

**DOES THE PLAN FIT? THE EFFECTIVENESS OF COMBINING  
IMPLEMENTATION INTENTIONS AND REGULATORY FIT FOR  
INCREASING PHYSICAL ACTIVITY AND DECREASING  
SEDENTARY BEHAVIOUR**

by

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## Abstract

The purpose of this study was to examine the effectiveness of combining implementation intentions (II) and regulatory fit in the context of two important health goals: increasing leisure time physical activity and decreasing leisure time sedentary behaviour. Implementation intentions specify exactly how, when, and where a behaviour will occur and can be an effective method of increasing goal enactment. Regulatory fit occurs when a goal or strategy used to achieve the goal matches an individual's regulatory orientation. University students ( $N = 180$ ) were randomly assigned to a goal (increase activity/decrease screen time) and an experimental condition (II/non-II). Participants formed a goal to increase their physical activity or decrease their screen time over the following four weeks according to their random assignment. Participants' commitment to their goal was monitored over the course of the study. The II group also formed a detailed plan regarding how they would accomplish their goal. Regulatory fit was determined based on group assignment and score on the regulatory focus questionnaire. Physical activity and screen time were assessed with self-report questionnaires. Follow-up occurred online four weeks after baseline. Data were analyzed separately by goal type using linear regressions to examine the effects of regulatory fit, experimental condition, and goal commitment on the behaviour variables. The regulatory fit manipulation was not successful. Among those with the physical activity goal, no significant effects emerged for the experimental variables. Among those with the screen time goal and in the fit, II group, stronger goal commitment tended to be associated with increased participation in moderate physical activity,  $\beta = .17$ ,  $t(22) = .94$ ,  $p = .36$ . Also,

participants who set II for the screen time goal and were committed to this goal tended to report less screen time than participants with lower goal commitment ( $\beta = -.40$ ,  $t(69) = -2.05$ ,  $p = .05$ ). Findings provide preliminary insight into the effectiveness of II and the importance of goal commitment in interventions aiming to reduce sedentary behaviour.

## **Co-Authorship**

This thesis presents the original work of Carolyn Barg in collaboration with her advisor, Dr. Amy Latimer.

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## Definitions of Key Terms

**Approach goal:** A goal that focuses on attaining a positive state

**Avoidance goal:** A goal that focuses on avoiding a negative state

**Regulatory focus:** A motivational system regulating goal-directed behaviour

**Promotion focus:** Someone with a promotion focus is concerned with the presence or absence of positive outcomes, has ideal self-regulation (i.e., focuses on end-states involving aspirations and accomplishments), and uses eager means of goal attainment (i.e., ensures gains and ensures against errors of omission)

**Prevention focus:** Someone with a prevention focus is concerned with the presence or absence of negative outcomes and has ought self-regulation (i.e., focuses on end-states involving responsibilities and safety), and uses vigilant means of goal attainment (i.e., ensures correct rejections and ensures against errors of commission)

**Regulatory fit:** Regulatory fit is achieved when goal type fits with regulatory focus

## **Chapter 1**

### **Introduction and Literature Review**

## **1.1 Background and Rationale**

### ***1.1.1 Physical Activity***

Being physically active has many health benefits. These include improved cardiovascular health, decreased incidence of diabetes, cancer and premature death (Warburton, Nicol, & Bredin, 2006), reduced anxiety and depression, and increased general well-being and positive mood (Stephens, 1988). The relationship between activity and health is clear and widely known. Despite this, almost half of all Canadians over the age of 12 reported being inactive in 2005 (Gilmour, 2007). Therefore there is significant room for improvement in physical activity promotion to help increase the proportion of the population who achieve these health benefits.

The issue of insufficient physical activity has been shown to be of particular relevance in young people making the transition from high school to university. Research shows a significant decline in vigorous physical activity among students at the end of high school and in their first year of university (Bray & Born, 2004; Leighton & Swerisson, 1995). If a sedentary lifestyle is adopted during this important transition period, it may become well-established and remain throughout adulthood (Reynolds et al., 1990). Therefore targeting young adults to increase their levels of physical activity during their university years may be especially important. The current study did this by testing strategies for increasing leisure time physical activity among a sample of university students.

### ***1.1.2 Leisure Time Sedentary Behaviour***

A complementary field of study to physical activity is that of sedentary behaviours. The study of leisure time sedentary behaviours and their relationship to

health is an emerging one (e.g., Rouse & Biddle, 2010; Hamar, Biddle, Soos, Takacs, & Huszar, 2010; Lazarou & Soteriades, 2010) and the majority of this type of research to date has focused on children and adolescents. Spending more leisure time in sedentary behaviour has been found to have negative health consequences such as increased incidence of metabolic syndrome (i.e., a cluster of risk factors for cardiovascular disease and type 2 diabetes; Ardern & Janssen, 2007). A recent study of adolescents found that the likelihood of having metabolic syndrome increased as daily screen time (i.e., number of hours spent watching television and using a computer during free time) increased, independent of physical activity (Mark & Janssen, 2008). Importantly, a similar pattern has now been shown in adults. A study (Shields & Tremblay, 2008b) of the Canadian population (aged 20-64) found that there is a positive relationship between both hours spent watching television and hours spent using a computer and obesity for men and women. This relationship holds, even after controlling for levels of leisure-time physical activity and consumption of fruits and vegetables. Data from the 2007 Canadian Community Health Survey indicate that 29% of Canadian adults watch an average of more than two hours of television per day, and of those, 19% watch at least 3 hours per day (Shields & Tremblay, 2008a). In terms of university students, a sample of students from the United States and Japan reported playing video games, watching television and using a computer to surf the internet or use e-mail for an average of 3.28 hours per day (Kobayashi, 2007). Reducing sedentary behaviour should therefore be an important health goal, independent of increasing physical activity, particularly among university students.



### ***1.1.3 Intentions***

Given the extensive research and media attention surrounding the importance of being physically active and avoiding sedentary leisure time, it is not surprising that many people form goal intentions to be active. Goal intentions specify a desired endpoint (Gollwitzer, 1999). For example, a goal intention regarding physical activity might be “I intend to exercise more often” or “I intend to lose 10 pounds”. According to the theory of planned behaviour (Ajzen, 1991), intentions are assumed to capture the motivational factors that influence a behaviour and indicate how hard people are willing to work to perform the behaviour. The stronger an intention is, the more likely the behaviour will be performed (Ajzen). However, forming strong intentions to act does not necessarily lead to behaviour change. This is often referred to as the “intention-behaviour gap”. A meta-analysis of the intention-behaviour relationship found that a medium-to-large sized change in intention only leads to a small-to-medium sized change in behaviour (Webb & Sheeran, 2006). Further, it has been demonstrated that the lack of consistency between intentions and behaviour is largely due to those who have positive intentions but fail to act (as opposed to those who perform the behaviour despite negative intentions to do so; Sheeran, 2002). Therefore even if people form the intention to be more active or to decrease sedentary behaviour, there is a good chance that they will not successfully translate this intention to behaviour.

In the context of physical activity, a meta-analysis examining the theory of planned behaviour and physical activity found that intentions were a significant predictor of behaviour with beta weights ranging from .047-.51 depending on which other predictors were included (Hagger, Chatzisarantis, & Biddle, 2002). Interestingly, age was found to moderate the intention-behaviour relationship such that older samples were more

likely to follow through with their intentions than were younger samples. This indicates that particularly in sample of university students, forming intentions to be physically active will not necessarily lead to the behaviour itself.

#### ***1.1.4 Implementation Intentions***

Forming implementation intentions is one strategy to increase goal enactment. Implementation intentions are detailed plans that specify how to follow through with an intention. This type of planning results in developing success scenarios and preparatory strategies for how to approach a difficult task. Engaging in planning makes it more likely that intentions will be translated into behaviour (Gollwitzer, 1999). Implementation intentions are based in the model of action phases (Gollwitzer, 1993). The model of action phases emphasizes the difference between the motivational matter of intention formation and the volitional matter of intention realization. Implementation intentions focus on the processes that lead to intention realization (Sheeran, Milne, Webb, & Gollwitzer, 2005). They do this by specifying exactly how, when, and where the goal behaviour will occur. Implementation intentions commit an individual to engage in their goal behaviour when the situational cues are encountered (Gollwitzer, 1999). An example of an implementation intention is “After work on Thursday, I will go to the gym and run on the treadmill for 30 minutes”. Forming implementation intentions allows the focus to shift from having to be in complete conscious control of goal-directed behaviour, to being partially controlled by predetermined situational cues (Gollwitzer, 1999).

Implementation intentions are said to be beneficial for two reasons; the first is that the process of making a detailed plan creates strong, accessible memories of how and when to act (Gollwitzer, 1993; Orbell, Hodgkins, & Sheeran, 1997). Secondly, forming

implementation intentions increases the speed with which people recognize opportunities to act. Therefore when presented with the appropriate situation, someone who has formed an implementation intention will respond quickly and with a well-remembered, predetermined plan (Gollwitzer, 1993). Indeed, a study by Webb and Sheeran (2008) confirms the finding that implementation intentions are effective not because they increase the strength of the goal intentions, but because they make situational cues more accessible and strengthen the link between cues and the desired response. These authors performed a meta-analysis of implementation intention studies and found that forming implementation intentions had, on average, very small effects on goal intention strength. As a follow-up to the meta-analysis, Webb and Sheeran conducted a study that required participants to form either an implementation intention related to their goal behaviour (to collect a coupon) or unrelated to this goal, and complete a lexical decision task assessing cue accessibility and the strength of cue-response links. Results showed that participants who had formed the relevant implementation intention were more likely to complete the goal behaviour and that this relationship was mediated by both cue accessibility and the strength of cue-response links.

Implementation intentions have been shown to be an effective way of improving the intention-behaviour relationship for many types of activities. For example, in a study of breast self-examination (BSE) adherence, it was found that forming implementation intentions significantly increased BSE performance, even when both groups had strong goal intentions (Orbell et al., 1997). Similarly, implementation intentions have been found to be effective in increasing the successful completion of a written report over a holiday (Gollwitzer, 1993), adherence to a daily vitamin consumption regimen (Sheeran

& Orbell, 1999), healthy eating (Verplanken & Faes, 1999), quitting/reducing smoking (Armitage, 2008) and reducing alcohol consumption (Armitage, 2009). In a 2006 meta-analysis of 94 studies, Gollwitzer and Sheeran found that implementation intentions had a positive effect on goal attainment with a, average effect size of .65. This is considered a medium-to-large effect (Cohen, 1992).

#### 1.1.4.1 Implementation Intentions and Physical Activity

There have been several studies to examine the effectiveness of implementation intentions for increasing physical activity behaviour. It has been found that forming implementation intentions increases participants' adherence to a strength training program over an 11-week period (Murray, Rodgers, & Fraser, 2009). Another study showed that participants who formed implementation intentions to exercise and also received text message reminders to exercise were most successful at increasing their exercise levels (Prestwich, Perugini, & Hurling, 2009). In a study of adolescents' physical activity, forming implementation intentions was found to influence physical activity behaviour (Dombrowski & Luszczynska, 2009). As well, forming implementation intentions has been shown to increase physical activity participation in a university population (Milne, Orbell, & Sheeran, 2002; Prestwich, Lawton, & Conner, 2003), in people with a spinal cord injury (Latimer, Martin Ginis, & Arbour, 2006), in orthopaedic rehabilitation patients (Reuter, Ziegelmann, Lippke, & Schwarzer, 2009), in a sample of sedentary women (Arbour & Martin Ginis, 2009), and in a sample of German women (Stadler, Oettingen, & Gollwitzer, 2009).

While there is research indicating the effectiveness of implementation intentions in the domain of physical activity, their effectiveness for decreasing leisure time

sedentary behaviour is less clear. This study provides a preliminary examination of the effectiveness of implementation intentions for reducing leisure time sedentary behaviour.

#### ***1.1.5 Goal Type***

The first step in changing health behaviour is often forming a personal goal to do so. A goal is conceptually similar to an intention (Gollwitzer, 1999). Goals serve to direct an individuals' motivation by guiding behaviour toward or away from an outcome (Elliot & Niesta, 2009). There are two broad types of behavioural goals that one can make: approach goals and avoidance goals. Approach goals are those that emphasize attaining a positive state, while avoidance goals emphasize avoiding a negative state (Elliot, Sheldon, & Church, 1997). An example of an approach goal would be to become more of a leader at work, while the corresponding avoidance goal would be to not become a follower at work (Elliot et al., 1997). Both goals may have the same desired outcome (to be more successful in the workplace, for example) but the means of accomplishing this outcome is different (Coats, Janoff-Bulman, & Alpert, 1996).

Past research indicates that people tend to have less success at achieving avoidance goals compared to approach goals, and that this is especially true over longer time periods. Specifically, participants in a study of eating habits who chose to pursue the avoidance goal (snacking on fewer unhealthy foods) consumed more calories and fat two weeks after baseline than those who chose to pursue the approach goal (snacking on more healthy foods; Sullivan & Rothman, 2008). There are also negative consequences associated with pursuing avoidance goals. These include finding the goal pursuit experience less enjoyable and fulfilling, and experiencing decreased self-esteem and decreased subjective well-being. In a study of university students, participants were asked

to identify eight personal goals that they wanted to achieve over the course of the upcoming semester. Results showed that participants who identified a higher number of avoidance goals than approach goals reported less satisfaction with their progress at the end of the semester. They also reported the experience of pursuing their goals to be less enjoyable and fulfilling, and they were more likely to report that the pursuit of their goals decreased their self-esteem and life satisfaction (Elliot & Sheldon, 1997). A similar study in which students were asked to list ten personal strivings and identify them as approach or avoidance in nature, found that participants reporting a greater number of avoidance strivings experienced lower levels of subjective well-being (Elliot, Sheldon, & Church, 1997). Having a higher percentage of avoidance goals as compared to approach goals has also been found to be related to higher levels of depression and lower optimism. Also, people report that their past avoidance goals have been more difficult to achieve than approach goals and that they think this type of goal will be more difficult to achieve in the future (Coats et al., 1996).

Given the body of evidence indicating that pursuing avoidance goals is detrimental to one's success and well-being, it might be argued that the best solution would be to encourage people to set approach goals rather than avoidance goals. However research has found that people are generally more inclined towards one type of goal over the other. One study involved a series of factor analyses of measures of extraversion, neuroticism, positive and negative emotionality and behavioural activation system (BAS; said to facilitate behaviour and produce positive affect) and behavioural inhibition system (BIS; said to inhibit behaviour and produce negative affect). Results demonstrated support for a two-factor structure representing approach (extraversion,

positive emotionality and BAS) and avoidance temperaments (neuroticism, negative emotionality and BIS; Elliot & Thrash, 2002). Additional analyses in the Elliot and Thrash series provided consistent evidence that an approach temperament is predictive of the pursuit of approach goals (and not avoidance goals) and avoidance temperament is predictive of the pursuit of both avoidance goals and approach goals. Furthermore, many important goals are simply of the avoidance type and cannot be easily modified to become approach goals without significantly changing the goal itself (e.g., eating less unhealthy food, being less sedentary, driving your car less etc.). These findings, combined with the fact that people tend to be less successful with their avoidance goals, indicates the importance of finding strategies to help people better accomplish their avoidance goals.

#### 1.1.5.1 Goal Type and Health Behaviour

Health behaviour change researchers have looked at a variety of approach and avoidance goals. Research with approach health goals includes performing breast self-examinations (e.g., Cox, Montgomery, Rai, McLaughlin, Steen, & Hudson, 2008), daily vitamin consumption (e.g., Sheeran & Orbell, 1999), fruit and vegetable consumption (e.g., Alexander et al., 2010), condom use (e.g., Harvey, Kraft, West, Taylor, Pappas-DeLuca, & Beckman, 2009), and physical activity (e.g., Bozak, Yates, & Pozehl, 2010). Research with avoidance goals includes reducing alcohol consumption (e.g., Armitage, 2009), smoking cessation (e.g., McClure, Ludman, Grothaus, Pabiniak, & Richards, 2009), and eating less unhealthy food (e.g., Sullivan & Rothman, 2008). In general, these studies target one or more theoretical constructs (e.g., self-efficacy, outcome

expectancies, attitudes, etc.) through an intervention of some sort (e.g., learning how to perform breast self-examinations, planning etc.) in an attempt to change behaviour.

#### 1.1.5.2 Goal Type and Physical Activity

In the context of physical activity, an example of an approach goal would be to increase the amount of physical activity you do. An example of an avoidance goal would be to decrease the amount of time you are sedentary. Because the focus of these two goals is so different (i.e., trying to move towards a desirable state versus trying to move away from an aversive state; Elliot, Sheldon, & Church, 1997), it follows that the most effective strategies for achieving them would also be different.

#### ***1.1.6 Interventions Targeting Sedentary Behaviour***

Health researchers and practitioners have developed many interventions in an attempt to help people achieve their health-related goals. Much is known about effective physical activity interventions (Task Force on Community Preventative Services, 2002). A systematic review has provided recommendations for interventions aiming to increase physical activity (Task Force on Community Preventative Services). Recommendations included the use of point-of-decision prompts, community-wide campaigns, school-based physical education, social support interventions in community settings, individually adapted health behaviour change programs, and enhancing access to places to engage in physical activity.

Less is known about strategies to reduce sedentary behaviour. The evidence demonstrating the health benefits that come from reducing sedentary behaviour is clear (e.g., Shields & Tremblay, 2008b). It is therefore important to develop and test the effectiveness of interventions that aim to reduce sedentary behaviour. To date, there are



very few intervention studies of this type and most of those that have been done target children or adolescents (e.g., Goldfield et al., 2006; Epstein, Saelens, Myers, & Vito, 1997). One study had children reduce their television viewing and computer use by having their parents pay them an allowance as a reward for doing so (Epstein et al., 2008). While this method did prove to be effective for reducing screen time, it is not an appropriate method for use with adults. Another study aiming to reduce screen time targeted Latina girls in middle school and the intervention was run through the schools (Spruijt-Metz, Nguyen-Michel, Goran, Chou, & Huang, 2008). This media-based physical activity intervention was also successful in reducing sedentary behaviour. Research examining the effectiveness of implementation intentions for reducing sedentary behaviour with the adult population is required to determine whether forming implementation intentions is a useful strategy for this population.

#### ***1.1.7 Implementation Intentions and Goal Type***

Gollwitzer (1999) demonstrated that implementation intentions can be particularly helpful when opportunities to act are hard to detect. Therefore, implementation intentions may be especially useful in helping people to achieve avoidance goals. This has been found to be the case with avoidance goals in the context of eating habits. The effectiveness of implementation intentions on the avoidance goal of eating fewer unhealthy snacks was recently examined. In the study (Sullivan & Rothman, 2008), participants chose whether they wanted to pursue an approach goal (eat more healthy snacks) or an avoidance goal (eat fewer unhealthy snacks) and were then randomly assigned to either the implementation intention group or the control group. Those in the implementation intention group were asked to plan what they would (or would not) eat,

as well as where and when they would carry out their plan. Results showed that implementation intentions were an effective strategy for avoidance goal pursuit and that their effect was stronger after a longer time period (two weeks compared to one). It was suggested that when an avoidance goal needs to be maintained over a long period, implementation intentions may be especially beneficial. As good health is a long-term goal, specific goals related to good health generally need to be maintained over time. Implementation intentions are therefore a logical strategy for the pursuit of avoidance health goals.

The majority of research on implementation intentions and health behaviours to date has focused on approach goals (Sullivan & Rothman, 2008), and as described in the implementation intentions section above, implementation intentions are generally effective at increasing the performance of the goal behaviour. For example, implementation intentions have been found to be beneficial in goal achievement for the approach goals of breast self-examination performance (Orbell et al., 1997), daily vitamin consumption (Sheeran & Orbell, 1999), and physical activity participation (Milne et al., 2002; Prestwich et al., 2003; Latimer, Martin Ginis, & Arbour, 2006). Implementation intentions therefore are a well supported method of increasing goal enactment for approach health goals.

#### ***1.1.8 Regulatory Focus***

People tend to have a preference for one type of goal (approach or avoidance) over the other (Elliot & Thrash, 2002). This preference suggests that there may be something about individual disposition that affects how goals are selected. One theory that examines these differences is Higgins' regulatory focus theory (Higgins, 1997).

Regulatory focus theory is a theory of self-regulation that emphasizes the differences between individuals' sources of motivation. The theory posits that there are two types of self-regulation. Ideal self-regulation focuses on end-states involving aspirations and accomplishments; someone with this type of regulation is said to be promotion-focused. Promoters are concerned with the presence or absence of positive outcomes. On the other hand, ought self-regulation focuses on end-states involving responsibilities and safety; someone with this type of regulation is said to be prevention-focused. Preventers are concerned with the presence or absence of negative outcomes (Higgins).

These tendencies were demonstrated in a study by Shah, Higgins and Friedman (1998) whereby individuals with a promotion focus were better at solving anagrams when they were told they would gain a point for each one (a positive outcome) and prevention-focused individuals were better when they were told they would not lose a point (a negative outcome). These two types of orientation develop over time and are reflective of individuals' subjective history of success with promotion and prevention goal attainment. Research (Higgins et al., 2001) has found that subjective history of success with promotion goals is related to using eager means or strategies, which refers to ensuring 'hits' or gains and ensuring against errors of omission (i.e., a loss of accomplishment). Similarly, a history of success with prevention goals is related to using vigilant means, which refers to ensuring correct rejections and ensuring against errors of commission (i.e., making a mistake). For example, someone with a promotion focus who is trying to achieve a high exam score may study extra material or organize a study group while someone with a prevention focus who is trying to achieve the same goal may instead ensure that he or she knows the required material and try to avoid distractions prior to the

test (Higgins et al.). It follows then that subjective history of success which manifests as regulatory focus may also affect the type of goal that people choose to work towards.

#### 1.1.8.1 Regulatory Focus and Health Behaviours

Research shows that regulatory focus affects individuals' likelihood of success at achieving different health goals. For example, in a longitudinal study of smoking cessation and weight loss, individuals with a promotion focus were more likely to successfully initiate both smoking cessation and weight loss but those with a prevention focus were more successful at maintaining both behaviours (Fuglestad, Rothman, & Jeffrey, 2008). These findings suggest that regulatory focus may affect the success that individuals have at different stages of goal attainment. Those with a promotion focus may be more successful at the beginning (i.e., 1-week follow-up) while those with a prevention focus may be more successful later on (i.e., 4-week follow-up). In addition, a recent study found that promotion-focused individuals were more likely to endorse three primary motivations to exercise (related to feeling good, appearance and health, and impression management) than were prevention-focused individuals (Pomery, Latimer, Rivers, Wallace, Martinez, & Salovey, 2009). This study indicates that an individuals' regulatory focus may affect their motivation and thus preference for different behaviours.

#### ***1.1.9 Regulatory Fit***

It has been proposed that when the means of goal pursuit fits with their regulatory orientation, people “feel right” about the behaviour and attach more value to a goal (Cesario, Grant, & Higgins, 2003; Higgins, 2000). This experience is called regulatory fit. Promoters are concerned with accomplishment and positive outcomes; those with this type of orientation therefore prefer eager means of goal achievement. Thus, promotion

focused individuals experience regulatory fit when working towards an approach goal. On the other hand, preventers are concerned with safety and negative outcomes; this type of orientation therefore prefers vigilant means of goal achievement. Thus, prevention focused individuals experience regulatory fit when working towards an avoidance goal (Higgins, 2000).

The increased value of goals that is experienced with regulatory fit has five manifestations (Higgins, 2000): increased preference for or inclination towards the behaviour (Higgins, Roney, Crowe, & Hymes, 1994), increased motivation to engage in the behaviour (Shah, Higgins, & Friedman, 1998), positive prospective feelings about the behaviour (i.e., imagining feeling good about the behaviour; Idson, Liberman, & Higgins, 2000; Latimer, Rivers et al., 2008), positive retrospective feelings about the behaviour (i.e., feeling good after engaging in the behaviour; Freitas & Higgins, 2002; Latimer, Rivers et al.), and assigning greater value to the behaviour (Higgins, Idson, Freitas, Spiegel, & Molden, 2003). These five indicators were used to measure regulatory fit in this thesis study.

The effectiveness of regulatory fit has been demonstrated in different domains. Regulatory fit has been found to result in increased success in laboratory tasks such as solving anagrams (Förster, Higgins, and Idson, 1998; Shah et al., 1998), solving math problems (Freitas, Liberman, & Higgins, 2002) and performing handgrip tasks (Hong & Lee, 2008). The effectiveness of regulatory fit has also been extended to self-regulatory tasks such as increased ability to resist the temptation of unhealthy snacks and increased motivation to obtain a medical test (Hong & Lee). In terms of goal performance, regulatory fit has also been shown to be beneficial for more everyday tasks such as

completing a report. In this case, experiencing regulatory fit significantly increased participants' goal performance (Spiegel et al., 2004).

There appear to be two different methods of achieving regulatory fit (Aaker & Lee, 2006). One is process-based, such that the way someone thinks about a decision or goal may fit with their regulatory focus. For example in a study that had participants write and submit a report about how they spent their Saturday, promoters instructed to use eagerness strategies (i.e., to imagine when where and how they would write their reports) and preventers instructed to vigilance strategies (i.e., to imagine when, where and how they would avoid writing their reports) to plan how they will accomplish their goal of completing the report has been shown to be an effective method of inducing fit (Spiegel, Grant-Pillow, & Higgins, 2004). The second method is outcome-based, focusing the individual on potential gains or losses that will be experienced as a result of the behaviour. For example, when promoters are given information about what they would gain in making a choice between items (a mug or a pen) and preventers are given information about when they would lose in making the same choice, both groups experience fit. This experience of fit is illustrated by the fact that both groups assign more value to the chosen object when fit is experienced than when it is not (Higgins et al., 2003). We employed both of these methods in this study in an attempt to maximize the effect of regulatory fit. Participants' goal type was framed in either promotion (approach) or prevention (avoidance) terms, thus making use of the outcome-based method. The means of working towards the goal used either an eagerness strategy (participants specified what, when and where they would perform their goal behaviour) or a vigilance

strategy (participants specified what, when and where they would avoid the behaviour) thus making use of the process-based method.

#### 1.1.9.1 Regulatory Fit and Health Behaviour

Research examining the effect of regulatory fit on health behaviours also has shown it to be beneficial particularly in the context of health message interventions (Latimer, Katulak, Mowad, & Salovey, 2005; Latimer, Rivers et al., 2008; Latimer, Williams-Piehota, et al., 2008; Mann, Sherman, & Updegraff, 2004; Spiegel et al., 2004). For example, one study (Spiegel et al., 2004) found that when eating more fruits and vegetables was represented as a promotion-focused issue (i.e., emphasizing the benefits of engaging in the behaviour), messages concerned with accomplishment resulted in regulatory fit and lead to increased fruit and vegetable consumption. Similarly, when eating more fruits and vegetables was represented as a prevention-focused issue (i.e., emphasizing the costs of not engaging in the behaviour), messages concerned with safety resulted in regulatory fit and also lead to increased fruit and vegetable consumption. In addition, a study by Latimer, Rivers et al. found that when inactive participants received messages that fit their regulatory style (promotion or prevention), this led to increased physical activity participation and more positive feelings about physical activity than did messages that did not provide regulatory fit. Furthermore, retrospective feelings about engaging in physical activity were found to mediate the relationship between regulatory fit messages and physical activity for promotion-focused individuals.

#### ***1.1.10 Regulatory Fit and Implementation Intentions***

As summarized above, both implementation intentions and regulatory fit have been shown to be effective in increasing success at accomplishing goals. To date, only

one study has examined the interplay between implementation intentions and a prevention or promotion regulatory focus. In Spiegel, Grant-Pillow and Higgins' (2004) study of regulatory fit, participants' regulatory focus was measured and they were then asked to contemplate when, where, and how they would accomplish the task of completing a report using either eagerness (i.e., to imagine when, where, and how they would write their reports) or vigilance simulation (i.e., to imagine when, where, and how they would avoid writing their reports). Findings demonstrated that regulatory fit as defined by regulatory focus and type of simulation (promotion/eagerness simulation and prevention/vigilance simulation) was an effective means of increasing the rate of completion. However, this study did not measure participants' experience of regulatory fit. It also lacked a control group and therefore the effectiveness of forming implementation intentions across the fit and non-fit conditions could not be examined. A review of the literature did not uncover any research that has examined both implementation intentions and participants' experience of regulatory fit together to determine if the combination is more effective than either one alone.

#### ***1.1.11 Regulatory Fit, Goal Type and Implementation Intentions***

Given the literature reviewed in the previous sections, it follows that the combination of regulatory fit and implementation intentions may be an effective method of increasing goal enactment, above and beyond the effectiveness of either individually. Past research (e.g., Sullivan & Rothman, 2008; Elliot & Sheldon, 1997) has indicated that the pattern of relationships may differ for approach and avoidance goals. Specifically, individuals may be more successful with approach goals in general, but the formation of implementation intentions may be particularly beneficial for individuals with avoidance



goals. Furthermore, the addition of regulatory fit to both of these groups is expected to additionally improve goal enactment.

## **1.2 Study Purpose**

The purpose of this study was to examine the effectiveness of combining implementation intentions and regulatory fit in the context of two goals: increasing leisure time physical activity (an approach goal) and decreasing leisure time sedentary behaviour (an avoidance goal).

## **1.3 Hypotheses**

It was hypothesized that when promoters were asked to work towards an approach goal (i.e., theoretically experiences regulatory fit) and formed implementation intentions to achieve the goal, they would be more successful at increasing their physical activity behaviour than those who only experienced fit or formed implementation intentions.

The second hypothesis was that when preventers were asked to work towards an avoidance goal (i.e., theoretically experiences regulatory fit) and formed implementation intentions to achieve the goal they would be more successful at decreasing their screen time than those who only experienced fit or formed implementation intentions.

## **Chapter 2**

### **Methods**

## **2.1 Study Design and Methods**

### **2.1.1 Variables**

#### *Independent Variables*

*Regulatory fit.* Based on participants' regulatory focus and assignment to goal type, they either experienced regulatory fit or they did not experience fit. Regulatory fit was experienced by promoters assigned to the approach goal and preventers assigned to the avoidance goal.

*Implementation intentions.* Participants were randomly assigned to form implementation intentions in order to help them achieve their goal, or they were assigned to the control condition where no implementation intentions were formed.

#### *Dependent Variables*

*Screen Time.* Sedentary behaviour was operationalized as screen time. Screen time refers to the number of hours of leisure time in the last week spent watching television, on the computer, and playing video games.

*Physical Activity.* Moderate and vigorous physical activity was measured using parts four and five of the International Physical Activity Questionnaire, long format, self-administered version. These sections of the questionnaire relate to recreation, sport, and leisure time physical activity and sitting behaviour.

### **2.1.2 Participants**

Convenience sampling was used to obtain a sample size ( $n$ ) of 180 Queen's University students between the ages of 18-35 ( $M$  age =  $21.62 \pm 4.90$ ). Participants were mostly female (78.4%) and White (76.8%).

The sample size calculation was done when the intended analysis plan was to use analyses of covariance. Sample size was calculated in GPower (version 3.0.10) with the following parameters: effect size = 0.25,  $\alpha = .05$ , power = .95, numerator  $df = 1$  (each factor has two levels), number of groups = 6 (four groups plus two covariates). A medium effect size was used in the calculation because it corresponds to the average effect size of 0.65 which was found in the meta-analysis of implementation intention literature (Gollwitzer & Sheeran, 2006). Based on this calculation, the desired sample size was 212.

Potential participants were initially screened for their level of goal commitment using the Hollenbeck, Wesson and Klein goal commitment questionnaire (Klein, Wesson, Hollenbeck, Wright, & DeShon, 2001). Goal commitment refers to an individuals' determination to try to achieve a goal and to persist when faced with challenges (Locke, Shaw, Saari, & Latham, 1981). Participants were considered eligible for the study if they reported an average goal commitment score above the midpoint (i.e.,  $\geq 4$ ) for each behaviour (Orbell, Hodgkins, & Sheeran, 1997). These exclusion criteria were in place so that the entire sample would be relatively committed to pursuing whichever goal to which they were randomly assigned.

### ***2.1.3 Measures***

#### ***Regulatory Focus Questionnaire***

The Regulatory Focus Questionnaire (RFQ) is an 11-item measure comprised of two subscales, promotion and prevention. The promotion subscale has six items and the prevention subscale has five items. Both subscales were found to be internally reliable with Cronbach's alphas from the current study of 0.65 and 0.76 respectively. They have

also shown good test-retest reliability over a period of two months with correlations between Time 1 (T1) and Time 2 (T2) scores of 0.79 for the promotion subscale and 0.81 for the prevention subscale. Respondents were asked to indicate how often they had experienced different events. Responses were given on a 5-point scale ranging from 1 = *never or seldom* to 5 = *very often*. Responses indicate respondents' subjective history of promotion and prevention success. A sample promotion item is, 'How often have you accomplished things that got you "psyched" to work even harder?'. A sample prevention item is, 'How often did you obey rules and regulations that were established by your parents?' (Higgins et al., 2001). Those scoring a 5 or higher on the RFQ were classified as promoters and those scoring a 4 or lower were classified as preventers (Uksul, Sherman, & Fitzgibbon, 2009).

#### *International Physical Activity Questionnaire*

The 'recreation, sport, and leisure-time physical activity' and 'time spent sitting' sections of the long form, self-administered, English-language version of the International Physical Activity Questionnaire (IPAQ) were used. These sections contain a total of eight items. They ask for information regarding frequency and duration of sitting, walking, moderate, and vigorous physical activity over the last seven days. Specifically, participants were asked to provide the number of days in the last seven in which they spent at least ten minutes of their leisure time walking and engaging in moderate and vigorous activity, as well as the average amount of time (in minutes) spent doing each activity. The number of days was multiplied by the number of minutes for each category. This total was then multiplied by the corresponding MET value (3.3 for walking, 4.0 for moderate-intensity and 8.0 for vigorous-intensity). The long form IPAQ has been found

to be reliable measure of physical activity with a pooled Spearman's correlation of 0.81 (Craig et al., 2003). The long form IPAQ has also been found to have criterion validity that is at least as good as other self-report measures of physical activity (Craig et al.). Agreement between the long form IPAQ and actual physical activity as measured with an accelerometer was found to be fair with a Spearman's correlation of 0.33 (Craig et al.).

### *Screen Time*

Screen time was measured with six items. Participants were asked to report the number of leisure time hours in the previous week that they spent watching television or videos, on a computer, and playing video games (adapted from the Canadian Community Health Survey, 2007). Response options were *none, less than 1 hour, 1-2.9 hours, 3-5.9 hours, 6-10.9 hours, 11-14.9 hours 15-20 hours and more than 20 hours*. This measure has good predictive validity in epidemiological studies. It has been found to predict obesity rates in adult men and women (Shields & Tremblay, 2008b). Also, a very similar measure has been shown to predict the incidence of metabolic syndrome in adolescents (Mark & Janssen, 2008). Consistent with Shields and Tremblay we had participants select a category. Participants then indicated a specific number of hours of screen time within this category. We used this strategy to direct participants to a specific response category and then to narrow their response within the category. Only the three items asking for the exact number of hours spent in each screen time behaviour were used in the analyses. The categorical questions were determined not to be sensitive enough to capture potential changes in behaviour and were therefore not used in the analyses.

### *Manipulation Checks*

*Planning.* Whether or not participants made detailed plans about how to accomplish their goal of increasing physical activity or decreasing screen time was assessed. This questionnaire functioned as a manipulation check to ensure that instructing participants to form a detailed plan in the implementation intention condition, did in fact affect their level of planning.

Participants' planning was measured with four items. They were asked to report if they had made a detailed plan regarding when, where, how, and how often they would engage in their goal behaviour (increasing physical activity or decreasing screen time). Responses ranged from 1 (*not at all true*) to 7 (*exactly true*; Sniehotta, Scholz, & Schwarzer, 2005). Scores ranged from 4-28. This measure showed good internal reliability with alphas ranging of .79 at T1 and .94 at T2.

*Indicators of regulatory fit.* Whether or not regulatory fit was achieved when a promoter was asked to work towards an approach goal and a preventer was asked to work towards an avoidance goal was verified. The increased value of pursuing a goal when regulatory fit is experienced manifests itself in several ways (Higgins, 2000) and these were used as the basis for determining if fit had been achieved.

Increased inclination towards the behaviour was assessed with one item rated on a 7-point scale ranging from 1 = *strongly disagree* to 7 = *strongly agree* regarding the extent to which participants find their goal behaviour to be important for their health. Scores ranged from 1-7. Increased motivation to engage in the behaviour was assessed with three items. One asked participants how motivated they were to achieve their goal behaviour. Responses were rated on a 7-point scale ranging from 1 = *not at all* to 7 = *very*

(Vaughn, Baumann, & Klemann, 2008). The other two items asked participants the degree to which they would try and intended to engage in their goal behaviour (Armitage, 2004). Scores ranged from 3-21. All items were added to create a subscale and Cronbach's alpha was calculated to assess internal reliability (alpha at T1 = .89, T2 = .86). Positive prospective feelings about the behaviour were assessed using the item stem "Increasing my physical activity/decreasing my screen time by at least 60 minutes per week over the next four weeks would be:" and three bipolar adjective pairs (*unpleasant-pleasant, not enjoyable-enjoyable, stressful-relaxing*) rated on a 7-point scale (Rhodes & Courneya, 2003; alpha at T1 = .83, T2 = .89). Scores ranged from 3-21. Retrospective feelings about the behaviour were assessed with five items. The first and second asked how satisfied participants felt with the progress they made towards their goal and the results they experienced from working towards the goal. Responses were given on a 7-point scale from 1 = *not satisfied* to 7 = *extremely satisfied* (Finch et al., 2005). The other three were assessed with the bipolar adjective pairs described above for prospective feelings and were in the form: "Did you find increasing your physical activity/decreasing your screen time by at least 60 minutes per week over the past week (4 weeks) to be..." (Rhodes & Courneya). Items were added to create a subscale and scores ranged from 5-35. Cronbach's alphas were calculated to assess internal reliability (alpha at T2 = .89). Finally, there were two items to assess perceived goal value. Participants were first asked to report how valuable they found their goal. Responses were on a 7-point scale from 1 = *extremely worthless* to 7 = *extremely valuable* (adapted from Latimer, Rivers et al, 2008). The second item asked how effective participants believe their goal behaviour will be for achieving health benefits or avoiding negative health consequences. Responses were on a



7-point scale from 1 = *not at all* to 7 = *extremely* (adapted from Graham, Prapavessis, & Cameron, 2006). Items were added together to create a subscale as described above. Scores ranged from 2-14. The correlations between items at T1 was .70 and at T2 was .74.

### *Goal Commitment*

Participants' level of commitment to their goal was assessed with the five-item Hollenback, Wesson and Klein goal commitment questionnaire. These asked how seriously they took the goal, whether or not they cared about the goal, how committed they were to the goal, how easy it would have been for them to abandon the goal and whether or not they believed the goal was a good one (Klein, Wesson, Hollenbeck, Wright, & DeShon, 2001). Responses were on a 7-point scale from 1 = *strongly disagree* to 7 = *strongly agree*. Scores ranged from 5-35. All items were added to create a subscale and Cronbach's alphas were calculated for each time point to assess internal reliability ( $\alpha = .83$  at each time point).

### *Demographics*

Participants completed a demographics questionnaire asking for information regarding sex, age, program and year of study and ethnic background. This information was used to describe the sample and to look for any relationships that existed between any of these variables and the independent measures.

### *Screening*

Potential participants were screened via e-mail for their level of goal commitment for both goals. To assess goal commitment, three of the items described above were asked about each goal behaviour. Only three items were asked in order to keep the

screening questionnaire as brief as possible. The three items selected were those with the highest internal reliability.

#### ***2.1.4 Procedure***

##### ***2.1.4.1 Pilot Testing***

Prior to beginning the data collection for the full study, pilot testing was done in an undergraduate class to ensure that the goals would be accepted as assigned. A sample of 36 undergraduate students was tested. They completed the RFQ, the IPAQ, and the screen time measure and were then asked to form a goal to either increase their leisure time physical activity or decrease their leisure time screen time. Next, they completed the goal commitment questionnaire and the manipulation check items. Results showed that the mean goal commitment scores for the approach goal was 3.46 and for the avoidance goal was 3.01 (on a 7-point scale). These scores were below the cut-off of four that was considered to demonstrate goal commitment. Based on these results, the goals were modified to allow for more flexibility in how the goal was defined: increasing physical activity or decreasing screen time by 30 minutes, 3 times per week was changed to 60 minutes over the course of the week. Also, given the low level of goal commitment it was determined that all participants would be screened on this measure for both goals.

##### ***2.1.4.2 Main Study***

To recruit participants for the larger study, posters were placed around Queen's University campus advertising the study. Recruitment announcements were also made in classes and sent to various campus groups and clubs. In the announcements, participants were informed that the study was related to health goals regarding increasing physical activity and decreasing inactivity, the format of the study, and the approximate time

commitment involved. As an incentive to participate, participants' names were entered in a draw for 15, \$20 gift cards for local stores.

Potential participants were contacted by e-mail and asked to complete the screening questionnaire. If their responses indicated that they were eligible, they were asked to attend a testing session in the School of Kinesiology and Health Studies building at Queen's University. Participants were also asked if they use a day planner on a regular basis. If they said yes, they were asked to bring it with them to the session.

Upon arrival, participants first read and signed a consent form. They were then randomly assigned to the approach (i.e., increase physical activity) or avoidance (i.e., decrease screen time) goal condition and the implementation intention or control condition.

After being randomly assigned to groups, participants completed the demographic questionnaire, the RFQ, the IPAQ, and the screen time measure. They were then given a brief statement about the important health benefits or potential consequences that come from being physically active or inactive, consistent with their experimental assignment. The outcome-based method of achieving regulatory fit focuses the individual on potential gains or losses that will be experienced as a result of the behaviour (Aaker & Lee, 2006). It is being employed here by framing physical activity in promotion terms (putting the focus on health benefits that will be gained) and inactivity in prevention terms (putting the focus on the negative health consequences that come from being inactive). All participants were then asked to form a goal to either increase their physical activity or decrease their screen time by 60 minutes per week over the next four weeks. The process-based method of achieving regulatory fit refers to the way that someone thinks about a

decision or goal fitting with their regulatory focus (Aaker & Lee). This method is being employed here as the means of working towards the approach goal uses an eagerness strategy (increasing activity) and the avoidance goal uses a vigilance strategy (decreasing screen time). Participants were also asked to write out the goal statement to help them commit to it.

The implementation intention group was also given a statement about the importance of planning which explains how planning can help them accomplish their goals. They were then asked to form a detailed plan to accomplish their goal over the next four weeks. Participants were given a four week calendar. They were asked to write in the specific activities that they planned to do (or avoid) and where they planned to do (or avoid) them on which days at specific times. They were asked to refer to their day planners (if they had them) to allow them to make the plans as realistic as possible. A copy of the plans were made for participants to take home with them.

The control group was asked to think of and write down some activities that they could do to help them achieve their goal. This section was included so that both groups spent an approximately equivalent amount of time considering their goal activity. This method has been used in other implementation intention interventions as an alternate task for the control group (e.g., Latimer et al., 2006). All participants were also asked to track their progress by placing a checkmark on their calendars on the days which they achieved their goal.

Finally, participants completed the goal commitment questionnaire and the planning and regulatory fit measures (except for the items assessing positive retrospective feelings, which were omitted from the baseline questionnaire).

One follow-up was done via online survey four weeks after the initial session. Participants were sent an e-mail with a link to the online survey. They were once again asked to fill out the IPAQ and screen time measure. They also responded to the goal commitment questionnaire, and the planning and regulatory fit manipulation check measures. Upon completion of the follow-up, participants were fully debriefed. Those who did not complete the follow-up sessions were tracked and sent the debrief message upon study completion.

## **Chapter 3**

### **Results**

### **3.1 Results**

#### ***3.1.1 Data Cleaning***

Prior to conducting any analyses, frequencies were run on all variables to verify data for outliers and errors in data entry. For all non-behaviour variables, responses were reported on a scale. These variables were verified for any data points falling outside the range of the scale (e.g., below one or above seven). For the physical activity data, outliers for time spent in an activity were considered values greater than 180 minutes (“Guidelines for Data Processing”, 2005). For the screen time data, outliers were considered values more than three standard deviations above the mean (Allison & Gorman, 1993). In the physical activity and screen time data, outliers were found and as a result, the data were truncated.

In addition, the physical activity and screen time data were positively skewed. To remedy non-normal data distributions, a square root transformation was applied to the measures of physical activity and a logarithmic transformation was applied to the measures of screen time.

#### ***3.1.2 Comparison of Groups at Baseline***

Demographic information is reported in Table 1. To ensure that the characteristics of participants in all groups (i.e., fit implementation intention, fit non-implementation intention, non-fit implementation intention, and non-fit non-implementation) were similar at baseline, chi-square tests were run on the categorical variables of sex and ethnicity. In addition, one-way analyses of variance (ANOVA) with group as the independent variable were run on demographic variables (age, year of study). Consistent with the analysis strategy for hypothesis testing, tests were run separately for the physical activity and

screen time goals. Significant differences emerged for sex in the physical activity group  $\chi^2(3, N = 111) = 10.32, p = .02$  and year of study in the screen time group  $F(3, 82) = 4.06, p = .01$ . To examine potential differences between groups for physical activity and screen time, 2 (Regulatory Fit) x 2 (Experimental Condition) ANOVAs were conducted for each goal type. In the physical activity group, there was a trend towards differences between groups for vigorous physical activity as indicated by the main effect of regulatory fit ( $F(1, 107) = 2.90, p = .09$ ) whereby those in the fit group tended to engage in more vigorous activity than those in the non-fit group. Analyses also revealed a main effect of experimental condition on screen time in the physical activity group ( $F(1, 106) = 5.18, p = .03$ ). Participants in the implementation intention group reported significantly higher levels of screen time than those in the non-fit group. No significant differences emerged between groups with the screen time goal.

To account for the group differences and the time that people spent in all leisure activities of interest at baseline (e.g., if someone spends more time in moderate activity then they have less time to be on the computer), total physical activity (walking, moderate, and vigorous activity) and total screen time (television, computer and video games) was controlled for in the following analyses (Shields & Tremblay, 2008b; Latimer, Rench et al., 2008).

### ***3.1.3 Hypothesis Testing***

I conducted linear regressions to assess the effects of regulatory fit (fit vs. non-fit), experimental condition (implementation intention vs. non-implementation intention), and goal commitment and their interactions (2- and 3-way) on indicators of regulatory fit, planning and behaviour variables. Regulatory fit and experimental condition variables



were dummy coded (0 = non-fit, 1= fit; 0 = non-implementation intention, 1 = implementation intention). The goal commitment variable was zero-centered prior to analysis (Cohen, Cohen, West, & Aiken, 2003). Separate analyses were run for each goal type. For the analyses of behavioural outcomes, baseline total physical activity and total screen time were entered in the first step of the model. Only the highest order effects are reported. All significant three-way interactions were first decomposed by regulatory fit. Significant two-way interactions were decomposed by regulatory fit or experimental condition, depending on the effect being examined.

Goal commitment was included in the model as a moderator because not all participants reported a high level of commitment. Lower levels of goal commitment were expected to interact with the independent variables to affect behaviour scores such that higher levels of goal commitment would be associated with greater changes in behaviour (i.e., increases in physical activity and decreases in screen time).

Separate analyses were run for each goal type. This was done because the behaviour that participants were asked to change was different between the two goal type groups. In particular, we were interested in the distinct effects of each goal on the corresponding outcome behaviour at follow-up. We did also conduct exploratory analyses examining the effects of each goal on the discordant behaviour (e.g., screen time in the physical activity goal group). In addition, separate models were analyzed for moderate and vigorous physical activity and total screen time. This method of analysis was chosen so that the behavioural outcomes would be consistent with the goals that were set (i.e., increasing moderate- and vigorous-intensity physical activity and decreasing total screen time).

### 3.1.4 Physical Activity Goal Type

#### *Goal Commitment*

Participants assigned to the physical activity goal type reported mean goal commitment scores as follows: at baseline  $M = 5.83$ , median = 6.00 (ranging from 2.60-7.00), at Time 2  $M = 5.39$ , median = 5.60 (ranging from 2.40-7.00). A repeated measures analysis of variance (ANOVA) was conducted on goal commitment scores. Results revealed a main effect indicating that goal commitment scores were significantly lower at follow-up ( $F(1, 99) = 23.78, p < .001$ ). None of the interactions were significant.

#### *Indicators of Fit Manipulation Check*

To determine whether or not the regulatory fit manipulation was successful, regression models were run with each of the five indicators of regulatory fit as the dependent variable (Table 2). All regression models testing the indicators of fit were significant ( $p < .05$ ). For *increased goal value* ( $\beta = .18, t(95) = 1.48, p = .14$ ) and *retrospective feelings about the behaviour* ( $\beta = .03, t(95) = .27, p = .79$ ) the main effect of regulatory fit was not significant, but the relationships were in the expected direction (i.e., regulatory fit being associated with higher levels of the indicator). For *increased motivation to engage in the behaviour*, again the main effect of regulatory fit was not significant, however in this case the relationship was not in the expected direction ( $\beta = -.07, t(95) = -.73, p = .47$ ). See Table 3 for the means and standard deviations.

The regression on *increased inclination towards the behaviour* revealed a main effect ( $\beta = .18, t(95) = 1.35, p = .18$ ) and an interaction effect of regulatory fit and experimental condition that approached significance ( $\beta = -.34, t(95) = -1.94, p = .06$ ). To examine this interaction, the analysis was run separately for fit and non-fit groups. The effect of experimental group was significant for the fit group ( $\beta = -.25, t(55) = -1.97, p =$

.05) but not for the non-fit group. This finding indicates that being in the fit group and the implementation intention condition was associated with less inclination towards the goal behaviour (Figure 1).

Finally, a significant main effect of regulatory fit on *positive prospective feelings about the behaviour* was observed ( $\beta = .27, t(95) = 2.07, p = .04$ ), demonstrating that regulatory fit was associated with more positive prospective feelings. However this main effect was qualified by significant regulatory fit by experimental condition ( $\beta = -.46, t(95) = -2.68, p = .01$ ) and regulatory fit by goal commitment ( $\beta = -.44, t(95) = -2.36, p = .02$ ) interactions. Each of these analyses were run separately for the fit and non-fit groups. The effect of experimental condition was significant for the fit group ( $\beta = -.40, t(56) = -3.28, p = .002$ ) but not for the non-fit group. This finding indicates that being in the fit group and the implementation intention condition was associated with lower levels of positive prospective feelings about the goal behaviour (Figure 2). The effect of goal commitment was significant for both the fit ( $\beta = .25, t(56) = 2.09, p = .04$ ) and non-fit groups ( $\beta = .54, t(41) = 3.98, p < .001$ ). These findings demonstrate that in both the fit and the non-fit groups, higher levels of goal commitment were associated with higher levels of positive prospective feelings (Figure 3).

#### *Planning Manipulation Check*

The manipulation check model predicting planning was significant,  $F(7, 95) = 6.41, p < .001$ . This analysis indicated a significant main effect of experimental condition such that being in the implementation intention condition was associated with higher levels of planning ( $\beta = .47, t(95) = 3.35, p = .001$ ; Table 4). In addition, there was a significant main effect of goal commitment indicating that higher levels of goal

commitment were associated with higher levels of planning ( $\beta = .48$ ,  $t(95) = 2.74$ ,  $p = .01$ ).

### *Effect of Time*

Paired sample t-tests were run for physical activity and screen time behaviours to determine if there were any changes in these behaviours from Time 1 to Time 2. Among participants with the physical activity goal, moderate physical activity significantly increased over time ( $t(102) = -3.09$ ,  $p = .003$ ) and total screen time significantly decreased over time ( $t(93) = 2.01$ ,  $p = .05$ ). Vigorous physical activity did not change significantly from Time 1 to Time 2.

### *Physical Activity Behaviour*

*Moderate activity.* The model predicting moderate physical activity was significant,  $F(9, 92) = 3.27$ ,  $p = .002$ . Total physical activity at Time 1 emerged as a unique predictor ( $\beta = .37$ ,  $t(92) = 3.96$ ,  $p < .001$ ; Table 6). However, no significant effects emerged for the experimental variables (i.e., regulatory fit, experimental condition, goal acceptance and their two- and three-way interactions). The main effect of experimental group approached significance  $\beta = -.29$ ,  $t(92) = -1.85$ ,  $p = .07$ . This trend indicates that being in the implementation intention group tended to be associated with lower levels of moderate physical activity.

*Vigorous activity.* The model predicting vigorous physical activity was significant,  $F(9, 92) = 3.71$ ,  $p = .001$ . Total physical activity at Time 1 emerged as a unique predictor ( $\beta = .38$ ,  $t(92) = 4.13$ ,  $p < .001$ ). The main effect of goal commitment approached significance,  $\beta = .32$ ,  $t(92) = 1.74$ ,  $p = .09$ . This effect indicates that higher

reported levels of goal commitment tended to be associated with higher levels of vigorous physical activity.

#### *Screen Time Behaviour*

*Total screen time.* The model predicting total screen time was significant,  $F(9, 84) = 5.56, p < .001$ . Total screen time at Time 1 emerged as a unique predictor ( $\beta = .56, t(84) = 6.11, p < .001$ ). However, no significant effects emerged for the experimental variables.

#### **3.1.5 Screen Time Goal Type**

##### *Goal Commitment*

Participants assigned to the screen time goal type reported mean goal commitment scores as follows: at baseline  $M = 5.59$ , median = 5.80 (ranging from 2.20-7.00), at Time 2  $M = 4.74$ , median = 4.80 (ranging from 2.20-7.00). A repeated measures ANOVA was conducted on goal commitment scores. Results revealed a main effect indicating that goal commitment scores were significantly lower at follow-up ( $F(1, 75) = 44.74, p < .001$ ). None of the interactions were significant.

##### *Indicators of Fit Manipulation Check*

The regulatory fit manipulation check was tested for the screen time goal type exactly as for the physical activity goal type. All regression models testing the indicators of fit were significant ( $p < .05$ ). For *increased goal value* ( $\beta = .09, t(72) = .68, p = .50$ ) the main effect of regulatory fit was not significant, but the relationship was in the expected direction (i.e., regulatory fit being associated with higher levels of the indicator; Table 7). For the remaining indicators the main effect of regulatory fit also was not significant, however in these cases, the relationships were not in the expected direction;

*increased inclination towards the behaviour* ( $\beta = -.02$ ,  $t(72) = -.12$ ,  $p = .91$ ), *increased motivation to engage in the behaviour* ( $\beta = -.03$ ,  $t(72) = -.33$ ,  $p = .74$ ), *positive prospective feelings about the behaviour* ( $\beta = -.05$ ,  $t(72) = -.33$ ,  $p = .75$ ) and *retrospective feelings about the behaviour* ( $\beta = -.05$ ,  $t(72) = -.39$ ,  $p = .70$ ). See Table 8 for the means and standard deviations.

#### *Planning Manipulation Check*

The manipulation check model predicting planning was significant,  $F(7, 72) = 4.57$ ,  $p < .001$ . A significant three-way interaction was observed,  $\beta = -.56$ ,  $t(72) = -2.77$ ,  $p = .007$  (Table 5). To examine the interaction, separate analyses were conducted for the fit and non-fit groups. The two-way interaction of experimental condition and goal commitment was significant in the fit group ( $\beta = -.61$ ,  $t(40) = -3.07$ ,  $p = .004$ ) but not in the non-fit group. The significant two-way interaction was decomposed further by experimental condition to examine the simple effect of goal commitment on the efficacy of the planning manipulation. These analyses revealed that among people in the fit group who did not set implementation intentions, increased goal commitment was associated with increased planning,  $\beta = .63$ ,  $t(16) = 3.27$ ,  $p = .01$ . Goal commitment was not associated with planning in the fit, implementation intention group. Indeed the pattern of findings described in Figure 4 indicates that higher levels of goal commitment generally tended to be associated with higher levels of planning in all groups except for the fit, implementation intention group.

#### *Effect of Time*

Paired sample t-tests were run for physical activity and screen time behaviours to determine if there were any changes in these behaviours from Time 1 to Time 2. Among

participants with the screen time goal, moderate physical activity significantly increased over time ( $t(79) = -3.49, p = .001$ ) and total screen time significantly decreased over time ( $t(78) = 2.46, p = .02$ ). Vigorous physical activity did not change significantly from Time 1 to Time 2.

### *Screen Time Behaviour*

*Total screen time.* The model predicting total screen time was significant,  $F(9, 69) = 3.07, p = .004$ . Total screen time at Time 1 emerged as a unique predictor ( $\beta = .36, t(69) = 3.31, p = .001$ ; Table 9). A significant main effect of experimental condition emerged indicating that being in the implementation intention group was associated with less total screen time ( $\beta = -.38, t(69) = -2.29, p = .03$ ). The main effect was qualified by a significant two-way interaction between experimental condition and goal commitment ( $\beta = -.40, t(69) = -2.05, p = .05$ ; Table 2). To examine the interaction, separate analyses were run for the implementation and non-implementation intention groups. The effect of goal commitment approached significance for the implementation intention group ( $\beta = -.20, t(35) = -1.31, p = .20$ ) but not for the non-implementation intention group. This pattern suggests that for those who formed implementation intentions, higher levels of goal commitment tended to be associated with lower levels of screen time (Figure 5).

### *Physical Activity Behaviour*

*Moderate physical activity.* The model predicting moderate intensity physical activity was significant,  $F(9, 70) = 2.79, p = .01$ . Total physical activity at Time 1 emerged as a unique predictor ( $\beta = .39, t(70) = 3.54, p = .001$ ). A significant three-way interaction was observed,  $\beta = .53, t(70) = 2.51, p = .01$ . To examine the interaction, separate analyses were conducted for the fit and non-fit groups. The two-way interaction

of experimental condition and goal commitment was significant in the fit group ( $\beta = .46$ ,  $t(38) = 2.30$ ,  $p = .03$ ) but not in the non-fit group. The significant two-way interaction was decomposed further by experimental group to examine the simple effect of goal commitment on the efficacy of the implementation intention intervention. These analyses revealed a non-significant trend that among people in the fit group who did not set implementation intentions, stronger goal commitment was associated with decreased participation in moderate intensity physical activity,  $\beta = -.46$ ,  $t(14) = -1.67$ ,  $p = .12$ . In the fit, implementation intention group, the pattern was the opposite suggesting that stronger goal commitment may be associated with increased participation in moderate physical activity,  $\beta = .17$ ,  $t(22) = .94$ ,  $p = .36$ . As depicted in the graph of this interaction (Figure 6), there is a clear trend towards increased goal commitment being associated with decreased moderate physical activity present in all groups except for the fit, implementation intention group where the pattern is opposite.

*Vigorous physical activity.* The model predicting vigorous intensity physical activity was significant,  $F(9, 70) = 9.62$ ,  $p < .001$ . Total physical activity at Time 1 emerged as a unique predictor ( $\beta = .71$ ,  $t(70) = 8.28$ ,  $p < .001$ ). However, no significant effects emerged for the experimental variables.



## **Chapter 4**

### **Discussion**

## 4.1 Discussion

### 4.1.1 *Summary of Findings*

This study examined the effectiveness of combining implementation intentions and regulatory fit for increasing physical activity and decreasing screen time in university students. The main hypothesis, that the combination of implementation intentions and regulatory fit would be more effective at changing each behaviour than either experimental variable separately was not supported. The hypothesis likely was not supported because it seems that the regulatory fit manipulation lacked strength.

Contrary to past research (e.g., Hong & Lee, 2008; Spiegel et al., 2004), this study did not provide support for the beneficial effect of regulatory fit on goal attainment. There was no main effect of regulatory fit detected for either goal type. This may be due to the fact that the regulatory fit manipulation was not successful. In both the physical activity and the screen time groups, none of the five indicators of regulatory fit showed significantly higher values in the fit group than the non-fit group.

The apparent failure of the regulatory fit manipulation has several possible causes. One is that the instrument that we used to measure fit was not sensitive to fit effects that were present. This measure was used relatively successfully in a study of message tailoring and physical activity (Latimer, Rivers et al., 2008). In that study, the measure was used successfully for promotion messages but not prevention messages. In other studies, a common approach is to use only one indicator of fit (e.g., Shah, Higgins, & Friedman, 1998; Freitas, Liberman, & Higgins, 2002). Using only one indicator of fit may not provide a complete picture of whether or not regulatory fit is achieved. It is also common for researchers to use completely different methods of measuring the value

derived from regulatory fit. One such method is to have participants provide a monetary value for some item, assuming that those who have experienced fit would be willing to pay more (e.g., how much participants would be willing to spend on an iPod after viewing a framed advertisement; Mannetti, Giacomantonio, Higgins, Pierro, & Kruglanski, 2010). In the current study, this could have been done by asking participants to report how much they would pay for a gym membership or personal trainer for the physical activity goal and for a television for the screen time goal (those with fit should pay less for the television).

On the other hand, it is possible that the manipulation itself was unsuccessful and that promoters in the physical activity group and preventers in the screen time group did not experience regulatory fit. One explanation for why this might be the case is that people were assigned to their goal. While this strategy has been suggested in previous research (Sullivan & Rothman, 2008), and has the important benefit of reducing systematic variation between groups, it may have had a detrimental effect on feelings of regulatory fit. It is possible that even though for some people the goal they were assigned did fit with their regulatory focus, telling them what goal they had to try to achieve had a negative effect on their desire to achieve it and that this negative reaction took precedence over the effect of regulatory fit. Had people come to the decision to increase their physical activity or decrease their screen time on their own, then the goal may have been something that they valued and thus they would have been more likely to experience regulatory fit. Research from the study of motivation supports this possibility.

One of the main aspects of self-determination theory (Ryan & Deci, 2000) is the distinction that is made between different types of motivated behaviour. The theory posits

that there is a continuum of motivation with amotivation (lack of motivation) at one end and intrinsic motivation at the other. Intrinsic motivation refers to motivation that is highly autonomous and causes people to perform a behaviour for its own sake (Norman & Conner, 2005). The concept of intrinsic motivation has some parallels with that of regulatory fit. Namely, the feeling of “rightness” and increased value attached to a goal when one experiences fit (Higgins, 2000), and the internal desire to perform a behaviour with intrinsic motivation.

Studies have shown that when people are intrinsically motivated (i.e., motivated by a desire to achieve an internal reward), they are more successful at accomplishing their goals (e.g., Curry, Wagner, & Grothaus, 1991). However when they are extrinsically motivated (i.e., motivated by a desire to receive an external reward), they are less so. Additionally, work by Curry and colleagues on smoking cessation demonstrated that when people were internally motivated but also received an extrinsic reward (money) for engaging in a behaviour (smoking cessation), they were less successful than those who received only the intrinsic motivation intervention. Furthermore, a meta-analysis of the effects of choice on intrinsic motivation showed that providing choice enhances intrinsic motivation and can have a positive effect on effort, task performance, perceived competence, and preference for a challenge (Patall, Cooper, & Robinson, 2008). In the current study, the lack of choice in the goal, and the fact that they were trying to achieve the goal based on my request, indicates that participants’ motivation was at least partially extrinsic. Thus, even if participants were intrinsically motivated (by the experience of regulatory fit), the addition of the extrinsic motivation may have had a negative effect on their feelings towards the behaviour and thus hindered their experience of fit.

This explanation is supported by findings in the current study. In the physical activity group, experiencing fit and being asked to form an implementation intention were associated with decreased inclination towards the behaviour and lower levels of positive prospective feelings about the behaviour. If people had a negative reaction to being asked to form a goal in the first place, then being asked to form an implementation intention may further turn them off.

Despite the main hypothesis not being supported, several significant effects did emerge. These effects provide insight into the utility of goal setting and the factors that optimize goal achievement.

This study provides support for the beneficial effects that come from the act of goal setting. Across groups, moderate physical activity increased significantly and total screen time decreased significantly from Time 1 to Time 2. These findings are interesting because they indicate that the simple act of asking university students to set a goal to either increase their physical activity or decrease their screen time and their participation in a relatively brief intervention had an effect on their behaviour over a four week period.

Several interesting findings emerged regarding strategies to enhance goal attainment in the current study. Setting implementation intentions was found to be a useful strategy for optimizing the achievement of the avoidance goal. Interestingly, implementation intentions did not optimize achievement of the approach goal. The effectiveness of implementation intentions for avoidance goal attainment was supported in the current study based on the results from the screen time group. In the screen time group, a significant main effect for experimental condition was observed indicating that forming implementation intentions was associated with lower levels of total screen time.

This finding is consistent with past research that has suggested the importance of implementation intentions in avoidance goal attainment (e.g., Sullivan & Rothman, 2008; Gollwitzer, 1999). However, the effect on total screen time was qualified by a two-way interaction between experimental condition and goal commitment. This interaction demonstrated that for those who formed implementation intentions, higher levels of goal commitment were associated with lower levels of screen time. This finding emphasizes the importance of goal commitment in an implementation intention intervention. If individuals are not committed to pursuing a goal, then it appears that forming implementation intentions will not be beneficial. If this is indeed the case, then further research is needed to determine how to increase goal commitment for health related goals. One avenue of research in this area may be to base this work in self-determination theory and the concept of intrinsic motivation. It is likely that if someone is more intrinsically motivated to achieve a goal, they will also be more committed to it.

The effects of implementation intentions found in the current study are similar to those reported in the work of Sullivan and Rothman (2008). Their study looked at eating behaviours rather than physical activity (eating more healthy snacks and less unhealthy snacks), and yet the findings are similar. They also found that implementation intentions were effective for achieving an avoidance goal, and they failed to find an effect of implementation intentions for the approach goal. However in their study, the means were in the expected direction for the approach goal, which was not the case in the current study. The approach goal of eating more healthy snacks may be less complex and therefore an easier goal to achieve. Alternatively, because participants in the healthy

eating study were allowed to choose their goal, they may have been more committed to achieving it than they were in this study.

The current study did not provide support for the effectiveness of implementation intentions in optimizing approach goal attainment. In the physical activity group, forming implementation intentions was associated with lower levels of moderate physical activity. This effect is the opposite of what would be expected (i.e., that forming implementation intentions would increase physical activity levels) and what has generally been found in past research (e.g., Murray et al., 2009; Prestwich et al., 2009; Dombrowski & Luszczynska, 2009). Furthermore, research examining the efficacy of implementation intentions in a university population also demonstrates planning to be an effective method of increasing physical activity levels (e.g., Milne, Orbell, & Sheeran, 2002; Prestwich, Lawton, & Conner, 2003).

There are several possible explanations for the lack of support found in the current study for the effectiveness of implementation intentions with an approach goal. The manipulation check on planning in the physical activity group demonstrated a main effect of planning thus indicating that the implementation intention manipulation did successfully result in increased planning. Therefore it does not appear to be the planning intervention itself that was the problem. One potential explanation for this finding is that the physical activity goal was more difficult than the screen time goal. Based on difference scores between Time 2 and Time 1, 48.5% of people in the physical activity group were able to achieve the goal of modifying their behaviour by 60 minutes per week, while 57% of the people in the screen time group were successful in achieving

their goal. This indicates that the physical activity goal may have been more difficult to achieve than the screen time goal.

Another possible explanation for the lack of support for implementation intentions in the physical activity group compared to past research is that the goal in the current study was for participants to increase their level of activity. Other studies of implementation intentions and physical activity often ask participants to be active a certain number of times per week, regardless of their baseline level of activity (e.g., Prestwich, Perugini, & Hurling, 2009; Reuter, Ziegelmann, Lippke, & Schwarzer, 2009; Milne, Orbell, & Sheeran, 2002). For those who were already quite active, adding an additional 60 minutes per week may have been a particularly difficult goal. Mean baseline moderate and vigorous physical activity among participants in the physical activity group was 35.36 minutes per day, which is quite high, thus indicating that there were many people in the study for whom adding 60 minutes of activity per week may have been difficult.

In addition to implementation intentions, the findings from the current study provide some preliminary insight into the effects of goal setting on non-target, complementary behaviours (i.e., behaviours that may increase or decrease in frequency as a result of trying to modify the goal behaviour). Given the design of the current study, I was able to examine the effects of setting a screen time goal on physical activity behaviour and vice versa. I did find that setting a screen time goal may be useful for changing physical activity behaviour. Specifically, among participants with the avoidance goal who were in the fit group and formed implementation intentions to decrease their screen time, higher levels of goal commitment tended to be associated with higher levels



of moderate activity. It may be that people who accepted the goal planned to replace their screen time with physical activity. This finding has potential implications for health promotion interventions. It suggests that asking people to decrease their screen time may also have the effect of increasing their physical activity, thereby providing even more health benefits. This suggestion is supported by a recent cross-sectional study of children's levels of screen time and physical activity (Melkevik, Torsheim, Iannotti, & Wold, 2010). This study found that in North America, children who spent more than two hours per day in screen time were less likely to meet the daily physical activity recommendation as compared to those who spent less than two hours per day in screen time. Further research in this area is required to determine if there is a causal relationship between decreasing levels of screen time and increasing physical activity.

#### ***4.1.2 Contributions to Theory***

This study contributes to health behaviour change theory in the following ways. First, results provide further support for the effectiveness of implementation intentions for avoidance goal attainment. This finding is in line with other recent research in the field (e.g., Sullivan & Rothman, 2008; Gollwitzer, 1999). As this was one of the first studies to test the effectiveness of implementation intentions for decreasing sedentary behaviour, the results also make an important first step in demonstrating their effectiveness with this specific behaviour. In addition, study findings indicate that goal commitment is a potential moderator of the effect of implementation intentions on avoidance goal attainment. The effect of goal commitment should be further investigated in future research to provide additional insight into the relationship between goal commitment and implementation intentions and their effect on behaviour.

This study also provides some insight into the importance of the goal itself on the effectiveness of implementation intentions with approach goals. Approach goals, by nature, require engaging in a behaviour. If that behaviour is one that people are already performing to some extent, then asking them to add time to the behaviour may not be an effective strategy. For approach goals, implementation intentions may be most successful when the goal involves engaging in the behaviour for a set period or number of times, and not increasing it.

Unfortunately, due to the lack of success of the regulatory fit manipulation, results from this study do not provide contributions to regulatory fit theory.

#### ***4.1.3 Contributions to Practice***

This study also offers some practical contributions to the field of health behaviour change. Firstly, among university students, merely asking them to form a goal to change their behaviour may be enough to have an effect. Future researchers should conduct similar studies with longer follow-ups in order to determine if this effect lasts in the long-term. Another practical contribution from the current study is that for interventions aiming to reduce sedentary behaviour, forming implementation intentions may be an effective strategy for achieving this goal. However, results indicate that goal commitment moderates the effect of implementation intentions on screen time behaviour. Thus, implementation intentions will likely be most effective in a population that is highly committed to changing their behaviour. It may therefore be beneficial to measure goal commitment prior to beginning an implementation intention intervention. If goal commitment is low, an important first step would be to try to increase it.

#### ***4.1.4 Study Strengths***

One strength of the current study is that it is one of the first interventions to look at the combination of implementation intentions and regulatory fit for increasing goal enactment. Unfortunately, the effectiveness of this approach was not supported in this study. However, given that the regulatory fit manipulation does not appear to have been successful, it would be premature to make any conclusions about this combination of strategies.

Another important strength of this study was that it employed a random assignment strategy for experimental group and goal type conditions. Randomly assigning participants ensured that groups were as equivalent as possible prior to the intervention, thus increasing the internal validity of the study. However, it should be noted that the study was not a true experimental design because regulatory fit was not randomly assigned. One aspect of fit (regulatory focus) is an individual quality that each participant brought into the study and therefore it is not something that could be assigned. In addition, while random assignment was a strength of the study, it was also a limitation in that it reduced the external validity of the findings.

#### ***4.1.5 Study Limitations and Future Directions***

It is important to note that there were many limitations in this study and thus many opportunities for further research. As I have already discussed, the regulatory fit manipulation may not have been a success. Promoters who were assigned to increase their physical activity and preventers who were assigned to decrease their screen time did not demonstrate the expected higher levels of fit, as measured by the five indicators of regulatory fit. Future researchers should work to develop a successful regulatory fit

manipulation and ensure that the measure of fit is appropriate, and then re-examine the combination of implementation intentions and regulatory fit and their effectiveness for increasing physical activity and decreasing sedentary behaviour.

A second limitation of the study is that participants were not able to choose their own goal. While the random assignment of participants to groups is a strength of the study in that it increases internal validity, it is a trade off that necessarily sacrifices external validity. Allowing participants to choose which goal they wanted to work towards would create a more realistic situation and ensure that their goal was something that they were committed to pursuing. Letting participants choose their goal may also have the effect of increasing the success of the regulatory fit manipulation. We did attempt to give participants some control by allowing them flexibility in how they accomplished their goal. They were asked to change their behaviour by 60 minutes per week, but were told that they could do this whichever way worked best for them (e.g., twice for 30 minutes at a time, three times for 20 minutes at a time, etc.). It would be interesting to conduct a similar study where participants are able to choose their goal and compare the results.

Another limitation of this study relates to participants' goal commitment. While mean goal commitment scores were fairly high at Time 2 (5.93 for physical activity and 4.74 for screen time), the scores ranged as low as 2.40 in the physical activity group and 2.20 in the screen time group. These low scores are somewhat surprising given that participants were screened for goal commitment prior to being enrolled in the study. There are two possible reasons for these low scores. One possibility is that scores were artificially high when participants answered the screening questions. This could be due to

the fact that, at the screening stage, the questions were necessarily hypothetical. It is possible that people idealized their behaviour and assumed that they would commit themselves to the goal. However when it came time to actually try to accomplish the goal, they may have realized that it would be more difficult than originally thought and thus were less committed to it. Another possible explanation is that actual goal commitment decreased over time. If people were not successful in achieving their goal, they may have devalued the goal as a means of not wanting to appear to have failed to achieve a goal that they cared about. This strategy would serve to protect their self-image. This explanation is supported by the significantly lower goal commitment scores at Time 2 as compared to baseline in both goal type groups.

Another limitation of the current study is that the measures of behaviour were self-reported. Inherent in all self-report measures are the possibility of social desirability bias whereby the participants respond in a way that they believe is more socially desirable. Relatedly, recall bias may have affected the results. Recall bias occurs when there is differential recall (and thus reporting) of information between groups (Hassan, 2006). This may have occurred in the current study if for example, participants in the screen time group paid more attention to, and were thus better able to recall, the amount of time they spent watching television, than someone in the physical activity group. Future researchers should use objective measures of physical activity (e.g., accelerometers) and screen time (e.g., inclinometers).

The timing of the study in relation to the 2010 Winter Olympic Games may also have had an effect on the results, particularly for reported levels of screen time. The Olympic Games took place over 16 days (February 12-28, 2010) during the course of the

study. Many participants assigned to the screen time goal during this time anecdotally commented that it was going to be difficult for them to reduce their screen time because they were planning to watch the Olympic coverage on television. Based on the timing of the first follow-up, 57 participants were enrolled in the study during the course of the Olympic coverage. It is likely that levels of screen time for some of these individuals were higher than they would have been had the study taken place at another time. In addition, physical activity levels may also have been affected. If people were spending a lot of time watching the Olympics, they may have removed some physical activity from their schedule in order to accommodate this increase in screen time.

A final limitation of this study relates to the characteristics of the sample. Because the sample consisted of mostly white, female university students, the results are not generalizable to other groups. Further research is needed to determine if implementation intentions and regulatory fit would be an effective combination for increasing physical activity and decreasing sedentary behaviour in other populations.

#### ***4.1.6 Conclusion***

This study provides a preliminary examination of the combination of implementation intentions and regulatory fit and their effectiveness for increasing physical activity and decreasing sedentary behaviour. While our hypotheses were not supported, I believe that future work on this subject matter is warranted to fully explore the potential utility of the approach. This study also served as one of the first interventions that attempted to reduce sedentary behaviour among adults. It is hoped that other researchers will learn from this study and design future interventions that will help

the individuals follow through with their goals to increase their physical activity and decrease their sedentary behaviour.

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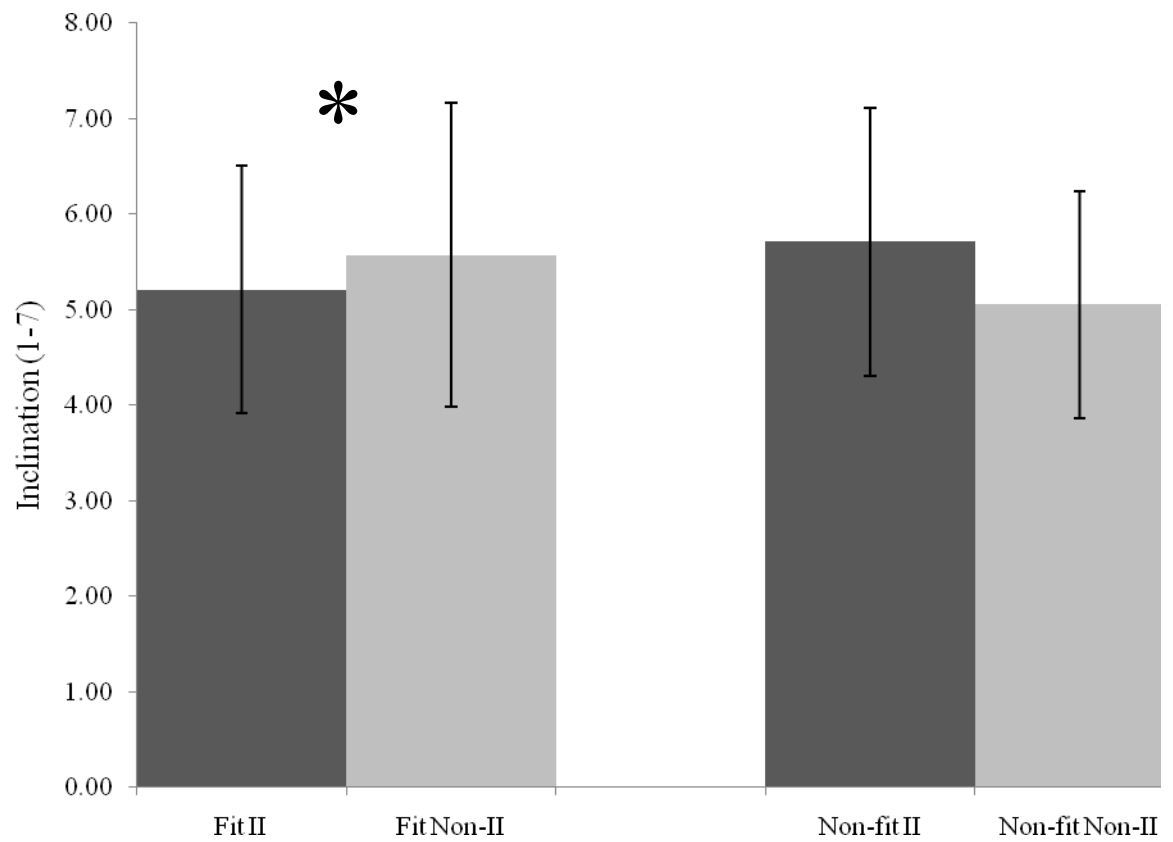


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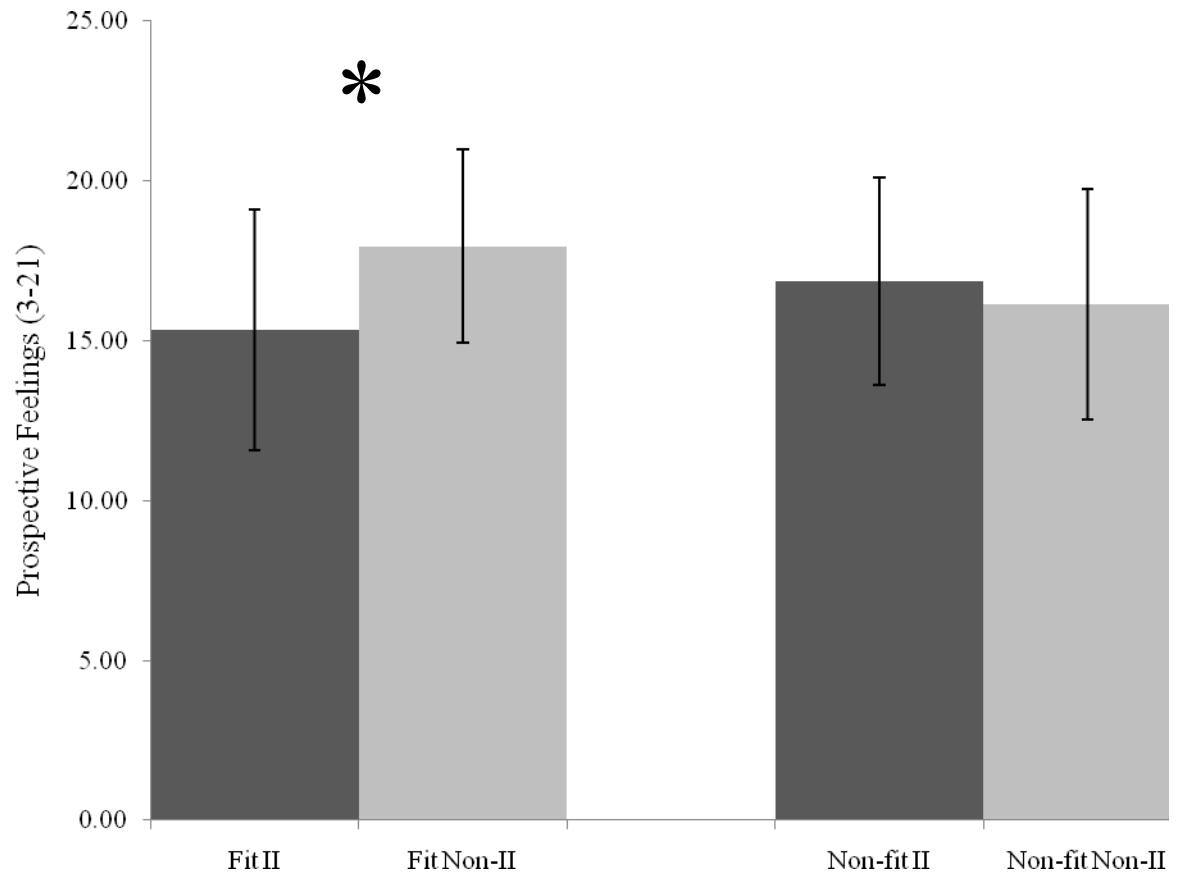
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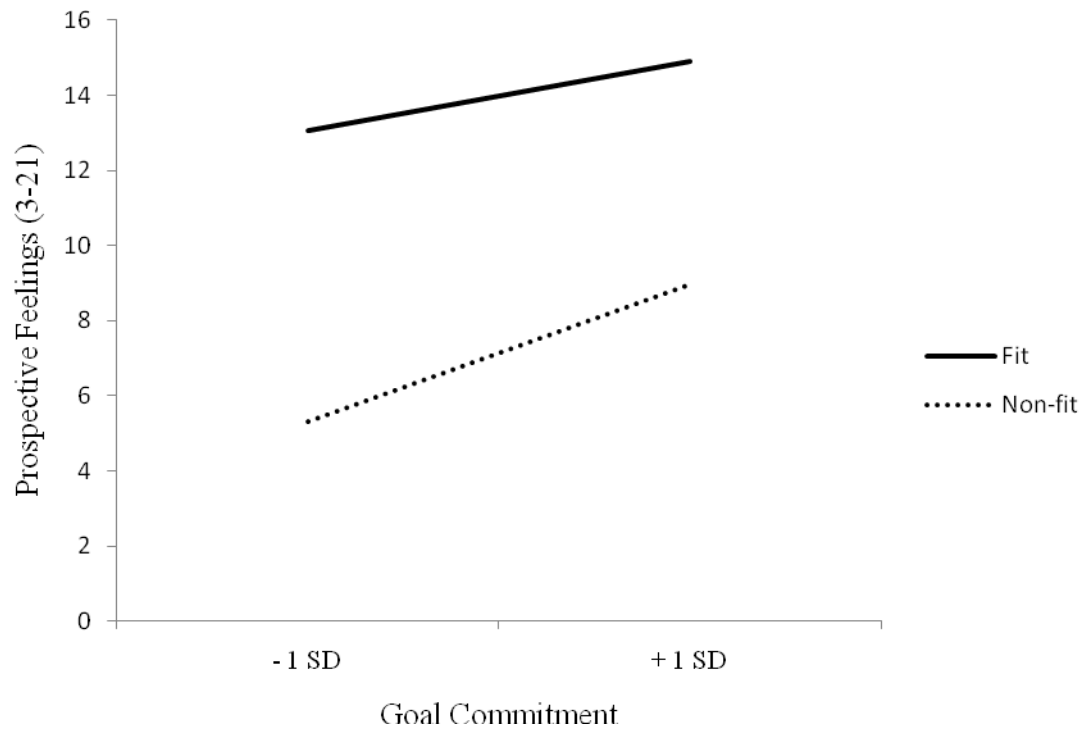
*Figure 1.* Two-way interaction between regulatory fit and experimental condition on increased inclination towards the behaviour in the physical activity group.

Error bars represent standard deviations. \*  $p < .10$

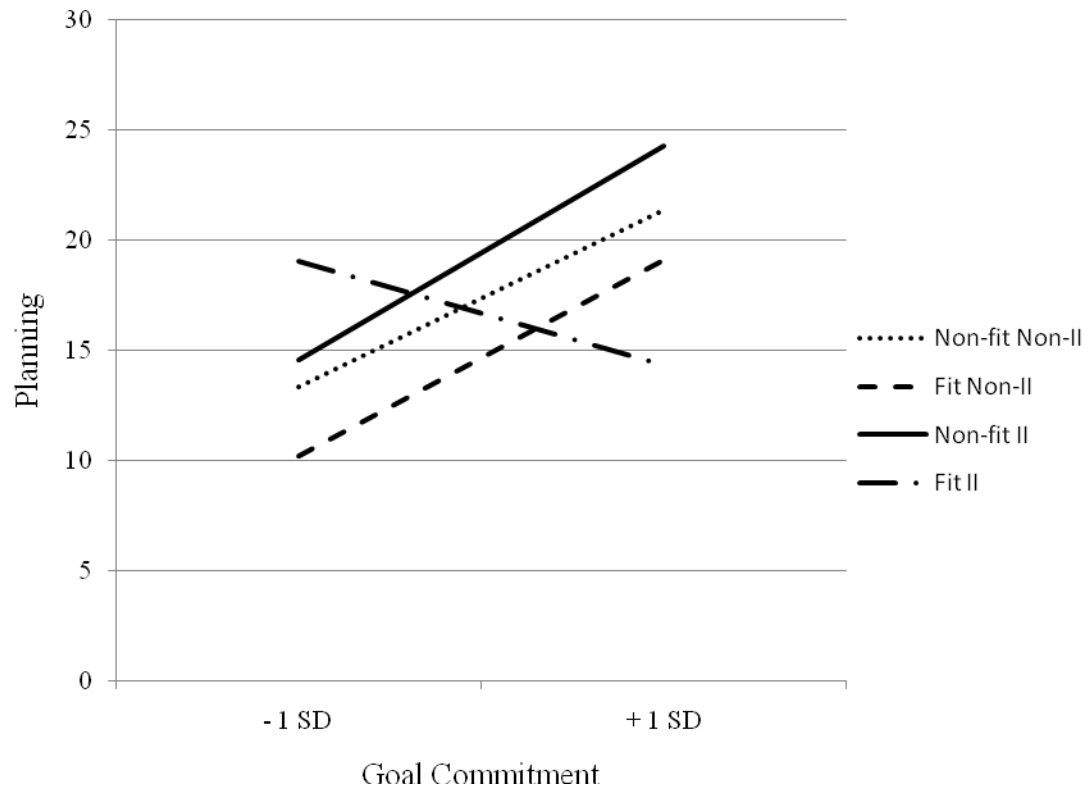


*Figure 2.* Two-way interaction between regulatory fit and experimental condition on prospective feelings about the behaviour in the physical activity group.

Error bars represent standard deviations. \*  $p < .10$

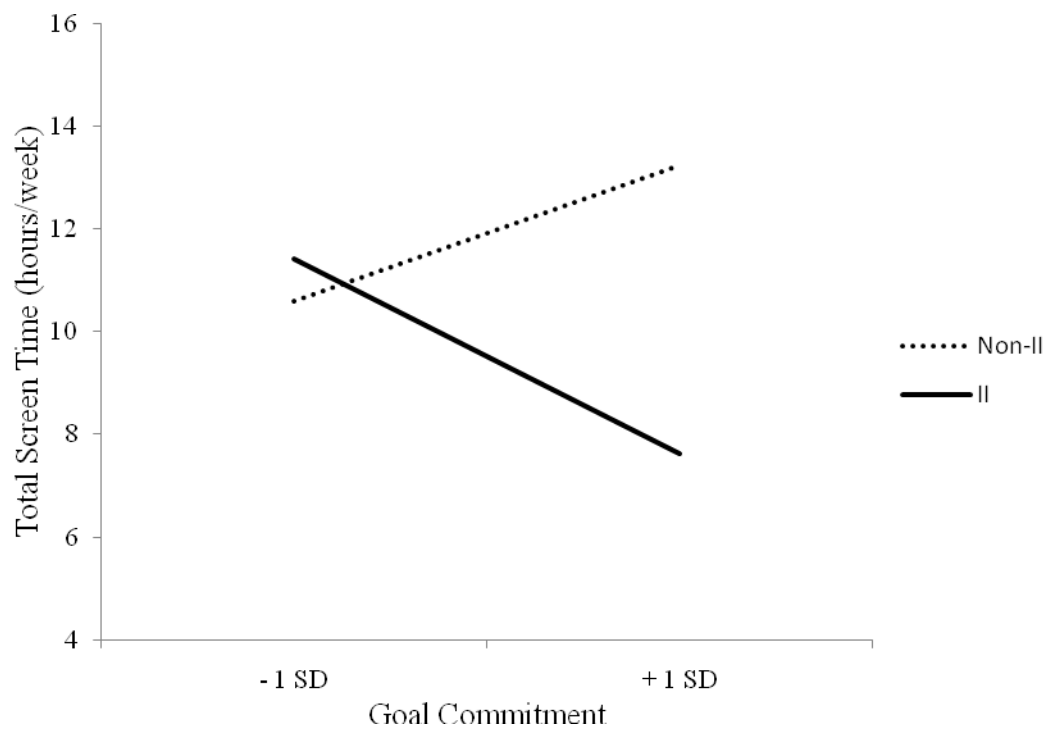


*Figure 3.* Two-way interaction between regulatory fit and goal commitment on prospective feelings about the behaviour in the physical activity group



*Figure 4.* Three-way interaction between regulatory fit, experimental condition and goal commitment on planning in the screen time group





*Figure 5.* Two-way interaction between experimental condition and goal commitment on total screen time in the screen time group

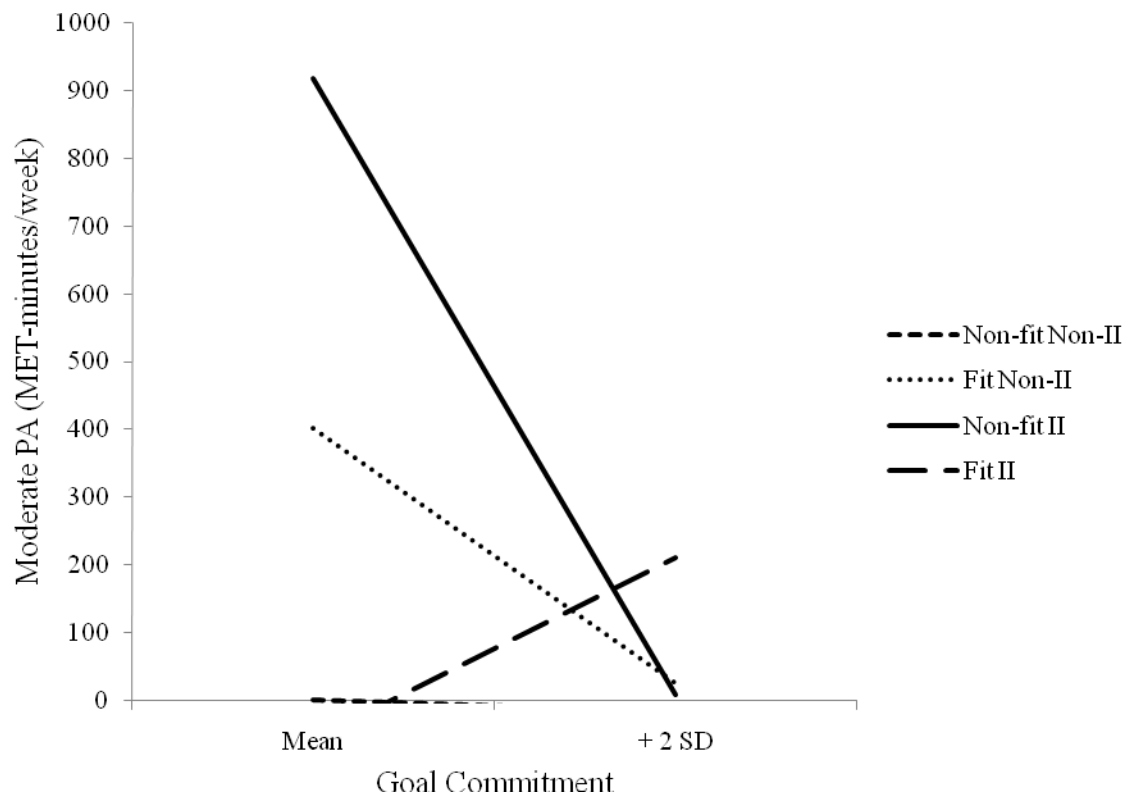


Figure 6. Three-way interaction between regulatory fit, experimental condition and goal commitment on moderate physical activity in the screen time group.

Table 1. Demographic variables at baseline

	Physical activity group				Screen time group			
	Fit II	Fit non-II	Non-fit II	Non-fit non-II	Fit II	Fit non-II	Non-fit II	Non-fit non-II
Age (years)	22.00 (4.84)	21.68 (4.96)	20.64 (2.93)	21.39 (3.75)	20.36 (5.41)	21.74 (3.62)	24.07 (4.65)	22.18 (7.63)
Sex (% female (N))	69.00 (20)	91.20 (31)	92.00 (23)	65.20 (15)	78.60 (22)	82.60 (19)	60.00 (9)	77.30 (17)
Year of Study								
1st year (% (N))	31.00 (9)	26.50 (9)	36.00 (9)	17.40 (4)	28.60 (8)	17.40 (4)	13.30 (2)	40.90 (9)
2nd year (% (N))	13.80 (4)	29.40 (10)	28.00 (7)	26.10 (6)	32.10 (9)	13.00 (3)	20.00 (3)	27.30 (6)
3rd year (% (N))	10.30 (3)	2.90 (1)	0	30.40 (7)	10.70 (3)	13.00 (3)	13.30 (2)	4.50 (1)
4th year (% (N))	13.80 (4)	5.90 (2)	8.00 (2)	8.70 (2)	0	21.70 (5)	0	0
Graduate (% (N))	27.60 (8)	32.40 (11)	28.00 (7)	17.40 (4)	21.40 (6)	30.40 (7)	40.00 (6)	22.70 (5)
Walking (MET- minutes/week)	246.93 (406.89)	430.46 (242.42)	314.82 (379.53)	304.17 (371.22)	348.86 (576.79)	241.04 (255.89)	997.70 (1176.63)	263.25 (332.84)

	Physical activity group				Screen time group			
	Fit II	Fit non-II	Non-fit II	Non-fit non-II	Fit II	Fit non-II	Non-fit II	Non-fit non-II
Moderate PA	288.28	324.12	276.75	475.65	250.71	383.48	284.00	337.27
(MET- minutes/week)	(345.85)	(311.51)	(421.84)	(525.49)	(371.92)	(469.22)	(405.97)	(377.88)
Vigorous PA	1275.86	1605.65	1116.80	1142.61	1407.14	1255.65	1208.00	1087.27
(MET- minutes/week)	(1220.70)	(1236.25)	(1006.71)	(1203.02)	(1205.28)	(1250.15)	(1407.91)	(1124.79)
Total Screen Time	22.41	16.36 (12.12)	25.91 (22.44)	15.56	17.34 (10.13)	19.69 (12.98)	15.91 (11.38)	15.45
(hours/week)	(19.50)			(9.79)				(8.40)
Goal commitment	6.03 (.67)	5.77 (.99)	5.98 (.62)	5.48 (1.13)	5.69 (1.14)	5.70 (.77)	5.24 (1.08)	5.59 (1.10)
(1-7)								

Note. All variables are reported as mean (standard deviation) except for sex and year of study which are percentage (N).

Table 2. Regression models for the indicators of regulatory fit for the physical activity goal type

Predictor	Inclination			Motivation			Prospective feelings			Retrospective feelings			Goal value		
	$\beta$	$t$	$p$	$\beta$	$t$	$p$	$\beta$	$t$	$p$	$\beta$	$t$	$p$	$\beta$	$t$	$p$
Regulatory fit	.18	1.35	.18	-.07	-.73	.47	.27*	2.07	.04	.03	.27	.79	.18	1.48	.14
Experimental condition	.12	.83	.41	.04	.36	.72	.04	.28	.78	-.17	-1.23	.22	.04	.28	.78
Goal commitment	.36	1.91	.06	.80*	5.90	< .001	.64*	3.53	.001	.61*	3.63	< .001	.55*	3.20	.002
Fit x condition	-.34	-1.94	.06	.00	.00	1.00	-.46*	-2.68	.01	-.06	-.39	.69	-.14	-.86	.40
Fit x goal commitment	-.13	-.66	.51	.01	.03	.97	-.44*	-2.36	.02	-.01	-.06	.95	-.02	-.09	.93
Condition x goal commitment	.15	.72	.47	-.11	-.71	.48	-.16	-.78	.44	.15	.82	.41	.12	.64	.53
Fit x condition x goal commitment	.12	.57	.57	.04	.27	.79	.34	1.64	.11	-.24	-1.27	.21	-.07	-.37	.71
Model significance	$F(7, 95) = 3.88, p = .001$			$F(7, 95) = 19.37, p < .001$			$F(7, 95) = 4.76, p < .001$			$F(7, 95) = 7.84, p < .001$			$F(7, 95) = 7.06, p < .001$		

\*  $p < .05$

Table 3. Means and standard deviations of behaviour variables, indicators of fit and planning for the physical activity goal type at T2

	Fit		Non-fit		Total			
	II	Non-II	II	Non-II	II	Non-II	Fit	Non-fit
Behaviour								
Moderate PA (MET-minutes/week)	486.90 (503.77)	535.33 (650.72)	340.00 (406.21)	591.00 (523.89)	486.90 (503.77)	535.33 (650.72)	511.52 (578.65)	454.09 (474.89)
Vigorous PA (MET-minutes/week)	1140.69 (1041.74)	1782.67 (1613.07)	1401.67 (1391.13)	998.00 (969.55)	1258.87 (1207.28)	1468.80 (1433.61)	1467.12 (1389.13)	1218.18 (1221.40)
Total screen time (hours/week)	18.12 (13.62)	15.62 (13.62)	19.40 (12.80)	14.33 (7.83)	18.70 (13.15)	15.10 (11.11)	16.96 (13.28)	17.30 (11.19)
Indicators of fit								
Inclination (1-7)	5.21 (1.29)	5.57 (1.59)	5.71 (1.40)	5.05 (1.22)	5.43 (1.35)	5.37 (1.47)	5.39 (1.45)	5.42 (1.35)
Motivation (3-21)	16.34 (3.55)	15.37 (4.41)	16.71 (2.61)	15.47 (4.51)	16.51 (3.14)	15.41 (4.40)	15.85 (4.00)	16.16 (3.59)

	Fit		Non-fit		Total			
	II	Non-II	II	Non-II	II	Non-II	II	Non-II
Prospective feelings	15.34	17.97	16.88	16.26	16.04	17.31	16.68	16.60
(3-21)	(3.76)	(3.03)	(3.23)	(3.68)	(3.58)	(3.37)	(3.63)	(3.41)
Retrospective feelings	21.48	24.23	23.29	23.42	22.30	23.92	22.88	23.35
(5-35)	(6.40)	(7.53)	(6.70)	(6.66)	(6.53)	(7.14)	(7.07)	(6.60)
Goal value (2-14)	10.62	10.77	10.63	9.74	10.62	10.37	10.69	10.23
	(2.41)	(2.67)	(2.00)	(2.18)	(2.21)	(2.52)	(2.53)	(2.10)
Planning (4-28)	22.45	20.47	23.75	18.05	23.04	19.53	21.44	21.23
	(5.38)	(6.36)	(5.22)	(5.67)	(5.30)	(6.16)	(5.93)	(6.07)

Table 4. Regression model predicting planning for the physical activity goal type

Predictor	Planning		
	$\beta$	$t$	$p$
Regulatory fit	.17	1.35	.18
Experimental condition	.47*	3.35	.001
Goal commitment	.48*	2.74	.01
Fit x condition	-.32	-1.91	.06
Fit x goal commitment	.05	.27	.79
Condition x goal commitment	-.25	-1.28	.21
Fit x condition x goal commitment	.14	.73	.47

\*  $p < .05$



Table 5. Regression model predicting planning for the screen time goal type

Predictor	Planning		
	$\beta$	$t$	$p$
Regulatory fit	-.09	-.62	.54
Experimental condition	.27	1.68	.10
Goal commitment	.48*	2.87	.01
Fit x condition	-.28	-1.38	.17
Fit x goal commitment	.07	.38	.71
Condition x goal commitment	.12	.63	.53
Fit x condition x goal commitment	-.56*	-2.77	.01
* $p < .05$			

Table 6. Standardized regression coefficients predicting behaviour for the physical activity goal type

Predictor	Moderate activity at T3			Vigorous activity at T3			Total screen time at T3		
	$\beta$	$t$	$p$	$\beta$	$t$	$p$	$\beta$	$t$	$p$
Total activity at T1	.37	3.96	< .001	.38	4.13	< .001	.09	.98	.33
Total screen time at T1	.04	.40	.69	.09	.94	.35	.56	6.12	< .001
Regulatory fit	-.15	-1.10	.27	.22	1.65	.10	.01	.07	.95
Experimental condition	-.29	-1.85	.07	.11	.69	.49	.13	.90	.37
Goal commitment	.32	1.69	.10	.32	1.74	.09	.09	.48	.63
Fit x condition	.23	1.30	.20	-.24	-1.39	.17	-.08	-.45	.65
Fit x goal commitment	-.16	-.81	.42	.03	.18	.86	-.21	-1.06	.29
Condition x goal commitment	.10	.45	.65	-.003	-.02	.99	-.13	-.60	.55
Fit x condition x goal commitment	.06	.30	.77	-.11	-.50	.62	.25	1.18	.24

Table 7. Regression models for the indicators of regulatory fit for the screen time goal type

Predictor	Inclination			Motivation			Prospective feelings			Retrospective feelings			Goal value		
	$\beta$	$t$	$p$	$\beta$	$t$	$p$	$\beta$	$t$	$p$	$\beta$	$t$	$p$	$\beta$	$t$	$p$
Regulatory fit	-.02	-.12	.91	-.03	-.33	.74	-.05	-.33	.75	-.05	-.39	.70	.09	.68	.50
Experimental condition	-.02	-.14	.89	.02	.15	.88	-.15	-.94	.35	-.08	-.51	.61	.02	.12	.90
Goal commitment	.37*	2.19	.03	.85*	7.68	< .001	.66*	3.94	< .001	.78*	4.93	< .001	.68*	4.43	< .001
Fit x condition	.12	.59	.56	.02	.14	.89	.01	.04	.97	.01*	.05	.96	-.05	-.27	.79
Fit x goal commitment	.27	1.46	.15	.03	.28	.78	-.15	-.83	.41	-.12	-.66	.51	.07	.41	.68
Condition x goal commitment	-.08	-.41	.69	.02	.16	.88	-.05	-.27	.79	-.15	-.82	.41	-.13	-.73	.47
Fit x condition x goal commitment	-.02	-.09	.93	-.13	-.97	.33	-.06	-.30	.76	-.20	-1.03	.31	-.01	-.07	.95
Model significance	$F(7, 72) = 4.34, p < .001$			$F(7, 72) = 23.35, p < .001$			$F(7, 72) = 4.39, p < .001$			$F(7, 72) = 6.02, p < .001$			$F(7, 72) = 7.36, p < .001$		

\*  $p < .05$

Table 8. Means and standard deviations of behaviour variables, indicators of fit and planning for the screen time goal type at time 2

	Fit		Non-fit		Total			
	II	Non-II	II	Non-II	II	Non-II	Fit	Non-fit
Behaviour								
Moderate PA (MET- minutes/week)	578.46 (621.51)	453.33 (428.40)	411.43 (881.46)	484.55 (616.66)	520.00 (716.32)	470.50 (533.86)	527.27 (548.64)	456.11 (719.76)
Vigorous PA (MET- minutes/week)	1713.85 (1775.52)	1271.11 (1864.72)	1757.14 (2795.53)	1138.18 (744.73)	1729.00 (2150.87)	1198.00 (1348.64)	1532.73 (1804.44)	1378.89 (1824.59)
Total screen time (hours/week)	12.27 (9.31)	14.94 (9.65)	11.95 (9.25)	17.08 (11.53)	12.16 (9.17)	16.12 (10.65)	13.39 (9.43)	15.08 (10.86)
Indicators of fit								
Inclination (1-7)	4.69 (1.57)	4.06 (1.70)	4.36 (1.28)	4.55 (1.74)	4.58 (1.47)	4.33 (1.72)	4.43 (1.63)	4.47 (1.56)
Motivation (3-21)	14.65 (3.71)	13.33 (4.65)	13.57 (4.13)	14.77 (4.61)	14.28 (3.84)	14.13 (4.63)	14.11 (4.12)	14.31 (4.41)

	Fit		Non-fit		Total			
	II	Non-II	II	Non-II	II	Non-II	Fit	Non-fit
Prospective feelings (3-21)	14.31 (3.45)	14.83 (3.67)	13.79 (3.45)	15.55 (3.58)	14.13 (3.41)	15.23 (3.59)	14.52 (3.51)	14.86 (3.59)
Retrospective feelings (5-35)	21.77 (5.91)	21.00 (5.65)	20.71 (5.66)	22.59 (6.13)	21.40 (5.77)	21.88 (5.90)	21.45 (5.75)	21.86 (5.94)
Goal value (2-14)	9.46 (2.45)	9.11 (2.59)	9.00 (2.35)	9.27 (2.57)	9.30 (2.40)	9.20 (2.54)	9.32 (2.49)	9.17 (2.46)
Planning (4-28)	16.69 (7.89)	14.67 (7.06)	19.43 (7.58)	17.36 (6.61)	17.65 (7.80)	16.15 (6.87)	15.86 (7.55)	18.17 (6.98)

Table 9. Standardized regression coefficients predicting behaviour for the screen time goal type

Predictor	Moderate activity at T3			Vigorous activity at T3			Total screen time at T3		
	$\beta$	$t$	$p$	$\beta$	$t$	$p$	$\beta$	$t$	$p$
Total activity at T1	.39	3.54	.001	.71	8.28	< .001	-.17	-1.54	.13
Total screen time at T1	-.04	-.40	.69	-.07	-.86	.39	.36	3.31	.001
Regulatory fit	-.10	-.61	.54	-.09	-.77	.45	-.12	-.79	.43
Experimental condition	-.40	-2.35	.02	-.13	-1.01	.31	-.38	-2.29	.03
Goal commitment	-.04	-.22	.83	-.04	-.26	.80	.04	.25	.80
Fit x condition	.52	2.46	.02	.23	1.41	.16	.27	1.31	.20
Fit x goal commitment	-.28	-1.40	.17	.07	.44	.66	-.06	-.28	.78
Condition x goal commitment	-.29	-1.42	.16	.17	1.07	.29	-.40	-2.05	.05
Fit x condition x goal commitment	.53	2.51	.01	-.19	-1.13	.26	.31	1.54	.13

## Appendix

### Appendix A: Recruitment Materials, Letter of Information/Consent Form

#### Recruitment Materials - Poster



The poster features the Queen's University crest and logo at the top. Below this, a black banner with white text reads "PARTICIPANTS NEEDED" and "Do you want to be healthier??" in a bold, sans-serif font. The main body of the poster is white with black text, containing the following information:

Make your New Year's Resolutions a reality!  
We are currently recruiting Queen's students between the ages of  
18 and 35 years for a study on health goals.

Participants will be entered in a draw to win one of  
fifteen \$20 gift cards to local stores!

[healthgoalstudy@gmail.com](mailto:healthgoalstudy@gmail.com)

At the bottom, there is a row of ten vertical lines, each followed by the email address [healthgoalstudy@gmail.com](mailto:healthgoalstudy@gmail.com).

## Queen's University



This study is being conducted by Carolyn Barg and Amy Latimer from the School of Kinesiology and Health Studies at Queen's University, Canada.

This study examines people's goals related to physical activity and sedentary behaviour. This session will take about 20-30 minutes to complete. You will first be asked to fill out some demographic information. Then, you will be asked to complete two short questionnaires regarding events in your life and how you react to things. Next, you will be asked to respond to several questions about your physical and sedentary activity. Then you will be asked to form a personal goal and complete two final questionnaires. You will be contacted by e-mail one and four weeks after the initial session and sent a link to a short online survey to complete at that time. Your name will be entered in a draw to win one of fifteen \$20 gift cards to popular local stores once for each of the three phases of the study that you participate in (for a maximum of three entries per participant). You will not experience any pain or discomfort resulting from this study. There are no known risks associated with this study, and there is no reason to suspect that any pain or discomfort will result from taking part.

This is a voluntary study. As a volunteer, you are free to choose whether or not you would like to participate in this study and may withdraw at any time without any consequences. You may also exercise the right to have your data removed from the study. To exercise this right, you will need to inform Carolyn Barg or Amy Latimer of your wishes in person or via e-mail correspondence (contact details below). You can refuse to answer any of the study's questions at any time, without any consequences, while still remaining in the study. If you withdraw from the study, you will still be entered in the draw for the gift cards.

Your answers are confidential. Your contact information will be stored on a password-protected School of Kinesiology and Health Studies computer. This file will be stored separately from your answers. The data will be published in composite form with no ability to trace you as an individual. All records will be secured safely under password protection and in locked cabinets.

If you would like further information about the study, or have additional questions or concerns, please feel free to contact: the researchers, Carolyn Barg at [carolyn.barg@queensu.ca](mailto:carolyn.barg@queensu.ca) Dr. Amy Latimer, at 613-533-6000, ext. 78773 or [amy.latimer@queensu.ca](mailto:amy.latimer@queensu.ca), Queen's University General Research Ethics Board [ChairGREB@queensu.ca](mailto:ChairGREB@queensu.ca), or the Head of the School of Kinesiology and Health Studies, Dr. Jean Cote (613)533-5054 or e-mail [skhs.director@queensu.ca](mailto:skhs.director@queensu.ca).



## **SIGNATURE OF PARTICIPANT**

I have read and understand the letter of information and consent form for this study. I have had the purposes, procedures and technical language of this study explained to me. I have been given sufficient time to consider the above information and to seek advice if I chose to do so. I have had the opportunity to ask questions which have been answered to my satisfaction. I am voluntarily signing this form. I will receive a copy of this consent form for my information.

Please sign this document in the space provided below.

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**Name of participant**

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**Signature of participant**

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**Date**

Would you like to be contacted by members of our lab for the purpose of participating in future research studies?

☐ Yes

☐ No

If you answered “Yes”, please provide an e-mail address where you can be reached:

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## **SIGNATURE OF INVESTIGATOR**

In my judgment, I believe the participant is voluntarily and knowingly giving informed consent and possesses the legal capacity to give informed consent to participate in this research study.

---

**Signature of investigator**

---

**Date**

## Appendix B: Questionnaires

### Sections 1-5 for all versions of questionnaire

Before beginning the questionnaire, please create an identification number for yourself by combining your day and month of birth with the last four digits of your current phone number. For example, if you were born on September 10<sup>th</sup> and your phone number ends 7833, your ID # would be 10097833. This is how your responses will be tracked throughout the study. Please write this number at the top of every page of the questionnaire.

#### Section 1

Below are a few questions about you and your background. It will take about 2 minutes to complete. All of the information is, of course, strictly confidential. You can ask me any questions you may have at any time. Please provide the following details:

1. Are you female or male?

- ☐ Female
- ☐ Male

2. What is your date of birth: Day: \_\_\_\_\_ Month: \_\_\_\_\_ Year: \_\_\_\_\_

3. How old are you? \_\_\_\_\_ years

4. People living in Canada come from many different cultural and racial backgrounds. Which of the following backgrounds best describes you? You can check more than one option.

- ☐ White
- ☐ Chinese
- ☐ South Asian (e.g., East Indian, Pakistani, Sri Lankan, etc.)
- ☐ Black
- ☐ Filipino
- ☐ Latin American
- ☐ South Asian (e.g., Cambodian, Indonesian, Laotian, Vietnamese)
- ☐ Arab
- ☐ West Asian (e.g., Afghan, Iranian, etc.)
- ☐ Japanese
- ☐ Korean
- ☐ Aboriginal People of North America (North American Indian, Métis, Inuit/Eskimo)

☐ Other: \_\_\_\_\_

5. What is your year of study?

- ☐ 1<sup>st</sup> year undergraduate  
☐ 2<sup>nd</sup> year undergraduate  
☐ 3<sup>rd</sup> year undergraduate  
☐ 4<sup>th</sup> year undergraduate  
☐ Other: \_\_\_\_\_

6. What is your program of study? \_\_\_\_\_

## Section 2

This set of questions asks you HOW FREQUENTLY specific events actually occur or have occurred in your life. Please indicate your answer to each question by circling the appropriate number below it.

1. Compared to most people, are you typically unable to get what you want out of life?

1	2	3	4	5
Never or seldom		Sometimes		Very often

2. Growing up, would you ever “cross the line” by doing things that your parents would not tolerate?

1	2	3	4	5
Never or seldom		Sometimes		Very often

3. How often have you accomplished things that got you “psyched” to work even harder?

1	2	3	4	5
Never or seldom		Sometimes		Very often

4. Did you get on your parents’ nerves often when you were growing up?

1	2	3	4	5
Never or seldom		Sometimes		Very often

5. How often did you obey rules and regulations that were established by your parents?

1	2	3	4	5
Never or seldom		Sometimes		Very often

6. Growing up, did you ever act in ways that your parents thought were objectionable?

1	2	3	4	5
Never or seldom		Sometimes		Very often

7. Do you often do well at different things that you try?

1	2	3	4	5
Never or seldom		Sometimes		Very often

8. Not being careful enough has gotten me into trouble at times.

1	2	3	4	5
Never or seldom		Sometimes		Very often

9. When it comes to achieving things that are important to me, I find that I don't perform as well as I ideally would like to do.

1	2	3	4	5
Never or seldom		Sometimes		Very often

10. I feel like I have made progress toward being successful in my life.

1	2	3	4	5
Certainly false				Certainly true

11. I have found very few hobbies or activities in my life that capture my interest or motivate me to put effort into them.

1	2	3	4	5
Certainly false				Certainly true

### Section 3

Please rate your agreement to the following statements using the scale below:

1	2	3	4	5
<i>Strongly Disagree</i>	<i>Somewhat Disagree</i>	<i>Neutral</i>	<i>Somewhat Agree</i>	<i>Strongly Agree</i>

1. \_\_\_\_ When I see an opportunity for something I like, I get excited right away.
2. \_\_\_\_ I worry about making mistakes.
3. \_\_\_\_ I'm always willing to try something new if I think it will be fun.
4. \_\_\_\_ I go out of my way to get things I want.
5. \_\_\_\_ Even if something bad is about to happen to me, I rarely experience fear or nervousness.
6. \_\_\_\_ When good things happen to me, it affects me strongly.
7. \_\_\_\_ I have very few fears compared to my friends.
8. \_\_\_\_ When I get something I want, I feel excited and energized.
9. \_\_\_\_ Criticism or scolding hurts me quite a bit.
10. \_\_\_\_ I crave excitement and new sensations.
11. \_\_\_\_ When I go after something I use a "no holds barred" approach.
12. \_\_\_\_ If I think something unpleasant is going to happen I usually get pretty "worked up."
13. \_\_\_\_ When I want something, I usually go all-out to get it.
14. \_\_\_\_ I feel pretty worried or upset when I think or know somebody is angry at me.
15. \_\_\_\_ If I see a chance to get something I want, I move on it right away.
16. \_\_\_\_ It would excite me to win a contest.
17. \_\_\_\_ I will often do things for no other reason than they might be fun.

18. \_\_\_ I feel worried when I think I have done poorly at something.
19. \_\_\_ When I'm doing well at something, I love to keep at it.
20. \_\_\_ I often act on the spur of the moment.

#### Section 4

**Part 1:** This part is about all the physical activities that you did in the **last 7 days** solely for recreation, sport, exercise or leisure. Please do not include any activities related to your job, transportation, or housework.

1. Not counting any walking related to your job, transportation or housework, during the **last 7 days**, on how many days did you **walk** for at least 10 minutes at a time **in your leisure time**?

\_\_\_ **days per week**

☐

No walking in leisure time



*Skip to question 3*

2. How much time did you usually spend on one of those days **walking** in your leisure time?

\_\_\_ **hours per day**

\_\_\_ **minutes per day**

3. Think about only those physical activities that you did for at least 10 minutes at a time. During the **last 7 days**, on how many days did you do **vigorous** physical activities like aerobics, running, fast bicycling, or fast swimming **in your leisure time**?

\_\_\_ **days per week**

☐

No vigorous activity in leisure time



*Skip to question 5*

4. How much time did you usually spend on one of those days doing **vigorous** physical activities in your leisure time?

\_\_\_ **hours per day**

\_\_\_ **minutes per day**

5. Again, think about only those physical activities that you did for at least 10 minutes at a time. During the **last 7 days**, on how many days did you do

**moderate** physical activities like bicycling at a regular pace, swimming at a regular pace, and doubles tennis **in your leisure time**?

\_\_\_\_\_ **days per week**

☐

No moderate activity in leisure time



***Skip to Part 2***

6. How much time did you usually spend on one of those days doing **moderate** physical activities in your leisure time?

\_\_\_\_\_ **hours per day**

\_\_\_\_\_ **minutes per day**

**Part 2:** The last questions are about the time you spend sitting while at work, at home, while doing course work and during leisure time. This may include time spent sitting at a desk, visiting friends, reading or sitting or lying down to watch television. Do not include any time spent sitting in a motor vehicle that you have already told me about.

7. During the **last 7 days**, how much time did you usually spend **sitting** on a **weekday**?

\_\_\_\_\_ **hours per day**

\_\_\_\_\_ **minutes per day**

8. During the **last 7 days**, how much time did you usually spend **sitting** on a **weekend day**?

\_\_\_\_\_ **hours per day**

\_\_\_\_\_ **minutes per day**

### Section 5

Please indicate your answer to the following questions by circling the category that best represents your response. Please report **leisure-time hours only** and exclude time spent on these activities at work or school.

1. How many hours **in the last week** did you spend watching television or videos?
- a) None
  - b) Less than 1 hour
  - c) 1-2.9 hours

- d) 3-5.9 hours
- e) 6-10.9 hours
- f) 11-14.9 hours
- g) 15-20 hours
- h) More than 20 hours

Within the category that you selected, please provide an estimate of the **exact number** of hours that you spent watching television or videos during your leisure time in the last week: \_\_\_\_\_

2. How many hours **in the last week** did you spend on a computer, including playing computer games and using the Internet?

- a) None
- b) Less than 1 hour
- c) 1-2.9 hours
- d) 3-5.9 hours
- e) 6-10.9 hours
- f) 11-14.9 hours
- g) 15-20 hours
- h) More than 20 hours

Within the category that you selected, please provide an estimate of the **exact number** of hours that you spent on a computer during your leisure time in the last week: \_\_\_\_\_

3. How many hours **in the last week** did you spend playing video games, such as XBOX, Nintendo and Playstation? Please do not include games that require whole body movement (e.g., Wii, Dance Dance Revolution).

- a) None
- b) Less than 1 hour
- c) 1-2.9 hours
- d) 3-5.9 hours
- e) 6-10.9 hours
- f) 11-14.9 hours
- g) 15-20 hours
- h) More than 20 hours

Within the category that you selected, please provide an estimate of the **exact number** of hours that you spent playing video games during your leisure time in the last week:

\_\_\_\_\_



## Section 6 for the physical activity goal type, non-implementation intention condition

### Section 6

Being physically active is very important for your health. By increasing your physical activity you can achieve health benefits, like feeling more energetic and maintaining a healthy body weight. Physical activity refers to moderate-intensity activity and vigorous-intensity activity. Moderate-intensity activity means that you're active enough to raise your heart rate, breathe a bit faster than normal, and break a light sweat. Vigorous-intensity activity means that you're breathing hard and fast, your heart rate has gone up quite a bit, and you are sweating a lot.

**Please make it a personal goal to increase your leisure-time physical activity by at least 60 minutes per week over the next four weeks. You can do this in whatever increments work best for you. For example, increase your physical activity twice a week for 30 minutes at a time, three times a week for 20 minutes at a time, or whatever fits best into your schedule.**

To help you to commit to this goal, please rewrite the above goal statement in the space below.

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Now, please think about some activities that you could do to accomplish the goal of increasing your leisure-time physical activity by at least 60 minutes per week over the next four weeks. By thinking of activities to accomplish the goal, you greatly increase the chances that you will be successful. Use point form and write down as many ideas for activities as come to mind in the space below.

To track your progress, on the days that you increase your physical activity put a checkmark on your calendar.

## Section 6 for the physical activity goal type, implementation intention condition

### Section 6

Being physically active is very important for your health. By increasing your physical activity you can achieve health benefits, like feeling more energetic and maintaining a healthy body weight. Physical activity refers to moderate-intensity activity and vigorous-intensity activity. Moderate-intensity activity means that you're active enough to raise your heart rate, breathe a bit faster than normal, and break a light sweat. Vigorous-intensity activity means that you're breathing hard and fast, your heart rate has gone up quite a bit, and you are sweating a lot

**Please make it a personal goal to increase your leisure-time physical activity by at least 60 minutes per week over the next four weeks. You can do this in whatever increments work best for you. For example, increase your physical activity twice a week for 30 minutes at a time, three times a week for 20 minutes at a time, or whatever fits best into your schedule.**

To help you to commit to this goal, please rewrite the above goal statement in the space below.

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Making a plan is important when you are trying to achieve a goal. By making a detailed plan describing exactly when, where and how you will take action towards accomplishing your goal, you greatly increase the chances that you will be successful.

Please use the calendar on the next page to plan how you will increase your physical activity over the next week. If you brought it with you, refer to your day planner in order to make the plans as realistic as possible. Include what you will do, where you will perform the activity and the specific day and time period.

For example, if your plan is go the gym and run on the treadmill for 30 minutes on Monday, to play soccer at lunchtime on campus with friends on Wednesday and to go rollerblading Friday evening, put these details on your calendar.

Do you have your day planner with you?

- ☐ Yes
- ☐ No

Example:

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
	<i>What:</i> Run <i>When:</i> 5 pm before dinner <i>Where:</i> Gym in the PEC		<i>What:</i> Play soccer <i>When:</i> Lunchtime between Bio and Psych <i>Where:</i> Tindall field		<i>What:</i> Go rollerblading <i>When:</i> 7 pm after dinner <i>Where:</i> Earl Street loop	

Please fill out your calendar below. Remember, your goal is to **increase your leisure-time physical activity** by at least 60 minutes per week over the next four weeks. **Post your calendar somewhere where you will see it.** To help track your progress, check off the days on your calendar that you carry out your plan.

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
<i>What:</i>	<i>What:</i>	<i>What:</i>	<i>What:</i>	<i>What:</i>	<i>What:</i>	<i>What:</i>
<i>When:</i>	<i>When:</i>	<i>When:</i>	<i>When:</i>	<i>When:</i>	<i>When:</i>	<i>When:</i>
<i>Where:</i>	<i>Where:</i>	<i>Where:</i>	<i>Where:</i>	<i>Where:</i>	<i>Where:</i>	<i>Where:</i>
<i>What:</i>	<i>What:</i>	<i>What:</i>	<i>What:</i>	<i>What:</i>	<i>What:</i>	<i>What:</i>
<i>When:</i>	<i>When:</i>	<i>When:</i>	<i>When:</i>	<i>When:</i>	<i>When:</i>	<i>When:</i>
<i>Where:</i>	<i>Where:</i>	<i>Where:</i>	<i>Where:</i>	<i>Where:</i>	<i>Where:</i>	<i>Where:</i>
<i>What:</i>	<i>What:</i>	<i>What:</i>	<i>What:</i>	<i>What:</i>	<i>What:</i>	<i>What:</i>
<i>When:</i>	<i>When:</i>	<i>When:</i>	<i>When:</i>	<i>When:</i>	<i>When:</i>	<i>When:</i>
<i>Where:</i>	<i>Where:</i>	<i>Where:</i>	<i>Where:</i>	<i>Where:</i>	<i>Where:</i>	<i>Where:</i>
<i>What:</i>	<i>What:</i>	<i>What:</i>	<i>What:</i>	<i>What:</i>	<i>What:</i>	<i>What:</i>
<i>When:</i>	<i>When:</i>	<i>When:</i>	<i>When:</i>	<i>When:</i>	<i>When:</i>	<i>When:</i>
<i>Where:</i>	<i>Where:</i>	<i>Where:</i>	<i>Where:</i>	<i>Where:</i>	<i>Where:</i>	<i>Where:</i>

**Section 6 for the screen time goal type, non-implementation intention condition**

Section 6

Avoiding being physically inactive is very important for avoiding health problems. By decreasing your screen time you can avoid negative health consequences like feeling tired and gaining weight. Screen time refers to time spent watching television or videos, on a computer, including playing computer games and using the Internet, and playing video games.

**Please make it a personal goal to decrease your leisure-time screen time by at least 60 minutes per week over the next four weeks. You can do this in whatever increments work best for you. For example, reduce your screen time twice a week for 30 minutes at a time, three times a week for 20 minutes at a time, or whatever fits best into your schedule.**

To help you to commit to this goal, please rewrite the above goal statement in the space below.

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Now, please think about some activities that you could do to accomplish the goal of decreasing your leisure-time screen time by at least 60 minutes per week over the next four weeks. By thinking of activities to accomplish the goal, you greatly increase the chances that you will be successful. Use point form and write down as many ideas for activities as come to mind in the space below.

To track your progress, on the days that you decrease your screen time put a checkmark on your calendar.

**Section 6 for the screen time goal type, implementation intention condition**

Section 6

Avoiding being physically inactive is very important for avoiding health problems. By decreasing your screen time you can avoid negative health consequences like feeling tired and gaining weight. Screen time refers to time spent watching television or videos, on a computer, including playing computer games and using the Internet, and playing video games.

**Please make it a personal goal to decrease your leisure-time screen time by at least 60 minutes per week over the next four weeks. You can do this in whatever increments work best for you. For example, reduce your screen time twice a week for 30 minutes at a time, three times a week for 20 minutes at a time, or whatever fits best into your schedule.**

To help you to commit to this goal, please rewrite the above goal statement in the space below.

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ID #: \_\_\_\_\_  
(ddmm####)

Making a plan is important when you are trying to achieve a goal. By making a detailed plan describing exactly when, where and how you will take action towards accomplishing your goal, you greatly increase the chances that you will be successful.

Please use the calendar on the next page to plan how you will avoid screen time over the next week. If you brought it with you, refer to your day planner in order to make the plans as realistic as possible. Include what you will not do, where you will avoid the activity and the specific day and time period.

For example, if your plan is to not watch television for 30 minutes after school on Monday, not to go on Facebook at lunchtime on Wednesday and not to see a movie on Friday evening, put these details on your calendar.

Do you have your day planner with you?

- ☐ Yes
- ☐ No



**Example:**

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
	<i>What:</i> No TV  <i>When:</i> 5 pm before dinner  <i>Where:</i> Home		<i>What:</i> No Facebook  <i>When:</i> Lunchtime between Bio and Psych  <i>Where:</i> Stauffer library		<i>What:</i> No movie  <i>When:</i> 9 pm after dinner  <i>Where:</i> Downtown theatre	

Please fill out your calendar below. Remember, your goal is to **decrease your leisure-time screen time** by at least 60 minutes per week over the next four weeks. **Post your calendar somewhere where you will see it.** To help track your progress, check off the days on your calendar that you carry out your plan.

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
<i>What:</i>	<i>What:</i>	<i>What:</i>	<i>What:</i>	<i>What:</i>	<i>What:</i>	<i>What:</i>
<i>When:</i>	<i>When:</i>	<i>When:</i>	<i>When:</i>	<i>When:</i>	<i>When:</i>	<i>When:</i>
<i>Where:</i>	<i>Where:</i>	<i>Where:</i>	<i>Where:</i>	<i>Where:</i>	<i>Where:</i>	<i>Where:</i>
<i>What:</i>	<i>What:</i>	<i>What:</i>	<i>What:</i>	<i>What:</i>	<i>What:</i>	<i>What:</i>
<i>When:</i>	<i>When:</i>	<i>When:</i>	<i>When:</i>	<i>When:</i>	<i>When:</i>	<i>When:</i>
<i>Where:</i>	<i>Where:</i>	<i>Where:</i>	<i>Where:</i>	<i>Where:</i>	<i>Where:</i>	<i>Where:</i>
<i>What:</i>	<i>What:</i>	<i>What:</i>	<i>What:</i>	<i>What:</i>	<i>What:</i>	<i>What:</i>
<i>When:</i>	<i>When:</i>	<i>When:</i>	<i>When:</i>	<i>When:</i>	<i>When:</i>	<i>When:</i>
<i>Where:</i>	<i>Where:</i>	<i>Where:</i>	<i>Where:</i>	<i>Where:</i>	<i>Where:</i>	<i>Where:</i>
<i>What:</i>	<i>What:</i>	<i>What:</i>	<i>What:</i>	<i>What:</i>	<i>What:</i>	<i>What:</i>
<i>When:</i>	<i>When:</i>	<i>When:</i>	<i>When:</i>	<i>When:</i>	<i>When:</i>	<i>When:</i>
<i>Where:</i>	<i>Where:</i>	<i>Where:</i>	<i>Where:</i>	<i>Where:</i>	<i>Where:</i>	<i>Where:</i>

## Sections 7-8 for the physical activity groups

### Section 7

Please answer the following questions by **considering your goal of increasing your physical activity by at least 60 minutes per week over the next four weeks**. Circle the number that best represents your response.

1. It's hard to take this goal seriously.

1	2	3	4	5	6	7
Strongly disagree						Strongly agree

2. Quite frankly, I don't care if I achieve this goal or not.

1	2	3	4	5	6	7
Strongly disagree						Strongly agree

3. I am strongly committed to pursuing this goal.

1	2	3	4	5	6	7
Strongly disagree						Strongly agree

4. It wouldn't take much for me to abandon this goal.

1	2	3	4	5	6	7
Strongly disagree						Strongly agree

5. I think this is a good goal to shoot for.

1	2	3	4	5	6	7
Strongly disagree						Strongly agree

## Section 8

Please answer the following questions by circling the number that best represents your response.

1. I have made a detailed plan regarding...

... **when** to do my physical activity over the next four weeks.

1	2	3	4	5	6	7
Definitely false						Definitely true

... **where** to do my physical activity over the next four weeks.

1	2	3	4	5	6	7
Definitely false						Definitely true

... **how** to do my physical activity over the next four weeks.

1	2	3	4	5	6	7
Definitely false						Definitely true

... **how often** to do my physical activity over the next four weeks.

1	2	3	4	5	6	7
Definitely false						Definitely true

2. Increasing your physical activity by at least 60 minutes per week over the next four weeks is one of the most important things you can do for your health.

1	2	3	4	5	6	7
Strongly disagree						Strongly agree

3. How motivated do you feel to achieve the goal of increasing your physical activity by at least 60 minutes per week over the next four weeks?

1	2	3	4	5	6	7
Not at all						Very

4. I will try to increase my physical activity by at least 60 minutes per week over the next four weeks.

1	2	3	4	5	6	7
Strongly disagree						Strongly agree

5. I intend to increase my physical activity by at least 60 minutes per week over the next four weeks.

1	2	3	4	5	6	7
Strongly disagree						Strongly agree

6. Increasing my physical activity by at least 60 minutes per week over the next four weeks would be:

1	2	3	4	5	6	7
Unpleasant						Pleasant

1	2	3	4	5	6	7
Not						Enjoyable

enjoyable

1	2	3	4	5	6	7
Stressful						Relaxing

7. How valuable to you is the goal of increasing your physical activity by at least 60 minutes per week over the next four weeks?

1	2	3	4	5	6	7
Extremely worthless						Extremely valuable

8. How effective do you feel that increasing your physical activity by at least 60 minutes per week over the next four weeks would be for achieving health benefits?

1	2	3	4	5	6	7
Not at all effective						Extremely effective

## Sections 7-8 for the screen time groups

### Section 7

Please answer the following questions by **considering your goal of decreasing your screen time by 60 minutes per week over the next four weeks**. Circle the number that best represents your response.

1. It's hard to take this goal seriously.

1	2	3	4	5	6	7
Strongly disagree						Strongly agree

2. Quite frankly, I don't care if I achieve this goal or not.

1	2	3	4	5	6	7
Strongly disagree						Strongly agree

3. I am strongly committed to pursuing this goal.

1	2	3	4	5	6	7
Strongly disagree						Strongly agree

4. It wouldn't take much for me to abandon this goal.

1	2	3	4	5	6	7
Strongly disagree						Strongly agree

5. I think this is a good goal to shoot for.

1	2	3	4	5	6	7
Strongly disagree						Strongly agree

## Section 8

Please answer the following questions by circling the number that best represents your response.

1. I have made a detailed plan regarding...

... **when** to avoid screen time over the next four weeks.

1	2	3	4	5	6	7
Definitely false						Definitely true

... **where** to avoid screen time over the next four weeks.

1	2	3	4	5	6	7
Definitely false						Definitely true

... **how** to avoid screen time over the next four weeks.

1	2	3	4	5	6	7
Definitely false						Definitely true

... **how often** to avoid screen time over the next four weeks.

1	2	3	4	5	6	7
Definitely false						Definitely true

2. Decreasing your screen time by at least 60 minutes per week over the next four weeks is one of the most important things you can do for your health.



1	2	3	4	5	6	7
Strongly disagree						Strongly agree

3. How motivated do you feel to achieve the goal of decreasing your screen time by at least 60 minutes per week over the next four weeks?

1	2	3	4	5	6	7
Not at all						Very

4. I will try to decrease my screen time by at least 60 minutes per week over the next four weeks.

1	2	3	4	5	6	7
Strongly disagree						Strongly agree

5. I intend to decrease my screen time by at least 60 minutes per week over the next four weeks.

1	2	3	4	5	6	7
Strongly disagree						Strongly agree

6. Decreasing my screen time by at least 60 minutes per week over the next four weeks would be:

1	2	3	4	5	6	7
Unpleasant						Pleasant

1	2	3	4	5	6	7
Not enjoyable						Enjoyable

1	2	3	4	5	6	7
Stressful						Relaxing

7. How valuable to you is the goal of decreasing your screen time by at least 60 minutes per week over the next four weeks?

1	2	3	4	5	6	7
Extremely worthless						Extremely valuable

8. How effective do you feel that decreasing your screen time by at least 60 minutes per week over the next four weeks would be for avoiding negative health consequences?

1	2	3	4	5	6	7
Not at all effective						Extremely effective

**Additional follow-up questions for the physical activity groups**

1. How satisfied do you feel with the **progress** you have made towards increasing your physical activity by at least 60 minutes per week?

1	2	3	4	5	6	7
Not satisfied						Extremely satisfied

2. How satisfied do you feel with the **results** you have experienced due to increasing your physical activity by at least 60 minutes per week?

1	2	3	4	5	6	7
Not satisfied						Extremely satisfied

3. Did you find increasing your physical activity by at least 60 minutes per week over the past 4 weeks to be:

1	2	3	4	5	6	7
Unpleasant						Pleasant

1	2	3	4	5	6	7
Not enjoyable						Enjoyable

1	2	3	4	5	6	7
Stressful						Relaxing

4. To what extent did you follow the calendar that you prepared during the study that specified when, where and how you would achieve your goal?

1	2	3	4	5	6	7
Didn't follow at all						Followed exactly

### Additional follow-up questions for the screen time groups

1. How satisfied do you feel with the **progress** you have made towards decreasing your screen time by at least 60 minutes per week?

1	2	3	4	5	6	7
Not satisfied						Extremely satisfied

2. How satisfied do you feel with the **results** you have experienced due to decreasing your screen time by at least 60 minutes per week?

1	2	3	4	5	6	7
Not satisfied						Extremely satisfied

3. Did you find decreasing your screen time by at least 60 minutes per week over the past 4 weeks to be:

1	2	3	4	5	6	7
Unpleasant						Pleasant

1	2	3	4	5	6	7
Not enjoyable						Enjoyable

1	2	3	4	5	6	7
Stressful						Relaxing

4. To what extent did you follow the calendar that you prepared during the study that specified when, where and how you would achieve your goal?

1	2	3	4	5	6	7
Didn't follow at all						Followed exactly