on the PA intention-behaviour relationship.

**Results:** Across all moderation analyses, the main effect of intention strength was significant ($p < 0.001$), providing support for the necessary role it plays in PA behaviour. However, the main effects of goal-conflict and trait self-control were not found to be

significant, along with all interaction effects tested. Correlational analyses revealed intention strength ($r = 0.346$, $p < .001$) and goal-conflict ($r = -0.236$, $p < 0.05$) were significantly correlated with MVPA, however trait self-control ($r = 0.048$) was not.

**Conclusion:** Although results showed a modest intention-PA relationship, the hypothesized moderating effects of goal conflict and self-control were not supported. While the subjective perception of one's self-control ability did not moderate the intention-behaviour relationship, future research should explore the interaction between goal conflict and self-control further using more objective measures, or in combination with self-regulation strategies such as action and coping planning. Additionally, goal prioritization may be an important factor to consider when investigating the effect of goal conflict on PA and the intention-PA relationship.

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## Table of Contents

## List of Figures and Tables

**Figures**

**Tables**

## List of Abbreviations

ADAPT        Application of integrateD Approaches to understanding Physical activity during the Transition to emerging adulthood

BCT        Behaviour change technique

EMA        Ecological momentary assessment

IPAQ-SF        International Physical Activity Questionnaire – Short Form

MVPA        Moderate-to-vigorous physical activity

PA        Physical activity

PAR        7-day Physical Activity Recall

T1        Time 1

T2        Time 2

TPB        Theory of Planned Behaviour

TSC        Trait Self-control Scale

**Declaration of Academic Achievement**

I, Imran Haider, declare that I am the lead author of this thesis. My responsibilities included designing the study protocol, carrying out data collection procedures (i.e., participant recruitment, administration of online surveys, etc.), conducting all data analyses, as well as preparing the manuscript. All work was completed under the supervision of Dr. Steven Bray, Dr. Matthew Kwan, and Dr. Jeremy Walsh who provided input and feedback regarding the study design, study measures, data interpretation and manuscript preparation.

<center>**Introduction**</center>

**Health Benefits of Physical Activity**

   Public health guidelines in Canada recommend that adults engage in at least 150 minutes of moderate-to-vigorous physical activity (MVPA) each week (Ross et al., 2020). MVPA consists of any activity in which energy expenditure is at least three-times greater than while at rest (Rhodes et al., 2017). It has been well-established that regular engagement in MVPA can improve physical health by mitigating risks of developing several chronic diseases including cardiovascular disease, osteoporosis, diabetes mellitus, cancers, as well as premature mortality (Warburton & Bredin, 2017).

   Consistency of MVPA engagement is paramount in achieving long-term health benefits (Kahlert, 2015). Even when MVPA levels drop below public health recommendations for as little as two weeks, many of the cardiorespiratory benefits diminish (Dunton, 2017). Upon cessation of regular MVPA engagement, health benefits have been shown to disappear within two to eight months (Shephard, 1994).

   Extending beyond physical health, MVPA is also associated with positive outcomes related to mental health. Regular engagement in MVPA is associated with increases in positive markers of psychological well-being such as health-related quality of life and cognitive function, as well as reductions in negative markers of psychological well-being such as stress, depression, and anxiety (Biddle et al., 2019; Bize et al., 2007; Crews & Landers, 1987; North, et al., 1990; Petruzello et al., 1991; Rebar et al., 2015).

   Despite the well-known health benefits associated with regular engagement in MVPA, many Canadians are not meeting current MVPA recommendations. For example,

<center>1</center>

findings from the 2018 and 2019 Canadian Health Measures Survey revealed only 49% of

Canadian adults, aged 18 to 79, were meeting current public health guidelines (Statistics

Canada, 2021). Inadequate MVPA patterns observed in older adults have been shown to

persist all the way from emerging adulthood (Sparling & Snow, 2002). Therefore,

establishing sufficient MVPA habits during the emerging adulthood period may be

critical in efforts to promote lifelong health.

**Physical Activity during Emerging Adulthood**

Emerging adulthood is a period of the life course that generally begins following

the completion of one's high school education, during which people work to establish a

future for themselves where they are self-sufficient (Arnett, 2000). This period is

typically associated with an increase in personal responsibilities and major life changes,

such as living independently for the first time and entering post-secondary education, the

workforce, or military service (Kwan et al., 2012). Consequently, priorities are often

altered towards career-building endeavours, which can lead to changes in many lifestyle

behaviours including MVPA (Kwan et al., 2012; 2013). Therefore, it is perhaps

unsurprising to see reports of steep declines in PA levels during the transition from

adolescence into emerging adulthood (Bray & Born, 2004; Corder et al., 2019; Gordon-

Larsen et al., 2004; Kwan et al., 2009, 2012, 2021; Roberts et al., 2017). A recent meta-

analytic examination of the change in self-reported PA levels during this transition,

revealed PA levels decline by 13% (Corder et al., 2019). This reduction in PA grew to

17% upon examination of studies utilizing objective, accelerometer-based, measures of PA (Corder et al., 2019).

Considerable evidence has also demonstrated that individuals engage in significantly more PA during their high school years compared to the years following high school graduation (Bray & Born, 2004; Kwan et al., 2009, 2012, 2021; Van Dyck et al., 2015). Indeed, Bray and Born (2004) reported that 66% of participants met minimum recommendations for vigorous PA during their last two months of high school, whereas only 44% met these standards during their first eight weeks at university. Additionally, Downs and Ashton (2011) found significant reductions in vigorous PA and sports participation from high school to college. However, evidence suggests that even consistent involvement in organized sports does not attenuate the declines in overall PA that occur during this transition (Bélanger et al., 2009).

Investigations of PA in emerging adults have primarily focused on changes in MVPA or PA particularly during the transition from high school to post-secondary education. While the majority of emerging adults attend post-secondary education, it is important to note that many enter the workforce or enlist in military service upon graduating from high school. With respect to this distinction, results from a large sample of Canadian adolescents transitioning into emerging adulthood (Kwan et al., 2012) indicate that individuals not attending post-secondary education experience similar reductions in PA to those who do. However, the magnitude of the declines are sharpest amongst those who attend post-secondary education during emerging adulthood (Kwan et al., 2012). With these statistics in mind, research is needed to better understand the factors

responsible for the declines in PA engagement that occur during emerging adulthood, in order to develop strategies to attenuate or reverse these effects.

**Social Cognitive Frameworks**

Research has drawn heavily from social cognitive frameworks to investigate factors that can reliably predict regular PA behaviour (Rhodes & Nasuti, 2011; Rhodes et al., 2019). This work has led to the establishment of a strong network of interconnected factors, which has been used to inform the design and content of interventions directed at increasing engagement in PA (Rhodes et al., 2019; Young et al., 2014). Social cognitive frameworks are built on the premise that individuals form and subsequently act upon expectancies regarding behavioural events that are linked to desired or valued outcomes (Rhodes et al., 2019). These expectancies form the motivational processes that manifest as an intention to act, which, in turn, is theorized to translate into behavioural action. As an example, the Theory of Planned Behaviour (TPB; Ajzen, 1991), illustrated in Figure 1, proposes that one's attitude (positive or negative evaluation of the behaviour), subjective norm (perceived social pressures to perform the behaviour) and perceived behavioural control (perceived ability to perform the behaviour) represent the mechanisms underlying the formation of an intention to act, which in turn (together with some direct influence of perceived behavioural control) determines behaviour.

Over three decades of research has demonstrated strong support for the predictive ability of the mechanisms outlined within the TPB to predict a range of behaviours including: dieting, breastfeeding, condom use, sun protective behaviours, and PA (Guo et

al., 2016; Hagger & Chatzisarantis, 2009; Hagger et al., 2002; McDermott et al., 2015; McEachan et al., 2011; Starfelt Sutton et al., 2016). With specific reference to PA, Hagger and colleagues (2002) conducted a meta-analysis to assess the relationship between TPB constructs and PA intentions and behaviour drawing upon evidence from 72 studies. Attitude ($\beta = 0.40$), subjective norms ($\beta = 0.05$), and perceived behavioural control ($\beta = 0.33$) were all found to be significant predictors of PA intentions (Hagger et al., 2002). Additionally, intention ($\beta = 0.51$) and perceived behavioural control ($\beta = 0.15$) were found to be significant predictors of PA behaviour. Overall, the results showed the variables assessed by the TPB explained 44.5% of the variance in PA intentions and 27.4% of the variance in PA behaviour. These findings also aligned with results from a meta-analysis of 237 independent, prospective tests from 206 studies of health behaviours, which demonstrated that the TPB explains 44.3% of the variation in intentions and 19.3% of the variance in health-related behaviours (McEachan et al., 2011).

Although support for the predictive utility of the TPB to account for behavioural intentions is strong, a large amount of variance in PA and other health behaviours remains unaccounted for by constructs of the TPB. One criticism of social cognitive frameworks, such as the TPB, is the overreliance assigned on conscious intentions being the sole determinant of behaviour, to the exclusion of other factors that are non-conscious in nature such as habit (Rhodes & Yao, 2015; Sniehotta et al., 2014).
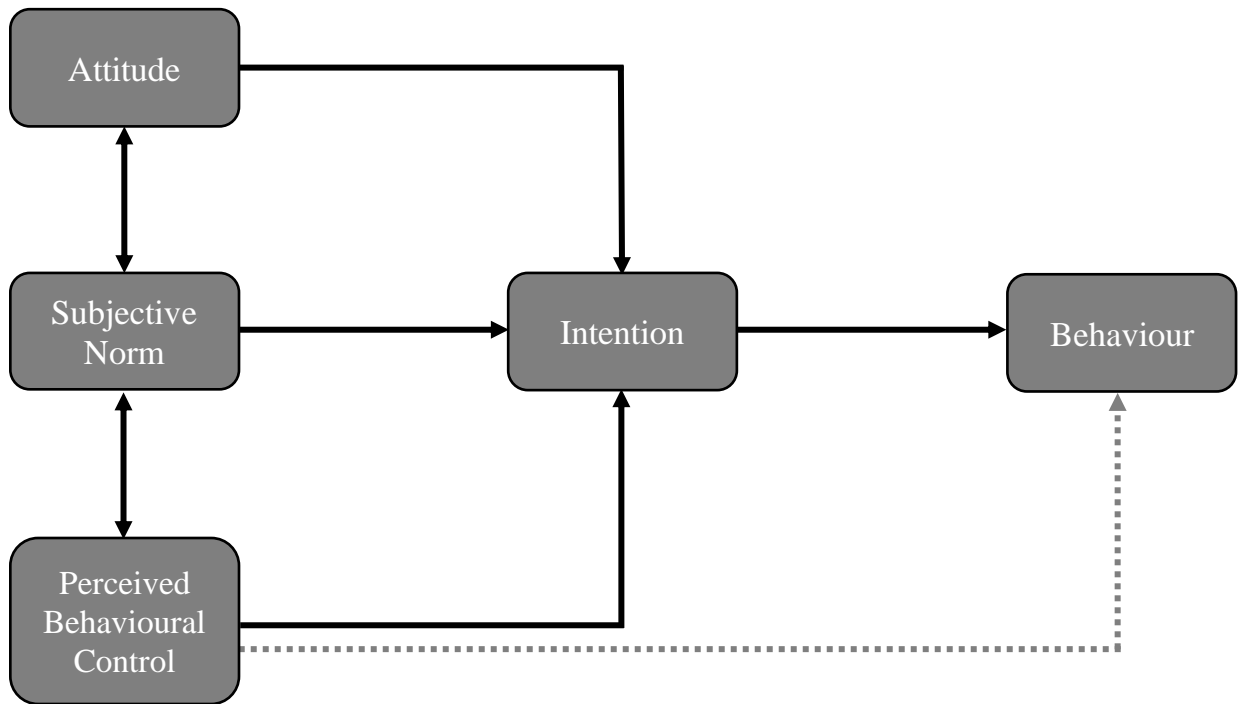
Figure 1. *The Theory of Planned Behaviour. Attitudes, subjective norms, and perceived*

*behavioural control facilitate the formation of an intention to act, which drives the*

*enactment of the corresponding behaviour (Ajzen, 1991).*

**The Intention-Behaviour Gap**

While intention has been shown to be the one of the strongest predictors of PA

(Armitage & Conner, 2001; Chatzisarantis & Biddle, 2002; Downs & Hausenblas, 2005;

Hagger et al., 2002; McEachan et al., 2011, 2016), research examining the intention-

behaviour relationship has documented a considerable amount of discordance between

PA intentions and subsequent behaviour. Indeed, a meta-analytic examination of the

intention to behaviour relationship for PA, based on observational studies, revealed that

48% of intenders (individuals with the intention to meet MVPA guidelines) failed to act

in accordance with their intentions (did not engage in sufficient MVPA to meet MVPA guidelines) (Rhodes & de Bruijn, 2013). Intervention studies have shown evidence of a similar disconnect between intention and behaviour, where medium-sized changes in intention ($d = 0.44$) are associated with trivial-sized changes in behaviour ($d = 0.17$) (Rhodes & Dickau, 2013). The correlation between intention and behaviour in these intervention studies was also very weak ($r = 0.06$) providing further evidence that other factors beyond one's intentions are needed to accurately predict PA behaviour.

The term intention-behaviour gap has commonly been used to describe the discordance between intention and subsequent behaviour (Godin & Conner, 2008; Sheeran & Webb, 2016). It is worth noting this discordance is asymmetrical in nature, largely representing individuals who fail to follow through with their intentions, and not individuals who enact a behaviour despite not having the intention to do so. An illustration of this contrast can be seen in data from the meta-analysis conducted by Rhodes & de Bruijn (2013) where 48% of intenders failed to follow through with their PA intentions and only 2% of non-intenders (people who did not intend to engage in sufficient MVPA to meet MVPA guidelines) followed up by being physically active. In short, evidence indicates intention may be a necessary, but often insufficient factor driving behavioural enactment of PA.

**Moderators of the Intention-Behaviour Relationship**

Growing recognition of the inability of social cognitive frameworks to account for large amounts of variance in behaviour, or to explain intention-behaviour discordance has

prompted investigation into potential mediators and moderators of the intention-behaviour relationship. In addition, action control theories have emerged in contemporary research on PA and other health behaviours (Rhodes & Yao, 2015). These theories expand on social cognitive frameworks by separating the process of forming intentions from the process of translating intentions into behaviour; the latter of which is referred to as action control (Rhodes & Yao, 2015). The distinction between these processes allows for the conceptualization of post-intentional constructs that can be strategically investigated as moderators of the process of action control, to determine factors that may strengthen or weaken the relationship between intention and PA behaviour.

Research focused on the appraisal of potential moderating variables can help elucidate why an intention-behaviour gap exists and create theoretical reform via the inclusion of post-intentional constructs which aim to "close" this gap. A moderator is a qualitative or quantitative variable that affects the strength or direction of the relationship between an independent or predictor variable and a dependent or criterion variable (Baron & Kenny, 1986). In other words, the presence or absence of a moderator can strengthen or weaken the association between intention and behaviour or even reverse the direction (positive / negative) of the relationship.

A recent systematic review of 129 studies appraised 77 variables that have been evaluated as potential moderators of the intention-behaviour relationship for PA (Rhodes et al., 2022). From that analysis, eight variables were identified as reliable moderators of the intention-behaviour relationship. Seven of the variables: affective attitude, anticipated regret, conscientiousness, intention commitment, intention stability, perceived

behavioural control/self-efficacy, and identity were deemed to strengthen the relationship between intention and behaviour, such that when measures of those variables were increased, the intention-behaviour relationship grew stronger. Only one variable (goal conflict) was shown to reliably weaken the relationship between intention and behaviour, such that when goal conflict was higher, the size of the intention-behaviour effect was significantly smaller compared to when goal conflict was lower.

The Rhodes et al. (2022) meta-analysis provides important information to aid in understanding the personal and environmental conditions, under which PA intentions may have a greater chance of being translated into PA behaviours in the general population. However, the authors cautioned their results were limited in several ways and emphasized the importance of continued investigation into moderators of the intention to PA relationship, which have been underexamined in younger populations; including emerging adults. Given this lack of evidence, research investigating these and other potential moderators of the PA intention-behaviour relationship is essential to better understand what factors influence the process of action control in emerging adults. This will help inform the development of intervention strategies designed to mitigate the decline in PA observed in emerging adulthood. In order to take a first step towards understanding moderators of the intention-behaviour relationship in emerging adults, the present study focused on two potential moderators: goal conflict and trait self-control.

**Goal Conflict**

Goal conflict refers to the inability to pursue multiple goals concurrently, which often evokes a response to prioritize progress towards one goal at the expense of another (Riediger & Freund, 2004). To illustrate, consider the example of a university student attempting to pursue the goal of spending quality time with relatives at a family party together with the goal of studying for an upcoming Calculus midterm. Although both goals are important, they may be very difficult to pursue concurrently, thus it is often the case that one goal is prioritized over the other. Given time and energy are limited resources, experiencing a greater number of competing goals in one's life, can make it difficult to achieve success in each area of a goal pursuit.

In the context of PA, goal conflict can arise such that the pursuit of one or more goals can take time away from, or otherwise interfere with, one's ability to pursue their PA goals or intentions. Emerging adults commonly engage in the pursuit of multiple goals across several facets of life, including achieving a high standard at school or work, participating in extra-curricular activities, building new social relationships, and spending time with family, in addition to being regularly active (Arnett, 2000). Therefore, the occurrence of goal conflict may help to explain why declining PA levels are commonly observed in this population.

Several studies have shown that goal conflict is negatively associated with PA behaviour. For example, Chatzisarantis and colleagues (2016a) measured participants' perceptions of past goal conflict and assessed its relationship with vigorous PA engagement in the last 5 weeks. To measure goal conflict, a total of 172 participants were

10

first instructed to indicate behaviours that prevented them from engaging in vigorous physical activities during their leisure time in the last 5 weeks. Once this step was complete, the frequency with which the competing behaviour interfered with participants' ability to perform vigorous PA was assessed using the following item: "In a typical week, how often did the alternative behaviour prevent you from engaging in vigorous physical activities for at least 45 minutes, during your leisure time?" This item was scored on a 5-point scale ranging from (1) "not at all" to (5) "most days of the week". Vigorous PA was assessed using Godin's leisure-time exercise questionnaire (Godin & Sheppard, 1985). The results demonstrated there was a significant negative correlation ($r = -0.35$, $p < 0.05$) between goal conflict and vigorous PA engagement, indicating goal conflict acts as a barrier to PA engagement.

As mentioned earlier, goal conflict has also been shown to reliably weaken the association between intention and PA behaviour, thereby making it more difficult to act on one's PA intentions (Rhodes et al., 2022). Specifically, goal conflict was found to moderate the PA intention-behaviour relationship in a negative direction in six of nine studies examined in a recent meta-analysis (Rhodes et al., 2022). In an illustrative demonstration of this effect, Bailis et al. (2011) carried out an experimental simulation of goal conflict by priming the cognitive salience of university students' academic goals, and examining its effect on PA levels one week later. University students ($N = 117$) between the ages of 17 and 36 participated in the study. Initial screening procedures were conducted to ensure the entire sample possessed strong goals to be physically active. Additionally, participants completed a measure asking them to indicate the level of

importance they placed on their university education ("Overall, how important to you personally is going to university?") on a 10-point rating scale from (1) not at all to (10) extremely. In the first experimental session, the 7-day Physical Activity Recall (PAR) (Blair et al., 1985) was completed to establish baseline PA levels. A copy of Canada's Physical Activity Guide to Healthy Active Living was also given to participants, which recommended engagement of at least 30 minutes of moderate PA on 4 or more days per week. Participants were asked to follow these recommendations over the following week, to which they all agreed at the time. Participants then completed a goal-priming task by writing about either their academic goals (i.e., "What is a positive academic outcome that you want to achieve and that is important to you?") or their exercise goals (i.e., "What is a positive exercise outcome that you want to achieve and that is important to you?"). Those who placed a high level of importance on their university education (reported a maximum score of 10) and completed the academic goal priming task were classified as the "goal conflict" group. In the second session, the 7-day PAR interview was completed again one week later to assess changes in PA levels that occurred after the goal priming task. Results showed that those in the "goal conflict" group engaged in significantly less PA in comparison to other participants one week later. These results suggest, priming academically-oriented students to think about valued academic goals can create conflict that, in turn, interferes with the enactment of PA intentions.

In another illustration of the effect of goal conflict on the intention-PA relationship, Rhodes and colleagues (2012) investigated if motivations to engage in screen-based leisure-time activities, such as watching tv or playing video games, could

predict whether participants acted on their PA intentions or not. Participants in the study completed assessments at two points. At time 1, they reported their intentions to meet vigorous PA recommendations of engaging in at least three, 20 minutes bouts of vigorous intensity PA per week over the next two weeks. The researchers utilized a single item binary measure of intention, in which participants responded either "yes" or "no". Additionally, motivations to engage in screen-based activities during participant's leisure time was assessed using 3 items (e.g., "On days with limited leisure-time, I will make screen viewing a priority") scored on a 5-point scale from (1) strongly disagree to (5) strongly agree. This measure was used as an indicator of goal conflict based on an assertion that motivations to engage in screen-based activities can compete with motivations to engage in PA during one's limited leisure time. Two weeks later, vigorous intensity PA was assessed using the Godin Leisure-Time Exercise Questionnaire (Godin & Sheppard, 1985).

To analyze the effect of goal conflict on the process of action control, participants were classified into one of 4 categories by dichotomizing intentions and PA scores: successful intenders (intenders that met vigorous PA recommendations), unsuccessful intenders (intenders that did not meet vigorous PA recommendations), non-intenders that met vigorous PA recommendations, and non-intenders that did not meet vigorous PA recommendations. It was found that motivations to engage in screen-based activities during one's leisure time, were significantly lower among the successful intenders compared to the unsuccessful intenders ($p < 0.01$). By analyzing the differences between successful and unsuccessful intenders, the authors inferred that goal conflict moderated

13

the PA intention-behaviour relationship when PA intentions were high, whereby the intention-behaviour relationship was weaker when leisure-time goal conflict was greater.

The results of the aforementioned studies demonstrate that having two conflicting goals can undermine the translation of intentions into behaviour. Thus, it stands to reason that the more goal pursuits one is engaged in on a regular basis, the greater potential there may be for conflicting goals to interfere with PA intentions and PA enactment. Given emerging adults are exposed to many new challenges across a variety of disciplines, this effect of goal conflict may be more pronounced when factoring in various other leisure-time motivations in addition to one's academic goals. Goal conflict may be particularly problematic during emerging adulthood, thus efforts to understand how to help emerging adults translate their PA intentions into action and the potential moderating role of goal conflict is warranted.

**Trait Self-Control**

Self-control refers to one's capacity to consciously regulate their thoughts, emotions, or behaviours in pursuance of desired goals (Baumeister et al., 2007). The strength model of self-control proposes that people's capacity to exert self-control is reliant upon a limited reserve of self-regulatory resources (Baumeister et al., 2007). According to this theory, as one engages in activities that require control over their thoughts, emotions, or behaviours, their self-regulatory resources become depleted or fatigued. Once depleted of self-control resources, people's subsequent attempts to exert

self-control are negatively affected and are prone to lapses in self-control or performance deficits.

Although the transient or acute effects of self-control strength depletion are thought to affect anyone, the extent of the self-control deficits people exhibit when depleted vary due to some individuals possessing a stronger dispositional ability to exert self-control than others (Baumeister et al., 1994). This innate or acquired ability to exert self-control across various contexts and situations is referred to as trait self-control. Research investigating self-control as a stable personality trait has demonstrated that higher levels of trait self-control strength are associated with positive outcomes across a variety of life domains such as academic and job performance, social relationships, and health-related behaviours including PA (de Ridder et al., 2012; Hagger et al., 2019).

Although trait self-control was not directly assessed in Rhodes et al.'s (2022) meta-analysis of moderators of the intention to PA relationship, a conceptually-similar personality construct: *conscientiousness* was found to be a significant intention-behaviour moderator. Conscientiousness is among the "Big 5" personality dimensions and is defined as a tendency to be responsible, organized, self-disciplined, and goal directed (Digman, 1990). The conceptual similarity of these two variables suggests that trait self-control might also be a moderator of the intention-PA relationship. Indeed, many of the items used to assess conscientiousness (Big Five Inventory; NEO Five Factor Inventory) and trait self-control (Trait Self-control Scale) tap into highly similar concepts (Costa & McCrae, 1989; John, Donahue, & Kentle, 1991; Roberts et al., 2014; Tangney et al., 2004). Additionally, self-regulation is a prominent construct in behavioural change

15

models, such as the Health Action Process Model and the Multi-process Action Control Model, that plays a role in the process of translating one's intention into action (Rhodes, 2017; Rhodes & Yao, 2015; Schwarzer, 2008). Thus, it seems reasonable to propose that one's dispositional ability to exert self-control may play a similar moderating role as that of conscientiousness. Furthermore, there is some evidence from individual studies to indicate trait self-control is a moderator of the PA intention-behaviour relationship.

Bertrams and Englert (2013) conducted a study to investigate whether individuals with greater trait self-control were better able to adhere to their PA standards or plans compared to those with lower self-control. In the study, a sample of 92 university students were administered a questionnaire assessing the variables of interest. Individualized PA standards (i.e., similar to PA intentions) were assessed by asking participants to indicate the minimum number of days they wished to engage in PA in an average week. Exercise engagement was determined by asking participants to indicate, using self-report, how many days they engaged in PA in an average week. Trait self-control was measured using an adapted version of the German version of the Trait Self-control Scale (Bertrams et al., 2011). The researchers found significant main effects of individualized PA standards ($p < 0.001$) and trait self-control ($p < 0.01$) in predicting PA frequency as well as a significant interaction between individualized PA standards and trait self-control ($p < 0.001$). Simple slope analyses revealed that when participants held a stronger desire to exercise more frequently (higher PA standard), those high in trait self-control engaged in significantly more PA compared to those low in trait self-control. Thus, while not assessing "intention"

per se, Bertrams and Englert (2013) provide some evidence that trait self-control moderated the intention-behaviour relationship.

In a second study investigating the moderating effect of trait self-control on the PA intention-behaviour relationship, Finne and colleagues (2019) investigated the relationship between trait self-control, weekly PA intentions, and PA behaviour. This study involved 259 university students and employees who were registered participants in sports and gym courses offered by two universities in Germany. The weekly courses ran for 13 weeks and consisted of various sports such as martial arts (kickboxing, taekwondo, etc.), aerobic exercise (Zumba, basketball, etc.), and Freeletics (endurance and strength-based exercises using one's own bodyweight). At baseline, participants completed a questionnaire assessing trait self-control using the German adaption of the short form of the Trait Self-control Scale (Bertrams & Dickhäuser, 2009). Attendance at each weekly course was recorded by research assistants. At the end of each weekly course, participants reported their weekly PA intentions by indicating how strongly they intended to participate in the course again the following week using a 10-point rating scale ranging from (1) "absolutely not" to (10) "at any rate". Cox proportional hazard models were computed to predict participation in exercise classes using weekly intention and trait self-control values. Results showed that within-person fluctuations in weekly intentions significantly predicted weekly course attendance ($p < 0.01$). More importantly, the results revealed a significant interaction effect ($p < 0.01$) of trait self-control and intra-individual fluctuations in intention on weekly course attendance. Specifically, it was found that amongst individuals with high levels of trait self-control, possessing stronger weekly

exercise intentions than usual was associated with a greater likelihood of attending

subsequent classes. Meanwhile, intentions did not predict attendance for those with lower

self-control. When considered together, evidence suggests the dispositional variable trait

self-control and the similar construct, conscientiousness, are associated with PA

intentions and behaviour and moderate the PA intention-behaviour relationship.


**Potential Additive and Interactive Effects of Goal Conflict and Trait Self-Control on**

**the Physical Activity Intention-Behaviour Relationship**

Thus far, evidence has been presented that goal conflict and trait self-control may

independently moderate the intention-behaviour relationship. However, these distinct

concepts may also function additively or interdependently. For example, possessing

stronger self-control abilities and experiencing lower levels of goal conflict may

strengthen the intention-behaviour relationship more than either factor alone. Similarly,

having weaker trait self-control together with greater goal conflict may combine to

weaken the intention-behaviour relationship. These two examples illustrate how goal

conflict and trait self-control may contribute additive effects in a multiple moderator

model of the PA intention-behaviour relationship. Further, these two potential moderators

may interact in more complex ways. For example, it is possible that individuals with

higher levels of trait self-control are better able to resist temptations and focus on

pursuing desired goals such as being physically active during periods of high goal

conflict, making intended PA enactment more likely. Thus, trait self-control may also

moderate the effects of goal conflict on the intention to behaviour relationship in the form

of moderated moderation. In light of these potential additive and interactive effects, research investigating goal conflict and trait self-control together with PA intentions and behaviour stands to make novel and important contributions to the literature.

**Purpose**

The purpose of this study was to investigate the potential moderating effects of goal conflict and trait self-control, both independently and in combination, on the PA intention-behaviour relationship in a sample of emerging adults. In addition to the expected intention-behaviour relationship, four moderation models were proposed to assess the relationships amongst the study variables (See Figures 2-5). It was hypothesized in Model 1, that goal conflict would moderate the intention-behaviour relationship whereby the association between intention and PA behaviour would be stronger (higher correlation) at lower levels of goal conflict compared to high levels of goal conflict. In Model 2, it was hypothesized that trait self-control would moderate the intention-behaviour relationship whereby participants reporting higher trait self-control would demonstrate a stronger association (higher correlation) between intention and PA behaviour compared to participants reporting lower trait self-control. Model 3, classified as an additive multiple moderation analysis, was computed to examine whether both goal conflict and self-control collaboratively moderate the intention-PA relationship. It was hypothesized that lower goal conflict and higher trait self-control, in combination, would be associated with a stronger intention-PA behaviour relationship, while higher goal conflict together with lower trait self-control would be associated with a weaker

relationship between intention and PA. Lastly, Model 4, classified as a moderated

moderation model, was computed to test if the effect of goal conflict on the intention-PA

relationship differs depending on trait self-control. Specifically, following up on the

hypothesis in Model 2, that higher goal conflict would negatively affect the intention-

behaviour relationship, it was hypothesized that those with higher trait self-control would

be more effective at translating their PA intentions into PA under conditions of high goal

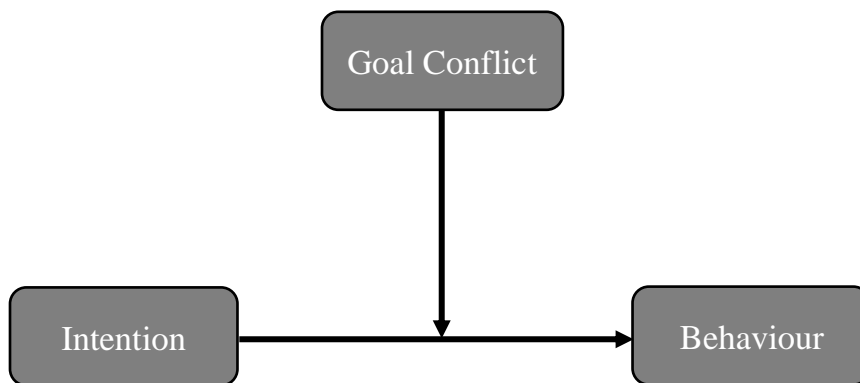conflict compared to those with lower trait self-control.
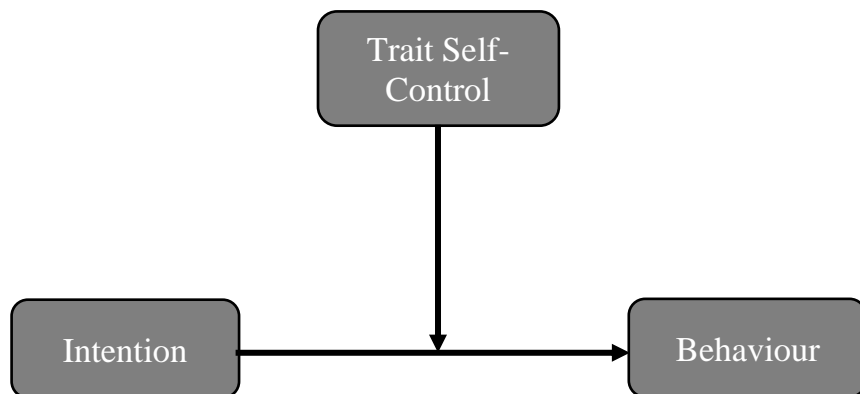


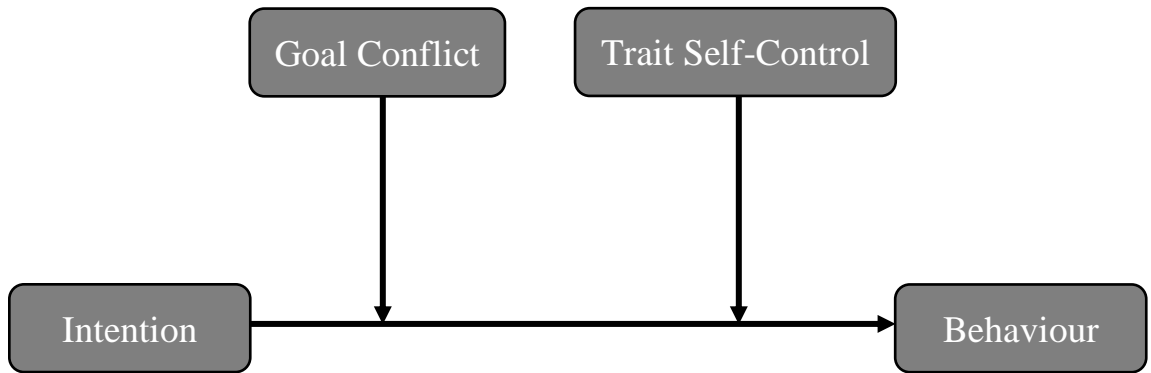Figure 2. *Moderation Model 1.*



Figure 3. *Moderation Model 2.*

Figure 4. *Moderation Model 3 (Additive Multiple Moderation Model).*
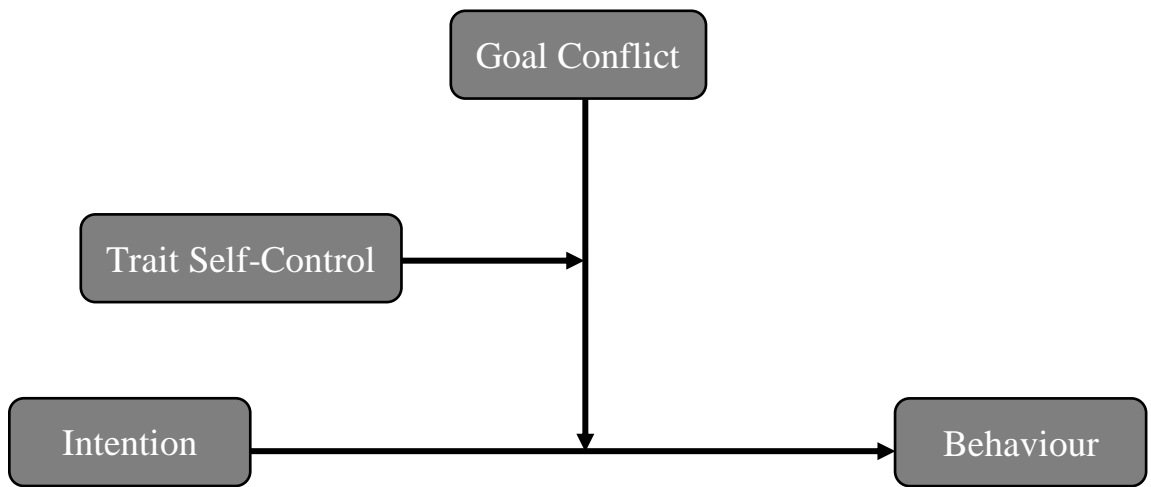


Figure 5. *Moderation Model 4 (Moderated Moderation Model).*

## Method

### Study Sample, Context, and Procedures

The current prospective study utilized data obtained from the third data collection cycle of the ADAPT study (Application of integrated approaches to understanding PA during the transition to emerging adulthood; Kwan et al., 2020) in addition to measures and procedures devised to address the specific objectives of the study. ADAPT is a four-year prospective cohort study aimed at examining predictors of PA behaviour among a large sample of Canadian adolescents as they transition out of high school and into emerging adulthood. At baseline, grade 11 students from seven secondary schools within a large school board in Southern Ontario were invited to take part in the study (Kwan et al., 2020). The ADAPT study is comprised of two interrelated studies. With respect to Study 1, each year all participants are asked to complete a large online questionnaire assessing a variety of psychosocial factors related to lifestyle behaviours, PA cognitions, and well-being. A subset of Study 1 participants every year are invited to take part in Study 2 where they are asked to wear an activity monitor for a period of one week and are engaged in a more intensive assessment of PA correlates using ecological momentary assessment or EMA.

The 148 participants taking part in Study 2 of the ADAPT study were recruited for the present study during the data collection cycle for Fall 2021. All participants were asked to complete two online surveys approximately 4 weeks apart. Measures of behavioural intention strength, goal conflict, and trait self-control were assessed at Time 1 (T1) as part of the Study 1 cycle. At time 2 (T2), a second online survey was sent to the

Study 2 subsample of participants to assess self-reported MVPA engagement. Data collection took place during the months of October and November. The protocol for the ADAPT study was approved by both the Institutional Research Ethics Board and the School Board Ethics Committee. More detailed information on participant recruitment and the procedural elements involved in data collection are described in the ADAPT methods paper (Kwan et al., 2020).

Participants were excluded from the analysis based on the following conditions: failure to complete either of the T1 or T2 surveys, completion of the T2 survey beyond the 1-month separation from the T1 survey, or completion of the T1 survey after the completion of the T2 survey. As a result, a total of 132 participants were included in the analyses ($M_{age}$ = 17.80 $\pm$ 0.46; 64% female).

**Measures**

*Demographics*. Participants reported demographic information when completing the T1 questionnaire pertaining to their age, gender, ethnicity, and parental education.

*Physical Activity Intention Strength*. A single item measure of intention was included in the T1 questionnaire to assess the strength of participant's intentions towards adhering to PA guidelines each week. This measure, developed by Courneya (1994), has been used extensively in PA research (Grant et al., 2020; Kaushal, 2016; Rhodes & Lithopoulos, 2022). Participants reported their agreement with the following statement: *"It is my intention to be physically active for at least 150 minutes each week over the next*

*4 weeks"*. Responses ranged from 1 (*strongly disagree*) to 7 (*strongly agree*). In the T1 questionnaire, to be "physically active" referred to engagement in MVPA.

***Goal Conflict***. A single item measure, developed by Chatzisarantis et al. (2016b), was used to assess goal conflict. Participants responded to the following question: "Thinking of a typical week over the next month… How often do you believe that alternative behaviours or commitments will conflict with, or prevent you being physically active"? on a 7-point scale ranging from 1 (Not often at all) to 7 (Very often).

***Trait Self-Control***. Trait self-control was assessed using 6 items taken from the brief (13-item) version of the Trait Self-control Scale (brief TSC; Tangney et al., 2004). Six items were used from the brief TSC to limit overall participant burden, given the many measures included within the broader questionnaire administered as part of Study 1 in the larger parent cohort study (ADAPT). Analyses of data from a pilot study of emerging adults using the 13-item Trait Self-control Scale showed a strong correlation of $r$ (172) = .871 between the scores derived from the 13-item brief TSC measure and the 6-item measure, indicating very high correspondence (Harris & Bray, 2019). Responses to each item were rated on a 5-point scale ranging from 1 (Not at all like me) to 5 (Very much like me). The 6 items included in the scale are as follows, "I have a hard time breaking bad habits", "I am lazy", "Fun sometimes keeps me from getting work done", "I am able to work effectively toward long-term goals", "I often act without thinking through all the alternatives", and "I am good a resisting temptations". Items 1, 2, 3, and 5

were reverse scored to ensure higher scores were representative of stronger trait self-control abilities. Internal consistency of the scale was acceptable (Cronbach's alpha = 0.70; Nunnally, 1978)

*Physical Activity Behaviour*. Self-reported PA was assessed using the International Physical Activity Questionnaire – Short Form (IPAQ-SF; Craig et al., 2003). Participants responded to three items indicating how many days, during the last 7 days, they engaged in 1) vigorous physical activities, 2) moderate physical activities, and 3) walked, for a duration of at least 10 minutes. If participants indicated that they engaged in one of these activities for one or more days, they were subsequently prompted to indicate how much time (hours and/or minutes) in total they usually spend participating in one of these activities on one of those days. A measure of MVPA was calculated by excluding self-reported walking and multiplying the frequency of engagement (during the last 7 days) with average duration per occasion (minutes) for each of vigorous and moderate intensity PA and computing the sum of these values.

## Data Analysis

Prior to analysis, the data were screened to ensure all participants had completed both T1 and T2 surveys within the one month separation period in the correct temporal order. Additionally, all assumptions for linear regression modelling were tested (normality of residuals, linearity, homogeneity of variance, multicollinearity, etc.) to determine whether any transformations were required. It was found that the distribution of the residuals of the linear regression models were positively skewed as determined

25

through computation of a Shapiro-Wilk normality test, as well as through visual inspection of a QQ plot and the distribution of the residuals. Accordingly, a square root transformation was performed on the MVPA data (outcome variable). Following the transformation, the assumption of normality was met.

Descriptive statistics and correlational analyses using Pearson's correlation coefficient were computed for all study variables. Moderation analyses were conducted using statistical software: *RStudio* to assess the hypotheses relating to goal conflict and trait self-control as potential moderators of the intention-behaviour relationship as conceptualized in each proposed model. For each moderator analysis, predictor and moderator variables were mean centered prior to computation as recommended by Hayes (2017) to reduce multicollinearity between the predictors and the interaction term. Simple moderation models were computed using the PROCESS macro, Model (Hayes, 2021) to evaluate hypothesized Models 1 and 2. Assessment of models 3 and 4, which involved complex, multiple moderators, was also conducted using the PROCESS macro.

To test Model 3, an additive multiple moderation analysis was conducted. In this Model, the effect of variable X (intention) on Y (MVPA) is predicted as an additive linear function of moderators W (goal conflict) and Z (trait self-control). Consequently, X's effect is conditional on both W and Z $(Y = i_Y + (b_1 + b_4W + b_5Z)X + b_2W + b_3Z + error)$ (Hayes, 2017). Furthermore, in this model, the effect of moderator W on the relationship between X and Y is not dependent on moderator Z and vice versa.

To test Model 4, a moderated moderation analysis was conducted. Although similar to Model 3, there is one key difference that distinguishes between the two

26

frameworks. In a moderated moderation model, the effect of moderator W, in this case goal conflict, on the relationship between X (intention) and Y (MVPA) is itself moderated by moderator Z (trait self-control) (Hayes, 2017). As such, a three-way interaction between intention, goal conflict and trait self-control was examined to test if the effect of goal conflict on the intention-behaviour relationship was itself moderated by trait self-control ($Y = i_Y + (b_1 + b_4W + b_5Z + b_7WZ)X + b_2W + b_3Z + b_6WZ + \text{error}$).

## Results

### Demographic Characteristics

Descriptive information regarding the demographic characteristics and measured variables from the current study sample as well as the full cohort from the third data collection cycle of the parent ADAPT cycle are presented in Table 1. As shown in the Table, proportions, mean scores and variability were similar between the full sample and sub-sample on all variables. In the present study, the majority self-identified as female (64.39%) and approximately half the sample self-identified their ethnicity as white (50.76%). A large portion of the sample (64.39%) reported having at least one parent that had received a college or university degree.

Table 1. *Demographic characteristics and measured variables*

| Characteristics | Current Study Sample<br>*N* = 132 (%) | Year III ADAPT Cohort<br>*N* = 610 (%) |
|---|---|---|
| Mean age in years (*SD*) | 17.80 (0.46) | 17.91 (0.51) |
| Gender frequency (percentage) | | |
| Female | 85 (64.39%) | 391 (64.10%) |
| Male | 44 (33.33%) | 192 (31.48%) |
| Non-binary | 2 (1.52%) | 8 (1.31%) |
| Two-spirit | 0 (0%) | 0 (0%) |
| Prefer not to answer | 1 (0.76%) | 7 (1.15%) |
| Ethnicity frequency (percentage) | | |
| White/Caucasian | 67 (50.76%) | 263 (43.11%) |
| Middle Eastern/Arab | 8 (6.06%) | 19 (3.11%) |
| Black | 6 (4.55%) | 44 (7.21%) |
| Asian | 11 (8.33%) | 32 (5.25%) |
| Indigenous | 2 (1.52%) | 9 (1.48%) |
| Latin | 3 (2.27%) | 18 (2.95%) |
| Other | 23 (17.42%) | 128 (20.98%) |
| Missing information | 12 (9.09%) | 97 (15.90%) |
| Parental Education frequency (percentage) | | |
| College or university graduates | 85 (64.39%) | 346 (56.72%) |
| Less than college/university degree | 33 (25.00%) | 157 (25.74%) |
| Missing information | 14 (10.61%) | 107 (17.54%) |
| Mean Values of Measured Variables (SD) | | |
| Intention | 4.69 (1.62) | 4.73 (1.78) |
| Goal Conflict | 4.43 (1.76) | 4.46 (1.66) |
| Trait Self-Control | 2.98 (0.71) | 3.01 (0.68) |
| MVPA (minutes) | 528.75 (441.94) | 484.13 (464.94) |

## Descriptive Statistics

Descriptive statistics and correlations between all study variables are illustrated in Table 2. Mean scores for intention strength (4.69), goal conflict (4.43) and trait self-control (2.98) were found to be slightly above a moderate level with respect to how each variable was scored. Based on responses from the IPAQ-SF, the sample population was considered highly active ($M = 528.75 \pm 441.94$ minutes of MVPA per week) in relation to the 150 minute weekly MVPA recommendations for adults (Canadian 24-Hour Movement Guidelines; Ross et al., 2020). Indeed 75.8% (100/132) of participants reported meeting or exceeding these recommendations.

Table 2. *Descriptive statistics and bivariate correlations of measured variables.*

| Variable | Mean | *SD* | Range | 1 | 2 | 3 | 4 |
|---|---|---|---|---|---|---|---|
| 1. Intention | 4.69 | 1.62 | 1-7 | -- | | | |
| 2. Goal conflict | 4.43 | 1.76 | 1-7 | -.240* | -- | | |
| 3. Trait self-control | 2.98 | 0.71 | 1.33-4.83 | .130 | -.132 | -- | |
| 4. MVPA (minutes) | 528.75 | 441.94 | 0-1260 | .346*** | -.236* | .048 | -- |

Note. *N*=132. MVPA = moderate-vigorous physical activity. *** = $p < 0.001$; ** = $p < 0.01$; * = $p < 0.05$.

All study variables were significantly correlated, with the exception of trait self-control. Intention was most strongly correlated with MVPA ($r = .346$) in accordance with

the widely observed effect that intention is a reliable predictor of MVPA behaviour (McEachan et al., 2011, 2016). Goal conflict was found to be negatively correlated with intention and MVPA providing support of its role as a barrier to MVPA engagement (Rhodes et al., 2022).

**Hypothesis Tests**

With respect to moderation Model 1 ($p < 0.001$), there was a significant main effect of intention on MVPA ($p = < 0.001$); however, the main effect of goal conflict on MVPA ($p = 0.095$) as well as the intention X goal conflict interaction ($p = 0.55$, $r^2 = 0.0028$) were non-significant.

Assessment of Model 2 ($p = 0.0015$) yielded the same significant effect of intention on MVPA ($p = < 0.001$), yet no significant effects for trait self-control ($p = 0.95$) or the intention X trait self-control interaction ($p = 0.24$, $r^2 = 0.0112$) on MVPA.

Results pertaining to the computation of the additive multiple moderation, Model 3 ($p = 0.0030$), revealed the main effect of intention on MVPA ($p < 0.001$) was significant. However, neither main effect of goal conflict ($p = 0.15$) or trait self-control ($p = 0.84$) on MVPA were significant when added to the model. Both the intention X goal conflict ($p = 0.59$, $r^2 = 0.0023$) and intention X trait self-control ($p = 0.49$, $r^2 = 0.0037$) interaction effects were not significant.

Lastly, assessment of the moderated moderation, Model 4 ($p = 0.0032$), demonstrated a significant main effect of intention on MVPA ($p < 0.001$), but no significant main effects of goal conflict ($p = 0.24$) or trait self-control ($p = 0.57$) on

MVPA. The intention X goal conflict ($p = 0.59$), intention X trait self-control ($p = 0.15$), and intention X goal conflict X self-control ($p = 0.21$, $r^2 = 0.0124$) interactions effects were all not significant.

## Discussion

The present study examined goal conflict and trait self-control as potential moderators of the PA intention-behaviour relationship in a sample of emerging adults. Drawing from past research showing goal conflict and trait self-control moderate the intention-behaviour relationship (Bertrams & Englert, 2013; Finne et al., 2019; Rhodes et al., 2022) and further theorizing that these variables may combine or interact to predict MVPA, four moderation models were proposed and tested. Self-reported measures of intention strength, goal conflict and trait self-control were collected from participants at T1, and levels of self-reported MVPA were recorded four weeks later at T2. Consistent with hypotheses and an abundance of accumulated evidence in the PA literature, a medium-sized intention-behaviour relationship ($r = 0.346$) was observed (Armitage & Conner, 2001; Downs & Hausenblas, 2005; Hagger et al., 2002; McEachan et al., 2011, 2016). However, contrary to hypotheses, neither goal conflict nor trait self-control significantly moderated the intention-behaviour relationship.

### Physical Activity Intention-Behaviour Relationship in Emerging Adulthood

The intention-behaviour relationship has been examined extensively in the literature (Rhodes et al., 2022), but underexamined amongst the emerging adult

population. From a correlational perspective, tests of the relationship between intention and PA across a wide age range demonstrate a large effect of intention on PA behaviour ($r = 0.50$) (Hagger et al., 2002). Additionally, de Bruijn and colleagues (2012) investigated the predictive utility of the TPB on exercise identity and PA behaviour with a mean age similar to our sample. In this population of undergraduate students ($M_{age} = 21.4$), it was found that intention was strongly correlated with PA behaviour ($r = 0.54$) similar to findings from Hagger and colleagues (2002). The strength of the association between intention and behaviour found in the present study ($r = 0.346$) provides additional support for the observation that stronger intentions predict greater engagement in PA, which has proven to be robust across several studies and health behaviours in older and younger adult populations (Armitage & Conner, 2001; Downs & Hausenblas, 2005; Hagger et al., 2002; McEachan et al., 2011, 2016).

Despite evidence supporting a strong association between intentions and PA behaviour, research also shows many individuals struggle to act on their intentions to engage in PA (Rhodes & de Bruijn, 2013). In a recent meta-analytic examination of the PA intention-behaviour relationship, Rhodes & de Bruijn (2013) showed that 48% of adults with the intention to meet MVPA guidelines of 150 or more weekly minutes of MVPA, failed to engage in a sufficient amount of MVPA to meet this desired standard. Interestingly, amongst the 62 participants in the current study whose intentions to meet MVPA guidelines were strong (reported an intention strength score greater than or equal to 5/7), only 12 reported not meeting the guidelines. This statistic estimates the intention-behaviour gap at approximately 19.4% ([12/62] x 100) in emerging adults, which is

considerably less than the 48% observed by Rhodes and de Bruijn (2013). The smaller

intention-behaviour gap observed in the current study is likely a result of the sample

reporting high levels of engagement in weekly MVPA. Indeed, 75.8% (100/132) of the

total sample reported meeting or exceeding current MVPA guidelines. Comparatively,

results from the 2018 and 2019 Canadian Health Measures Survey showed only 58% of

Canadian adults aged 18 to 39 years old accumulated at least 150 minutes of MVPA per

week. To put in perspective how active the current sample was, average engagement in

MVPA per day was 75.5 minutes (528.75 minutes of MVPA per week/7 days per week).

However, it must be taken into consideration that the study utilized self-report measures

of MVPA engagement, which are prone to overestimations in overall PA levels (Colley et

al., 2019; Helmerhorst et al., 2012).

Although, majority of the sample was effective at translating their PA intentions

into action, a sizeable intention-behaviour gap (19.4%) was still evident. This study

provides novel contributions to the literature by investigating the PA intention-behaviour

relationship and quantifying the existence of an intention-behaviour gap in an

underexamined population. The existence of a gap in emerging adulthood points to the

involvement of additional constructs beyond one's intentions in facilitating the translation

to PA behaviour. Therefore, more research is needed to investigate factors that can act as

potential facilitators and inhibitors of the process of action control to help emerging

adults act on their PA intentions.

**Goal Conflict and the Intention-Behaviour Relationship**

Goal conflict occurs when progress towards multiple goals cannot be achieved in concert, forcing the individual to prioritize progress towards one goal at the expense of others (Riediger & Freund, 2004). As previously cited, examination of goal conflict with respect to PA engagement has demonstrated it reliably weakens the association between intention and behaviour (Rhodes et al., 2022). Although none of the studies showing this moderating effect involved emerging adults, it was reasoned that due to the increase in responsibilities required of emerging adults as they work to become self-sufficient, they would be susceptible to high goal conflict and that higher goal conflict would be associated with a weaker intention-behaviour relationship.

While participants did report goal conflict was present in their lives, at levels greater than the scale mid-point, there was no moderating effect of the intention-PA relationship. This null finding, should be interpreted in light of the observation that study participants reported very high levels of MVPA engagement, which is not characteristic of other studies that have found goal conflict to be an intention-behaviour moderator. More specifically, out of the 94 participants to report higher levels of goal conflict (a score greater than 4/7 on the goal conflict measure), 70 (74.5%) were meeting or exceeding guidelines of 150 or more weekly minutes of MVPA. Thus, despite goal conflict being present in participants' lives, most were still able to be physically active.

The observation that many individuals with high goal conflict were engaging in high levels of MVPA could be explained by goal prioritization, which was not accounted for in the current study. Goal prioritization captures how strongly one is motivated to

achieve a goal in relation to other goal pursuits (Chatzisarantis et al., 2016a, 2016b; Conner et al., 2016) with the recognition that people may have strong motivations to accomplish many tasks, yet how strongly they value these goals relative to one another can dictate which goals have a higher likelihood of being accomplished. Intuitively, higher priority goals are more likely to be acted upon prior to the pursuit of lower priority goals. In the study by Bailis and colleagues (2011) reviewed earlier, a negative effect of goal conflict on PA was found only among participants who placed high importance on their university education. Although the effect observed in this study signalled prioritization of academic goals over PA, these findings indicate how one prioritizes or values each of their goal pursuits can have a significant impact on the corresponding outcomes.

Given the high levels of MVPA observed in the present sample, it seems reasonable to infer that while participants may have experienced high goal conflict, a high level of priority may have been bestowed onto their PA goals in relation to their other goal pursuits. For example, many participants could have scheduled time in their day to be physically active and worked around these activities while pursuing their other goal commitments. In cases where regular engagement in MVPA is considered one of the highest priority goals, the occurrence of multiple competing goals may not have a significant impact on their ability to be regularly active at that intensity. Future goal conflict research should include measures of the relative value, or prioritization, of each goal pursuit to get a better indication of how goal conflict can disrupt one's ability to act on their PA intentions.

**Trait Self-Control and the Intention-Behaviour Relationship**

Trait Self-Control refers to the dispositional ability to regulate one's thoughts, emotions, or behaviours in pursuance of desired goals across various situations and settings (Baumeister et al., 2007). Previous research has demonstrated stronger trait self-control is associated with increased PA behaviour and a smaller intention-behaviour gap (Bertrams and Englert, 2013; de Ridder et al., 2012; Finne et al., 2019; Hagger et al., 2019). As such, it was hypothesized greater levels of trait self-control would be associated with a stronger intention-behaviour relationship. Contrary to this hypothesis, trait self-control did not moderate the intention-behaviour relationship independently or in combination with goal conflict.

Despite existing research providing evidence of a potential moderating role of trait self-control, this is an area of study that deserves future research attention. One area of interest would be to explore trait self-control in concert with other behavioural capabilities associated with self-regulation. Indeed, a lack of moderation effect observed in the current study suggests the use of self-regulation behaviours, such as action and coping planning, may be more important consciously-controlled mechanisms that enable people to act on their PA intentions in addition to, or rather than, their innate ability to exert self-control. Prominent action control perspectives, such as the Health Action Process Model and the Multi-Process Action Control Model, emphasize the importance of self-regulatory strategies in facilitating the translation of intentions into action (Rhodes & Yao, 2015). These models also highlight the potential for such strategies to be enabling in the midst of multiple competing goals and distractions (Rhodes & Yao, 2015).

Although the hypothesized moderated moderation effects were not observed, it is interesting to note results showed that when PA intentions were weaker, lower levels of self-control were associated with greater PA engagement. These results are similar to those reported by Pfeffer and Strobach (2020) where most participants in their study with below-average levels of trait self-control reported meeting PA guidelines (67.9%). When considered together with the current findings, it seems possible that individuals who perceive their self-control abilities are limited, actively use volitional self-regulatory tactics such as action and coping planning to help act on their PA intentions. Future research should explore how the use of self-regulatory behaviours impacts the intention-behaviour relationship in emerging adults as well as the relationship between the use of self-regulatory behaviours and trait self-control.

Implementation of action and coping plans, in particular, have been associated with greater PA engagement and a smaller intention-behaviour gap (Carraro & Gaudreau, 2013; Conner et al., 2010; Norman & Conner, 2005; Scholz et al., 2008; Sniehotta et al., 2005). Additionally, evidence suggests self-regulation strategies are the most reliable behaviour change techniques (BCTs) included in PA interventions that yield large effect sizes for PA behaviour change (Bélanger-Gravel et al., 2013; Carraro & Gaudreau, 2013; Conn et al., 2011; Gollwitzer & Sheeran, 2006; Kwasnicka et al., 2013; McEwan et al., 2016; Michie et al., 2009; Rhodes & Pfaeffli, 2010). Given the proven effectiveness of self-regulatory strategies and the ease at which they can be implemented into one's lifestyle, an interesting avenue of future research would be to explore the moderating

effects of action and coping planning among emerging adults experiencing high goal conflict.

**Caveats Relating to COVID-19**

The results from the current study make several novel contributions to the literature, yet it is important to note they may have been influenced by the effects of the Coronavirus disease (COVID-19) pandemic. The rapidly transmissible nature of the virus resulted in worldwide deaths and hospitalizations placing an insurmountable burden on healthcare systems as a result (Lyengar et al., 2020). In response, governments across the globe, including Canada, implemented public health protocols at varying degrees of severity to mitigate the spread of COVID-19 (Haug et al., 2020). At the peak of the pandemic, many of these regulations, including stay-at-home mandates, gym closures, and the suspension of organized sports, made it difficult for people to engage in adequate amounts of movement, yet alone PA. Indeed, significant declines in PA engagement as well as large increases in sedentary behaviour during the COVID-19 pandemic have been widely documented around the world (Bertrand et al., 2021; Castañeda-Babarro et al., 2020; McCarthy et al., 2021; Stockwell et al., 2020). However, at the time of data collection in the present study, many of these restrictions were being eased in Ontario (Office of the Premier, 2021). It is possible participants may have been cognisant of the lack of movement being accumulated in comparison to before the pandemic and actively sought to establish a healthier pattern of behaviour upon relaxation of restrictions. This increase in PA motivations could have factored into why the majority of the sample

population were meeting or exceeding PA guidelines, despite reporting high goal conflict. In a recent editorial, Ding and colleagues (2020) investigated community interest in PA before and during COVID-19 outbreaks in Australia, the UK and the USA using Google trends data. It was found that in all three countries, the frequency of google searches including "exercise" related terms increased after lockdown protocols were implemented and remained elevated thereafter (Ding et al., 2020). Ever since records of google trends data began in 2004, the volume of exercise related searches at a population level has never been higher. Additionally, in a recent survey conducted by Sport England, it was reported that 62% of adults in England believe exercise is "more important" than before the start of the pandemic (Sport England, 2020). Therefore, stronger desires to be physically active could have contributed to greater MVPA engagement, despite high levels of goal conflict.

Stronger PA motivations at a population level could also be attributed to participants being more readily aware of the mental health burden resulting from the pressures of the pandemic. The implementation of stay-at-home mandates, school and business closures, as well as travel bans during the pandemic cultivated a multitude of stressors in individual's lives in the form of social isolation, familial health concerns, and a lack of financial security among many others. Ultimately the prevalence of these stressors lead to an increase in the susceptibility of developing adverse mental health outcomes. Indeed, many studies have demonstrated a higher prevalence of negative mental health outcomes as a consequence of the pandemic (Cost et al., 2022; Dozois, 2021; Gadermann et al., 2021; Samji et al., 2021; Vindegaard & Benros, 2020; Violant-

Holz et al., 2020), with one meta-analysis finding a 16-28% increase in anxiety and depressive symptoms as well as a 5% increase in self-reported stress since the start of the pandemic (Rajkumar, 2020). Given strong links between PA engagement and positive mental health outcomes (Biddle et al., 2019; Bize et al., 2007; Crews & Landers, 1987; North, et al., 1990; Petruzello et al., 1991; Rebar et al., 2015), participants may have held stronger desires to adopt PA as a coping mechanism. In the same editorial by Sport England, 65% percent of adults in England believe exercise is beneficial to their mental health (Sport England, 2020). Additionally, Ferguson and colleagues (2021) conducted a qualitative study examining emotional states and coping strategies of Canadian adolescents during the first wave of the COVID-19 pandemic. It was revealed that PA was frequently considered as a valuable coping mechanism to participants as a means of mitigating the pressures of the pandemic (Ferguson et al., 2021). Ultimately, stronger motivations to be physically active could have resulted in greater engagement in MVPA in the sample population. This relationship may have even been mediated by goal prioritization, where stronger motivations lead to a higher priority being placed on one's PA goals.

**Strengths**

There are several strengths to consider regarding the present study including the utilization of a theory-based approach to examine PA behaviour in a population that has been otherwise understudied, particularly in the intention-behaviour literature. Additionally, the use of a prospective design allows for a clearer understanding of the

41

temporal sequencing of the study variables and outcomes. Lastly, the use of online questionnaire-based assessments allowed us to reach a large sample of emerging adults across multiple disciplines such as post-secondary education or the workforce.

**Limitations**

Despite the prospective design and relatively broad sample utilized to assess potential moderators of the intention to behaviour relationship in emerging adults, there a number of limitations to consider. For instance, engagement in MVPA was assessed subjectively using a self-report questionnaire, which is prone to recall errors and social desirability effects that can often lead to overestimations of true activity levels (Colley et al., 2019; Helmerhorst et al., 2012). Previous research has found that the intention-behaviour gap is magnified when device-assessed measures (e.g., accelerometry) are used to assess PA (Rhodes et al., 2020). Participants were also asked to indicate their PA levels in the past seven days, which may not have been reflective of their typical behaviour. Furthermore, PA was assessed in the month of November and may have been affected by seasonal variations that could have influenced PA levels (Carson & Spence, 2010; Sallis et al., 2019; Tucker & Gilliland, 2007; Turrisi et al., 2021). Also, by measuring average goal conflict at a single timepoint, we were unable to capture the dynamic nature of goal conflict within people, over time, and how these variations may relate to participant's PA levels. Future studies could investigate how changes in goal conflict affect PA levels by utilizing EMA based protocols. EMA is a real-time data capture strategy that allows researchers to assess constructs that vary over time or space, by repeatedly sending

smaller scale surveys or prompts to participants electronically over the course of a day (Dunton, 2017). Single-item assessments were utilized to measure PA behavioural intention strength and conflict, thus their psychometric characteristics could not be assessed (i.e., internal consistency, reliability). Single-item measures were used to limit overall participant burden, given the many measures included within the broader questionnaire administered as part of Study 1 in the larger parent cohort study (ADAPT). Although the reliability and validity of the assessments could not be confirmed, single-item measures are commonly utilized for non-complex constructs such as intention (Grant et al., 2020; Kaushal, 2016; Li & Chan, 2008; Rhodes & Lithopoulos, 2022).

The lack of moderation effects for trait self-control could be associated with the measure of self-control administered to participants. Previous studies analyzing the effect of trait self-control on PA behaviours have typically utilized the brief version of the TSC (Pfeffer & Strobach, 2020; Stork et al., 2017). Due to concerns over the burden to participants of responding to multiple questionnaires in the parent ADAPT study, the present study utilized a six-item abbreviated version of the TSC. Although the item set exhibited good internal consistency, it is possible the scores from the six-item measure may not have captured an accurate representation of the construct. It would be interesting to explore the use of more specialized measures of self-control to directly assess the components of self-control that are required to engage in regular MVPA. For example, components of self-control such as response inhibition, sustained attention, and the ability to endure physical discomfort could be assessed to better understand how these more

nuanced dispositional capabilities of self-control might impact the intention-behaviour relationship.

**Conclusion**

In summary, the present study revealed a significant relationship between PA intention and behaviour in a sample of emerging adults, yet goal conflict and trait self-control were not significant moderators of the intention-behaviour relationship. Given the null findings, utilization of volitional self-regulation behaviours could be more effective than one's innate self-control ability at reducing the characteristic declines in PA that commonly occur during emerging adulthood. Additionally, goal prioritization may be a critical factor to consider when investigating the effect of goal conflict on PA. Future research could investigate the interaction between goal conflict and self-control further using more objective measures or in combination with self-regulation strategies such as action and comping planning.

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