UNDERSTANDING CONSISTENT EXERCISE: PSYCHOSOCIAL FACTORS RELATED TO LONG-TERM EXERCISE FREQUENCY MAINTENANCE

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ABSTRACT

Exercise results in numerous health promoting benefits, such as improved health-related quality of life, reduced stress, and improved physical functioning. However, much of the research in exercise and health psychology has focused on starting and increasing exercise. In contrast, limited research has investigated the subset of the population who *maintain* exercise. Identifying psychosocial processes that are involved in successful self-regulation and, in turn, long-term exercise maintenance is needed. Maintaining engagement in exercise requires self-regulation for successful pursuit over weeks, months, and years. Previous research has attempted to compile, describe, and explain different theoretical ideas of maintenance, identifying several key motives, with accompanying psychosocial factors. Considerable exercise research exists using various psychosocial factors (e.g., self-regulatory efficacy) to differentiate individuals meeting and not meeting public health guidelines. However, evidence is lacking on how individuals consistently self-manage their schedule, reach personal goals, and maintain their personally-set weekly exercise frequency. Thus, the primary study purpose was to determine whether individuals who differed in their weekly exercise frequency differed in psychosocial factors that were identified in prior research as providing theoretical explanations about how individuals maintain health behaviours over time. Based on the assumption that higher weekly exercise frequency patterns require the greatest challenge to maintain (Chao, Foy, & Farmer, 2000; Kwasnicka, Dombrowski, White, & Sniehotta, 2016), the group with the highest frequency of exercise maintenance was hypothesized to report significantly greater scores for the value of, and satisfaction with proximal and distal outcome expectations and various self-efficacy beliefs compared to low frequency maintainers. The secondary study purpose was to determine whether individuals who approached the exercise public health recommendation differed from a group who exceeded the recommendation relative to the same psychosocial factors as mentioned for the primary study purpose. Participants were 357 self-identified exercise maintainers (M = 31.88 ± 11.89 years) with an average 6.98 ± 3.92 years of maintenance of their weekly exercise frequency pattern. Maintainers included individuals who consistently followed their pattern of weekly exercise for more 6+ months for at least 2 days per week lasting 30 minutes or more. An online survey assessing outcome expectations, satisfaction, self-regulatory efficacy to overcome barriers, recovery efficacy, task self-efficacy, exercise level relative to the public health recommendation, and awareness of the public health recommendation was completed. To assess

the primary purpose, three groups were identified based on frequency of weekly exercise bouts: low, 2-3 days (n = 79); medium, 4-5 days (n = 178); and high, 6-7 days (n = 100). A MANOVA revealed that high frequency maintainers reported significantly higher ratings of proximal satisfaction with outcome expectations, distal satisfaction with outcome expectations, self-regulatory efficacy to overcome barriers, and recovery efficacy than low frequency maintainers. To assess the secondary purpose, two groups were identified based on whether participants self-identified as approaching/meeting (n = 71) or exceeding (n = 286) the public health exercise recommendation. A MANOVA revealed that exercise maintainers exceeding the public health exercise recommendation reported significantly higher ratings of value of distal outcome expectations, proximal satisfaction with outcome expectations, distal satisfaction with outcome expectations, self-regulatory efficacy to overcome barriers, and recovery efficacy than those approaching/meeting the recommendation. Further, only 56 individuals reported being correctly aware of the public health recommendation. In conclusion, this study was one of the first in the exercise literature to identify psychosocial factors consistent with maintenance theorizing and begins to fill a gap in this under-investigated area. Findings provide initial support for the notion that psychosocial factors involved in the successful self-management of individuals' maintenance of exercise frequency appear to be related to personal behavioral goals. This conclusion is strengthened by the finding that the present maintainer sample was unaware of, or incorrect about, public health recommendation.

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CHAPTER 1

INTRODUCTION

Only one in five Canadian adults meet the national public health recommendation of 150 minutes each week of moderate to vigorous physical activity (Canadian Society for Exercise Physiology, 2012; Statistics Canada, 2017). Exercise, which was the focus of the current study, is a subset of physical activity that is planned, structured, and repetitive and is performed in order to improve or maintain physical fitness (Caspersen & Christenson, 1985). Exercise requires self-regulation, which involves individuals exerting control over themselves in order to reach a desired behavioural goal, such as performing 150 minutes of exercise each week (Hagger, Wood, Stiff, & Chatzisarantis, 2010). Identifying psychosocial processes that are involved in successful self-regulation and, in turn, long-term exercise maintenance is needed (Bandura, 2004; Hagger et al., 2010). Knowledge about these processes may not only aid in the understanding of behavioural maintenance but might also inform the content of interventions that promote maintenance.

Much of the research in exercise and health psychology has focused on starting and increasing exercise (Baker, Francis, Soares, Weightman, & Foster, 2015; Coombes, Law, Lancashire, & Fassett, 2015; Thornton et al., 2016). In contrast, limited research has investigated the subset of the population who *maintain* exercise. Understanding how these individuals consistently self-manage their schedule, reach personal goals, and exercise regularly is not well understood. Considering that over 50% of people who begin to exercise will drop out within six months (Jekauc, 2015), the psychosocial mechanisms that people utilize for exercise initiation are likely different than those involved in exercise maintenance (Finch et al., 2005; Schwarzer, Luszczynska, Ziegelmann, Scholz, & Lippke, 2008). The focus of the present research was on exercise maintenance.

1.1 Exercise Maintenance

Understanding maintenance of motivated behaviours, including exercise, is an important and needed area for study (Kwasnicka et al., 2016; Rothman, 2000). Bandura (1997) argued that learning from the experiences of successful maintainers, including identifying psychosocial factors that help them maintain their behaviour, can lead to eventual interventions. Such interventions would aim to move non-maintainers into maintenance by targeting changes in psychosocial factors to levels that are characteristic of maintainers.

In the exercise domain, research has typically compared adults who meet versus those who do not meet various public health exercise recommendations (e.g., Public Health Agency of Canada [PHAC]; United States Department of Health and Human Services [USDHHS]: 150+ minutes of moderate to vigorous intensity exercise per week). The research, which has been conducted across healthy and diseased samples, has demonstrated that the two groups significantly differ in their psychosocial profiles (Gierc, Locke, Jung, & Brawley, 2014; Gyurcsik, Brawley, Spink, & Sessford, 2013; Jefferis et al., 2014). For example, Flora, Brawley, Sessford, Cary, and Gyurcsik (2016) found that, after controlling for pain intensity, adults with arthritis who met the recommendation reported significantly higher levels of self-regulatory efficacy to overcome arthritis-related barriers and pain acceptance compared to those who did not meet the recommendation.

Despite these promising findings, investigation of what appears to be a simple objective – studying successful maintainers – may be challenging given how maintenance is operationalized in research. If maintenance is defined as meeting the public health recommendation, then does investigation ignore individuals who aim for and consistently accumulate another duration of weekly exercise (e.g., 90 minutes/week)? Indeed, the recently released recommendation by the USDHHS (2018) recognizes that although 150+ minutes per week is the public health goal, it also recognizes that some exercise is better than no exercise. It clarifies that some populations, such as older adults or those with chronic disease, may not be able to the recommendation. Perhaps some individuals strive to meet the public health recommendation, whereas others aim to maintain exercise at a personal level lower than the public health level, but still sufficient to result in health benefits (de Souto Barreto, 2015) and be personally motivating and satisfying. For example, less than one hour a week of exercise is associated with a 15% reduced risk of all-cause mortality (Warburton, Charlesworth, Ivey, Nettlefold, & Bredin, 2010). By limiting the study of maintenance relative to a publicly advocated recommendation, researchers and public health professionals fail to recognize the personal meaning individuals attach to their successful behavioural maintenance and its psychosocial correlates.

Another challenge with defining maintenance revolves around the length of time that individuals need to maintain exercise to be considered a successful maintainer. At present, no agreement exists on whether maintenance occurs after durations of weeks, months, or years. Perhaps one of the most commonly used operational definitions of maintenance comes from the

Transtheoretical Model, a Stages of Change model. The Transtheoretical Model uses a staging algorithm that includes an arbitrary time frame to identify individuals in various stages of readiness for behaviour change (Bandura, 1997; West, 2005). For example, individuals are identified as being in the maintenance stage of change when a health behaviour, such as smoking cessation, has been sustained for at least six months (Carron, Hausenblas, & Estabrooks, 2003; Prochaska, DiClemente, & Norcross, 1992). In the exercise literature, the time frames for the stages in the model seem to have been borrowed from examination of other behaviours.

However, stage models have some limitations. First, the staging algorithm is based upon an arbitrary time frame, not accounting for differences in progression through the stages (Adams & White, 2005; Rothman, Baldwin, Hertel, & Fuglestad, 2004). Second, empirical evidence supporting stage models in exercise interventions is inconclusive, rarely finding differences between control and intervention conditions (Basler, Bertalanffy, Quint, Wilke, & Wolf, 2007; Fortier et al., 2012; Lundahl et al., 2013; Strachan, Woodgate, Brawley, & Tse, 2005). Third, stage models fail to identify evidence-based strategies to move individuals through each stage (Adams & White, 2005; Nigg et al., 2011; Rothman et al., 2004). These limitations are problematic considering their common use in the context of behaviour maintenance counselling (Rothman, 2000; West, 2005).

In summary, limited exercise maintenance research has been conducted using varying operational definitions of maintenance (Kahlert, 2015). This offers a confusing picture of inconsistent evidence and limits a psychosocial understanding of behavioural maintenance. However, the behaviour of maintenance could be studied as an individual psychosocial - behavioural phenomenon. By taking this approach, we may begin to understand the social psychology of maintenance for individuals, and whether common elements exist that determine exercise maintenance over lengthy periods of time. More specifically, aspects of Kwasnicka et al. (2016) suggest how to account for the maintenance of individuals' personal exercise. If the theories provide insight and understanding into what accounts for the behaviour of an exercise maintainer, this may reinforce theory-based content for future interventions designed not only to help individuals change but also sustain their change (de Souto Barreto, 2015; Kwasnicka et al., 2016). Thus, the present study was focused on investigating the psychosocial factors underlying individuals' success in pursuing personal levels of exercise maintenance.

1.2 Does a Theoretical Foundation Exist to Guide Investigation?

Can existing theories about the psychosocial determinants of behaviour be used to understand what motivates the maintenance behaviour of individuals, week in and out, for months and years? Using a theory would allow investigators to develop questions around exercise maintenance in a way that contributes to understanding about why and how maintenance happens (Brawley, 1993; Kwasnicka et al., 2016). Kwasnicka et al. (2016) conducted a review of theoretical explanations for maintenance of health behavioural change. The authors broadly conceptualized maintenance as continual behavioural performance after an initial intentional change that meaningfully differs from a baseline level. Five themes were identified as being common within and across the 100 theories that were reviewed. These themes offer explanations of the maintenance of initial behaviour change over time and across different contexts. The themes included: (1) maintenance motives, (2) self-regulation, (3) habits, (4) resources, and (5) environment and social contextual influences. Kwasnicka and colleagues called on researchers to examine existing evidence and undertake further empirical examination within and across the themes.

The present study focused on the first two themes of maintenance motives and self-regulation. These two themes were selected for investigation due to their specific theoretical explanations about how individuals maintain behaviour over time (Kwasnicka et al., 2016) and the strong empirical support showing relationships to overall exercise levels (Desharnais, Bouillon, & Godin, 1986; Olander et al., 2013; Strachan, Perras, Brawley, & Spink, 2016). The maintenance theme includes a guiding model for understanding maintenance motives, which was initially proposed by Rothman (2000). Further, the agency aspect of Bandura's (1986) social cognitive theory contributes key knowledge to the self-regulation theme. Within this theme, important consideration is also given to individuals' adaptability when setbacks interrupt typical patterns of exercise. An overview of maintenance motives and self-regulation themes follow.

1.3 Theme 1: Maintenance Motives

1.3.1 ***Outcome expectations and satisfaction***. Rothman (2000) argued that dominant theoretical approaches to health behaviour neglect to differentiate behavioural initiation from maintenance. This creates the impression that maintenance relies on the same psychosocial factors and behavioural skills as initial behavioural change. Interventions utilizing this approach provide little evidence of sustained behaviour change. Therefore, Rothman (2000)

conceptualized the behavioural change process using a framework focused on psychosocial processes differentially governing initiation and maintenance.

Maintenance motives are important drivers of volitional behaviours, including exercise, and involve outcome expectations that are distinct to maintenance as well as satisfaction with the outcomes (Kwasnicka et al., 2016; Rothman, 2000). Outcome expectations involve an estimate that a given behaviour will lead to certain personally valued outcomes, and consideration of whether those outcomes are sufficiently desirable to warrant continued engagement (Rothman, 2000). Rothman posits that individuals' decisions to *initiate* a volitional behaviour depend, in part, on whether expected outcomes from the new behaviour compare favourably to the perceived outcomes obtained from their current behaviour. However, the decision to *maintain* a behaviour depends on individuals' perceived value of expected outcomes and their satisfaction with meeting or exceeding their outcomes (Rothman, 2000).

Relative to exercise, setting overly optimistic outcome expectations may motivate individuals to initiate exercise, but often times leads to dissatisfaction when outcomes are not immediately achieved (Rothman, 2000; Rothman et al., 2004). For example, at the start of a new year, many individuals may be motivated by the outcome expectation of weight loss and begin to exercise. However, if this outcome is not achieved, dissatisfaction occurs. The failure to achieve overly optimistic outcome expectations and the resultant dissatisfaction should ultimately contribute to exercise dropout. Relative to exercise maintenance, Rothman suggests that maintainers have more realistic outcome expectations and/or adjust unrealistic expectations more efficiently. The result is that exercisers' satisfaction is sustained, thereby encouraging maintenance.

Furthermore, goal proximity is another important aspect of outcome expectations with respect to exercise maintenance. Bandura and Schunk (1981) suggested the impact of outcome expectations on behaviour is determined by when in the future they are expected to occur. *Distal* outcome expectations set the course and provide guidance for personal change. For example, individuals may expect to lose weight or prevent a health condition from worsening via exercise. However, distal outcomes take time to achieve and therefore are less able to evoke daily effort or control current behaviour (Bandura, 2004). *Proximal* outcome expectations provide more immediate motivation and direction for performance. Individuals formulate personally relevant proximal outcome expectations that serve as attainable sub-goals to pursue more distal outcomes in the future (Bandura & Schunk, 1981). When compared to distal outcomes, proximal outcome

expectations are more achievable in the short-term (Bandura, 2004), leading individuals to feel more satisfied and further perpetuate the maintenance of exercise (Rothman et al., 2004). For example, to achieve a distal outcome of preventing a health condition from worsening, an individual might set a proximal outcome of exercising to feel good during and after exercise.

Although maintenance appears to rely on valued outcomes that are satisfying, other influencing factors should also be important (Rovniak, Anderson, Winett, & Stephens, 2002). Based on the review by Kwasnicka et al. (2016), self-regulation factors should also be important contributors to maintenance behaviours.

1.4 Theme 2: Self-Regulation

1.4.1 ***Self-regulation and efficacy.*** Self-regulation involves individuals having the skills to successfully monitor and regulate a maintained behaviour, as well as having strategies to overcome challenging barriers (Kwasnicka et al., 2016). Self-regulation is a key component within social cognitive theory, which contends that a triadic reciprocal relationship exists between individuals' personal factors, their environments, and behaviour (Bandura, 1986a). Environmental factors are the over-riding predictors of volitional behaviour when they produce significant constraints. For example, in the context of exercise, inclement weather like a snowstorm could be the only reason why individuals do not exercise outside on a given winter day. However, when environmental factors are not significant constraints, individuals' personal factors are primarily responsible for the performance of volitional behaviours (Bandura, 1986).

Personal factors are important in behaviour change and maintenance due to the concept of human agency, whereby people effect change in themselves and their situations through their own efforts (Bandura, 1989). Examples of personal factors include self-efficacy, health status, mood, and emotions. Of the personal factors, self-efficacy is one of the most important determinants of behaviour (Bandura, 1989). Task self-efficacy involves individuals' confidence in their skills and abilities to perform the motivated behaviour (e.g., exercise on one, two, and so on days each week) (Woodgate, Brawley, & Weston, 2005). Bandura (ADD YEAR) posits that task-self efficacy is important when people are faced with challenges to behavioural performance. Such challenges typically arise, according to Bandura, when people are initiating a behaviour. However, with mastery experiences, task self-efficacy should play less of a role in the maintenance of a behaviour unless new challenges arise. Due to Bandura's positing, task self-efficacy has not typically been examined when maintenance has been studied relative to

meeting or not meeting the public health recommendation. Further, task self-efficacy has not been examined in the study of long-term personal exercise maintenance. Self-regulatory efficacy involves individuals' confidence in their skills and abilities to control their thoughts, emotions, and behaviour in order to achieve a desired goal, like regular exercise (Bandura, 1986a; Baumeister & Vohs, 2003). Key reviews have identified that being efficacious to overcome barriers, goal set, schedule/plan behaviour, self-monitor, and prevent relapses is crucial to long-term exercise (Artinian et al., 2010; Brawley, Gierc, & Locke, 2013).

Previous research has mainly applied social cognitive theory to the study of exercise *adoption* and *action* and not *maintenance* (Strachan et al., 2005). Conceptually, the theory contends that self-regulatory efficacy plays less of a role in predicting: (a) behavioural initiation and (b) maintenance when behavioural challenges are few (Bandura, 1997). Focusing first on behavioural initiation, task self-efficacy is needed and should be a key behavioural predictor (Woodgate et al., 2005). However, when behaviour is maintained, self-regulatory efficacy becomes critical – particularly in the face of challenging circumstances (Maddux & Gosselin, 2003). When challenged, individuals must be confident that they can change their schedules or actions to adapt to unexpected challenges or alterations in their planned behaviour (e.g., planned to run outside, but a rainstorm occurred). Compared to those with low self-regulatory efficacy, highly efficacious individuals are better able to overcome challenges (Bandura, 1997). Efficacious individuals will expend considerable effort and persistence in using their self-regulatory skills to overcome the challenges, so they can engage in the behaviour that is motivated by personally valued positive outcomes (Bandura, 1986a, 1997; Maddux, 1997).

Relative to exercise maintenance, the role that self-regulatory efficacy plays is not well understood. Strachan and colleagues (2005) conducted one of the only studies to explicitly study self-regulatory efficacy beliefs and exercise maintainers. Exercise maintainers were identified as being adult runners who self-reported successfully maintaining exercise for several years. Findings illustrated that both self-regulatory efficacy to schedule and to overcome barriers along with exercise identity, significantly predicted running duration. Due to limited exercise evidence, a need exists to continue to examine the processes that underlie the maintenance of exercise both within routine conditions and in the face of challenges (Orleans, 2000).

1.4.2 *Adaptability*. Adaptability is a part of self-regulation and is key to maintaining a volitional behaviour (Baumeister & Vohs, 2003). According to Kwasnicka et al. (2016), when

situations arise that challenge typical exercise patterns, individuals must apply effective coping strategies to continue the behaviour over time. A model which brings together various principles of exercise maintenance along with principles of adaptability is the Health Action Process Approach (HAPA) (Schwarzer et al., 2011). The model outlines the psychosocial mechanisms by which people are motivated to adopt, initiate, and maintain volitional behaviours and suggests that various psychosocial determinants are characteristic of different behavioural phases. The motivational or goal-setting phase is when individuals develop intentions for a desired behaviour. The volitional phase includes two groups: intenders, who have not begun the behaviour and actors who are engaged in doing the behaviour (i.e., maintainers). In this latter phase, emphasis is put on the differing psychosocial states of individuals in the two groups. Among maintainers in the volitional phase, a focus is on adaptability in which individuals need to prepare for challenging situations in which exercise lapses are probable. This model introduces the idea of *recovery self-efficacy*, which is defined as individuals' confidence in their skills and abilities to recover from setbacks (lapses) and resume typical exercise patterns (Luszczynska & Sutton, 2006; Schwarzer et al., 2011). This concept has a specific focus (recovery) and reflects self-regulatory efficacy for specific situations and challenges (i.e., the lapse situation).

The ability to maintain behaviour for long periods of time suggests that exercise maintainers have high levels of recovery self-efficacy to respond to challenges, such as a lapse from their exercise plans (Baumeister & Heatherton, 1996; Schwarzer et al., 2008). A lapse would involve a minor negative transgression in exercise plans, such as not exercising as much, if at all, as planned during a week, which would contrast with a relapse involving long-term periods of no exercise (Baumeister & Heatherton, 1996; Kwasnicka et al., 2016). In addition, maintainers should have developed strategies and plans to overcome reoccurring challenges in order to maintain their behaviour (Kwasnicka et al., 2016). However, these notions have yet to be examined among exercise maintainers.

1.5 Summary

Although previous research has attempted to compile, describe, and explain different theoretical ideas of maintenance, areas of uncertainty exist regarding: (a) how exercise maintainers are defined, (b) what motivates exercise maintenance, and (c) how maintainers consistently manage exercise over time (Kahlert, 2015). When describing and trying to

understand different patterns of maintenance exercise, there is likely a complex interplay between the personal factors individuals bring to the social situation, the physical and social environment, and the type and pattern of behaviour. However, to begin this area of investigation through an initial first generation study (Zanna & Fazio, 1982), the focus of the present study was on personal psychosocial factors. Further, in order to use the complementary theoretical perspectives outlined above (i.e., satisfaction with achieving outcomes expected: Rothman, 2000; agency aspect of social cognitive theory including outcome expectancies & self-efficacy: Bandura, 1997) as part of the maintenance motives and self-regulation themes described by Kwasnicka et al. (2016), a first step in the process of investigation is to determine if common psychosocial patterns exist among individuals who maintain exercise at a different frequency. For example, would these patterns be the same or different for people who maintain exercise at different weekly frequencies (e.g., 2x/week to 7x/week)?

1.6 Purposes

The primary study purpose was to determine whether individuals who differed in their frequency of weekly exercise maintenance differed in the strength of psychosocial factors thought to support maintenance. Based on the assumption that higher weekly exercise frequency patterns require the greatest self-regulatory challenge to maintain (Chao et al., 2000; Kwasnicka et al., 2016), the group with the highest frequency of exercise was hypothesized to report significantly greater scores for the value of outcome expectations, satisfaction, self-regulatory efficacy to overcome barriers, and recovery efficacy compared to low frequency maintainers. No differences were expected on task self-efficacy since all participants were exercise maintainers and no challenge was introduced to them as part of the research. Frequency of exercise was selected as the defining feature of maintenance for this study since a behaviour that occurs with multiple instances over many weeks, months, and years is expected to be the dominant behavioural response and considered to be maintained regardless of differing contexts and exercise intensities (Kwasnicka et al., 2016).

The secondary study purpose was to determine whether individuals who approached the exercise public health recommendation differed from an individual who exceeded the recommendation relative to the same psychosocial factors as mentioned for the primary study purpose. Although there has been considerable exercise research using various psychosocial factors (e.g., self-regulatory efficacy) to differentiate individuals meeting and not meeting public

health guidelines (e.g., Gierc et al., 2014; Gyurcsik et al., 2013), evidence is lacking on individuals who have maintained exercise over weeks, months, and years. Thus, differences between groups were explored. No theoretical or empirical basis existed for directional hypotheses to be advanced.

CHAPTER 2

METHODS

2.1 Participants

Participants were 357 adults, aged 18-71 years (M = 31.88 ± 11.89). Most were female (n = 243), white (n = 321), single (n = 179), educated at a level of a bachelor's degree or higher (n = 236), and had no known health-related problems (n = 206). Participants reported maintaining exercise an average of 6.98 ± 3.92 years. See Table 2.1 for a detailed breakdown of the primary demographic information. Appendix A contains additional demographic information to further describe the sample.

Table 2.1

Demographics of Study Participants (N = 357)

Demographic	*n*	%
Gender		
Female	243	68.1
Male	109	30.5
Nonbinary	3	0.8
Other	2	0.6
Ethnicity		
Aboriginal	9	2.5
Asian	16	4.5
Black	1	0.3
Latin American	6	1.7
South Asian	4	1.1
White	321	89.6
Other	7	2.0
Relationship Status		
Married	121	33.9
Divorced/Separated	12	3.4
Single	179	50.1
Common law	43	12.0
Not specified	2	0.6
Education		
≤ High school diploma	7	1.9
Post secondary student	110	30.8
University/college degree/diploma	216	60.5
Graduate student/degree	20	5.6
Other	4	1.1
Health Related Problems		
No known	206	57.7
Arthritis	13	3.6
Asthma	43	12.0
Diabetes	2	0.6
High blood pressure	10	2.8
High cholesterol	5	1.4
Cancer	1	0.3
Stomach problems	25	7.0
Thyroid problems	10	2.8
Other	61	17.1

2.2 Procedures and Study Design

After study approval by the University Behavioural Ethics Board, individuals were recruited to participate in this cross-sectional study via web-based announcements. A researcher emailed requests to online exercise organizations and fitness pages (e.g., YMCA Saskatoon, local and national gyms, Canadian athlete twitter feeds) to post study announcements on their websites and/or social media outlets. A study announcement was also posted on a Canadian university's website campus message board. Each announcement contained a link to the online survey.

Interested individuals who accessed the link and provided electronic informed consent then completed participant inclusion criteria questions (see Appendix C). The criteria were: (a) adults, aged 18+ years; (b) residing in Canada; (c) able to read and write English; (d) free of health restrictions or injuries that would prevent engagement in exercise; (e) were engaging in exercise at least twice a week for 30 consecutive minutes or more each session; (f) had completed this routine for at least 6 months (Howlett, Trivedi, Troop, & Chater, 2018); and (g) had plans to maintain or increase this exercise pattern during the next 6 months. The last three criteria, e – g, were key to identifying individuals who at minimum were maintaining and planning to maintain a specific amount of exercise over time. Focusing on a minimum of 30 minutes of exercise attempted to confirm participants were reporting on blocks of time that were planned and likely to be recalled (Bandura, 1986b; Cary, Gyurcsik, & Brawley, 2015). Given the lack of a validated definition of maintenance (Kahlert, 2015), the 6-month marker was selected based on past research that has typically operationalized maintenance in this manner (Carron et al., 2003; Howlett et al., 2018; Prochaska et al., 1992). Individuals who met the inclusion criteria then completed the survey, which took an average of 30 minutes.

2.3 Measures

Appendix D contains the study measures.

2.3.1 ***Demographics*****.** Information was obtained in order to describe the participants.

2.3.2 ***Exercise frequency*****.** In order to categorize groups of maintainers for the study analyses, exercise frequency was assessed. Before completing this measure and all primary study measures, participants were provided with a reference definition of exercise: *"Exercise refers to planned activity lasting at least 30 minutes that causes you to breathe more heavily than normal. This may include (but is not limited to) running, biking, exercise classes, resistance training, etc."* (CSEP, 2012). After reading this definition, participants reported the frequency of their

planned exercise over the prior 6 months. Participants were asked, *"On an average week during the last 6 months, how many days did you engage in exercise for at least 30 minutes?"* Response options could range from 0 – 7 days each week.

2.3.3 ***Value of proximal and distal outcome expectations.*** To assess the value of day-to-day, proximal outcome expectations, participants first read the following statement: "*It is important to know what aspects of exercise you value most and motivate you to sustain your current exercise pattern each day*". Participants were then asked to indicate whether each of five investigator-provided day-to-day outcomes were relevant to them in helping to sustain their exercise routine (O'Cathain & Thomas, 2004). Participants could also list in an open-ended manner another relevant outcome that did not appear on the list. Investigator-provided outcomes included "*Social recognition of the people that see me going for my regular exercise sessions", "Feeling good during and after exercise", "Help me feel more energized each day", "Spending time with others who also exercise",* and *"Making progress on my performance*". For each selected outcome, participants rated the value on a 1 (*minimal value*) to 10 (*highest value*) response scale.

Distal outcome expectations were measured using the same methodology. Participants read the statement: "*It is important to know what aspects of exercise you value most and motivate you to sustain your current exercise pattern over time*". Participants were then asked to indicate whether each of five investigator-provided day-to-day motivations were relevant to them in helping to sustain their exercise routine (O'Cathain & Thomas, 2004). Participants could also list in an open-ended manner another relevant outcome that did not appear on the list. Investigator-provided outcomes included: "*Weight management", "To prevent my health condition from progressing", "Helps me know I am doing something good for my health", "Training for an event/competition",* and *"Improve appearance"*. For each selected outcome, participants rated the value on a 1 (*minimal value*) to 10 (*highest value*) response scale. For the proximal and distal measures, the value placed on the first outcome selected by each participant was used in the analyses. Appendix D contains the rationale for this decision.

2.3.4 ***Satisfaction with proximal and distal outcome expectations*****.** Participants reported their satisfaction with their selected proximal and distal outcomes in the previous measures. Satisfaction with proximal and distal outcomes was assessed on a 1 (*minimal satisfaction*) to 10 (*high satisfaction*) scale.

2.3.5 ***Self-regulatory efficacy to overcome barriers.*** The measure of self-regulatory efficacy to overcome barriers was developed for this study, and followed recommendations for measuring self-efficacy beliefs (self-efficacy theory: Bandura, 1997, 2006). Participants could list up to three barriers in an open-ended manner and, for each barrier, reported the strength of their efficacy to overcome them. Before completing the measure and similar to previous research (e.g., Gyurcsik et al., 2009), a definition of barriers was provided to ensure clarity and common respondent interpretation. Barriers were defined as "*obstacles or circumstances that make achieving exercise goals challenging during a normal week*". After reading the definition, participants then listed up to three of their most frequently occurring barriers to their exercise plans. This approach ensured barriers were salient and personally relevant to participants, and posed self-regulatory difficulties (Brawley, Martin, & Gyurcsik, 1998). Strength of confidence to overcome barriers and engage in weekly planned exercise was assessed on a 0 (*not at all confident*) to 10 (*extremely confident*) response scale. A mean score was calculated for each participant, with the denominator being dependent on the number of barriers listed by that individual. Scores could have ranged from 0 to 10, with higher scores reflecting greater confidence to overcome barriers. Cronbach's alpha was not calculated due to varying number of barriers reported by participants.

2.3.6 ***Recovery efficacy.*** Efficacy to recover from exercise lapses, or gaps/periods of time with no exercise, was measured using 5-items that varied in lapse duration. The measure was developed for the study, based upon principles of the HAPA pertaining to recovery efficacy (Schwarzer et al., 2011) and followed recommendations for measuring self-efficacy beliefs (self-efficacy theory: Bandura, 1997, 2006). A lapse was defined as "*periods of time (lasting 7 days or more) over the last year where you stopped doing exercise and resumed it at a later point*". To ensure that a lapse was not confused with planned rest or instances where usual exercise patterns were not maintained, participants were instructed that a lapse was not "*… any planned rest required for muscle recovery or fatigue (i.e., 'rest days'), nor any vacations where you continued to exercise*". The latter description was included to prevent participants from considering exercise completed on vacation as a lapse in their exercise pattern. For example, an individual may typically engage in weekly CrossFit classes, but, while on vacation completes a treadmill workout in a hotel gym. While this may be a break from the individual's typical

pattern, the current study was concerned with complete lapses from the maintenance in their exercise.

After reading the above information on what a lapse is or is not, participants then reported their efficacy that they could "*...gradually build back up to the same exercise level you complete currently*" for each of 5 different lapse durations. This instruction concerns participants' perception of their abilities to self-regulate in a manner to return them to their original pattern of exercise before the lapse. A hierarchical series of items was used to vary the level of difficulty perceived according to the amount of time away from their pre-lapse exercise pattern. Example items included: "*after a 1 week gap*" and "*after a 4 week gap*". Responses were on a 0 (*not at all confident*) to 10 (*extremely confident*) scale. An average efficacy score was calculated, with higher scores reflecting higher confidence to resume exercise after a lapse. The measure had acceptable internal consistency in the present study (Cronbach's alpha = .88) (Tabachnick & Fidell, 2012).

2.3.7 ***Task self-efficacy.*** Efficacy to exercise was measured using 4 items that focused on participants' confidence in their skills and abilities to increase the duration of their regular exercise sessions. The measure was developed in line with recommendations for task self-efficacy measures (Bandura, 1997, 2006). Participants responded to the items after reading the statement: "*If you maintained your exercise pattern but increased the time per session, how confident are you that you could…*" Example items included: "*increase your average exercise session by 15 minutes"* and "*increase your average exercise session by 45 minutes".* Participants responded to each item on a 0 (*not at all confident*) to 10 (*extremely confident*) scale. An average efficacy score was calculated, with higher scores reflecting higher task self-efficacy beliefs. The measure had acceptable internal consistency in the present study (Cronbach's alpha = .87) (Tabachnick & Fidell, 2012).

2.3.8 ***Exercise level relative to the public health recommendation.*** To examine public health recommendation, two measures were collected. First, knowledge of the recommendation was measured by asking participants: *"Do you know the current physical activity recommendations for adults aged 18-64 years?"* Participants responded either yes or no. If participants answered yes, they were asked to provide the recommendation to the best of their knowledge in an open-ended fashion.

Second, participants self-reported their exercise maintenance levels in relation to the public health recommendation. Participants were asked: *"Given the weekly exercise pattern you have maintained for a long time, how does your exercise level compare to the recommendations of 150 minutes of moderate to vigorous physical activity each week?"* (CSEP, 2012). Participants self-categorized into the grouping that best described their current exercise routine: "*my exercise level is less than recommendation*", "*my exercise level is equal to recommendation*", or "*my exercise level is more than recommendation.*"

2.4 Statistical Analyses

SPSS 24.0 was used for the data analyses. The results are presented in five sections. Section one contains the data management summary. Section two presents the identification of maintenance groups. Section three presents the results from a MANOVA that was conducted to examine the primary study purpose. Recall that this was to examine whether exercise maintenance frequency groups significantly differed in the hypothesized psychosocial variables. Section four includes the results from a MANOVA that was conducted to examine the secondary study purpose. Recall that this purpose was to determine whether groups who differed in whether they met the public health recommendation were significantly different with respect to the hypothesized psychosocial variables. The fifth section presents investigation of possible alternative explanations for the primary study purpose (i.e., that might explain differences in exercise frequency used to make the maintenance groups).

CHAPTER 3

RESULTS

3.1 Data Management Summary

Data were first screened for outliers and normality. Missing values within a measure were replaced with the participant's mean score when the participant had partial responses. Missing data for each measure were random and minimal (i.e., < 10%). According to Tabachnick and Fidell (2012), outliers are to be expected with large sample sizes, and the present study was no exception. The outliers were random and minimal and, as recommended by Tabachnick and Fidell (2012), were transformed to one data point higher or lower than the next closest data point.

Analyses regarding the primary hypotheses involved a MANOVA. Maintenance frequency group was the independent variable. Dependent variables included value of proximal and distal outcome expectations, satisfaction with proximal and distal outcome expectations, self-regulatory efficacy to overcome barriers, recovery efficacy, and task self-efficacy. While the sample size was considered large enough to be robust to most violations of normality (Tabachnick & Fidell, 2012), Box's M was violated ($p < .001$). Thus, Pillai's trace was used as the criterion to interpret the overall MANOVA (Field, 2013; Tabachnick & Fidell, 2012). Two significant Levene's tests illustrated that the assumption of homogeneity of variance was violated for satisfaction with proximal outcome expectations ($p = .027$) and recovery efficacy ($p = .004$). If the overall MANOVA was found to be significant, then these violations would be dealt with by an adjustment to a more conservative alpha level (.05 to .01) in follow-up ANOVAs (Tabachnick & Fidell, 2012) and Type III sums of squares were also used given unequal group sizes and variances. Games-Howell post hoc analyses were used as follow-up to significant univariate ANOVAs (Field, 2013; Tabachnick & Fidell, 2012).

Analysis of the secondary study purpose involved a MANOVA. The independent variable was public health recommendation groups and the dependent variables included the same psychosocial variables as in the primary purpose. Box's M was violated ($p = .007$) and, thus, Pillai's trace was used to interpret the overall MANOVA (Field, 2013; Tabachnick & Fidell, 2012). The assumption of homogeneity of variance was violated for task self-efficacy ($p = .019$), thus an adjustment was made to a more conservative alpha (.05 to .01) in the follow-up ANOVA where Type III sums of squares were also used given unequal group sizes and variances (Tabachnick & Fidell, 2012). Further, Games-Howell post hoc analyses were used as follow-up

to significant univariate ANOVAs (i.e., unequal variances and group sizes; Field, 2013; Tabachnick & Fidell, 2012).

3.2 Study Adherence

A total of 484 individuals who accessed the online study link met the participant inclusion criteria. Three hundred and fifty-seven of these individuals completed the entire survey (i.e., study adherers) and 127 individuals did not complete all survey measures (i.e., study dropouts). Study adherers and dropouts could not be compared on demographic information as these data were collected at the end of the online survey and study dropouts provided no responses. However, the groups could be compared on exercise frequency as these data were collected at the beginning of the survey. An independent samples t-test comparing study adherers (n = 357) to dropouts (n = 127) on their exercise frequency (response range between 2 and 7 days per week) was not significant, $t(455) = .276$, $p = .782$ (adherers: $M = 4.65$, $SD = 1.27$ days; dropouts: $M = 4.61$, $SD = 1.29$ days). Finally, to ensure that the psychosocial variables were not redundant, bivariate correlations were run. As seen in Table 3.1, correlations were below the value of $r = .80$, illustrating lack of redundancy (Tabachnick & Fidell, 2012).

Table 3.1

Correlations between Main Study Variables

	1	2	3	4	5	6	7	8
1. Value of proximal outcome expectations	-							
2. Value of distal outcome expectations	.44**	-						
3. Proximal satisfaction with outcomes	.34**	.20**	-					
4. Distal satisfaction with outcome expectations	.17**	.24**	.58**	-				
5. Self-regulatory efficacy to overcome barriers	.13*	.14*	.20**	.14**	-			
6. Recovery efficacy	.19**	.15**	.18**	.18**	.16**	-		
7. Task self-efficacy	.06	.05	.07	.05	.12*	.07	-	
8. Exercise frequency	.08	.03	.16**	.15**	.19**	.21**	.12**	-

Note. *$p < .05$, **$p < .001$

3.3 Primary Purpose: Exercise Frequency Group Comparisons

To conduct the MANOVA, maintenance frequency groups needed to be created. As this was an initial stage in attempting to understand exercise maintainers, groups were created on the basis of their self-reported exercise pattern that had been maintained over months. The frequency of exercise bouts per week was the pattern used. Participants were placed into low weekly frequency (2-3 days per week), medium weekly frequency (4-5 days per week), and high weekly frequency (6-7 days per week) groups. To empirically verify a group frequency difference, a one-way ANOVA was conducted comparing the three exercise frequency groups on their days per week of exercise (2 to 7 days per week). The assumption of homogeneity of variance was violated for frequency groupings (p <.0001), thus an adjustment was made to a more conservative alpha (i.e., .05 to .01) in the follow-up ANOVA for frequency group. The overall ANOVA was significant, $F(2, 354) = 1265.95$, p <.0001. Follow-up analyses, using Games-Howell post hoc tests, illustrated that all groups were significantly different from each other (low frequency: $p < .0001$, $M = 2.91$, $SD = .29$; medium frequency: $p < .0001$, $M = 4.53$, $SD = .50$; high frequency: $p < .0001$, $M = 6.28$, $SD = .45$). Thus, the primary purpose MANOVA proceeded.

The overall between-groups MANOVA comparing exercise frequency groups on the psychosocial variables was significant, $F(14, 698) = 2.87$, Pillai's Trace = .109, p <.0001, partial $\eta^2 = .054$ (small effect; Cohen, 1988). Follow-up ANOVAs, comparing the estimated marginal means (see Table 3.2), illustrate variables on which the groups significantly differed

3.3.1 Proximal satisfaction with outcome expectations. The main effect of group was significant, $F(2, 354) = 4.82$, $p = .009$, partial eta squared (η^2) = .027 (small effect; Cohen, 1988). A Games-Howell post hoc test illustrated that the mean score for the high frequency group was significantly higher than the low frequency group ($p = .02$). However, no significant differences were found between the low and medium frequency groups ($p = .12$) or the medium and high frequency groups ($p = .35$).

3.3.2 Distal satisfaction with outcome expectations. The main effect of group was significant, $F(2, 354) = 4.20$, $p = .016$, partial $\eta^2 = .023$ (small effect; Cohen, 1988). A Games-Howell post hoc test illustrated that the mean score for the high frequency group was significantly higher than the low frequency group ($p = .007$). No significant differences were

found between low and medium groups (p = .44) or the medium and high frequency groups (p = .08).

3.3.3 Self-regulatory efficacy to overcome barriers. The main effect of group was significant, $F(2, 354) = 7.02$, $p = .001$, partial $\eta^2 = .038$ (small effect; Cohen, 1988). A Games-Howell post hoc test illustrated that the mean score for the high frequency group was significantly higher than the low frequency group ($p < .0001$). The mean score for the medium frequency group was significantly higher than the low frequency group ($p = .026$). No significant difference was found between medium and high frequency groups ($p = .17$).

3.3.4 Recovery efficacy. The main effect of group was significant, $F(2, 354) = 8.11$, $p < .0001$, partial $\eta^2 = .044$ (small effect; Cohen, 1988). A Games-Howell post hoc test illustrated that the mean score for the high frequency group was significantly higher than the low frequency group ($p = .001$). The mean score for the medium frequency group was significantly higher than the low frequency group ($p = .04$). No significant difference was found between medium and high frequency groups ($p = .11$).

3.3.5 Remaining psychosocial variables. The maintenance exercise frequency groups did not significantly differ with respect to: (a) value of proximal outcome expectations, $F(2, 354) = 1.75$, $p = .18$, partial $\eta^2 = .010$, (b) value of distal outcome expectations, $F(2, 354) = 1.60$, $p = .20$, partial $\eta^2 = .009$, and (c) task self-efficacy, $F(2, 354) = 2.66$, $p = .071$, partial $\eta^2 = .015$.

Table 3.2

Estimated Marginal Means for Study Variables between Maintenance Frequency Groups

Variable	Low Frequency (n = 78) *M (SEM)*	Medium Frequency (n = 178) *M (SEM)*	High Frequency (n = 100) *M (SEM)*
Value of proximal outcome expectations	9.13 (.13)	9.09 (.09)	9.35 (.11)
Value of distal outcome expectations	9.27 (.14)	9.09 (.09)	9.35 (.12)
Proximal satisfaction with outcome expectations	8.37 (.14)[a]	8.74 (.09)[a,b]	8.95 (.13)[b]
Distal satisfaction with outcome expectations	8.13 (.17)[a]	8.34 (.11)[a,b]	8.77 (.15)[b]
Self-regulatory efficacy to overcome barriers	6.35 (.20)[a]	6.93 (.14)[b,c]	7.37 (.18)[c]
Recovery efficacy	8.00 (.18)[a]	8.60 (.12)[b,c]	8.98 (.16)[c]
Task self-efficacy	4.73 (.25)	4.94 (.17)	5.46 (.22)

Note. Within a row, means with different subscripts significantly differed from each other. Scale ranges were 1 (*minimal*) to 10 (*high)* for outcome expectations and satisfaction and 0 (*not at all confident*) to 10 (*highly confident*) for the self-efficacy measures.

3.4 Secondary Purpose: Public Health Exercise Recommendation Group Comparisons

To conduct analyses on the secondary purpose, participants were initially placed into three groupings based on their exercise level relative to the public health recommendation: less than the recommendation (n = 18), equal to the recommendation (n = 53), or more than the recommendation (n = 286). Given the low number of participants in the less than recommendation group (n = 18), these participants were consolidated with participants in the equal to recommendation group. Thus, the groups used for comparison were equal to or less than the recommendation (n = 71) and more than recommendation (n = 286).

A MANOVA was conducted with public health recommendation group as the independent variable. The dependent variables were value of proximal and distal outcome expectations, satisfaction with proximal and distal outcomes, self-regulatory efficacy to overcome barriers, recovery efficacy, and task self-efficacy. Before the MANOVA was conducted, normality assumptions where checked. Task self-efficacy violated the homogeneity of variance assumption (i.e., Levene's test). Thus, the univariate F-test for significance was adjusted to a more conservative alpha (.05 to .01) for the task self-efficacy variable (Tabachnick & Fidell, 2012). Type III sums of squares in follow-up tests was also used due to the unequal group sizes.

The overall between-groups MANOVA comparing public health groups on the psychosocial variables was significant, $F(7, 349) = 6.56$, Pillai's Trace = .116, $p < .0001$, partial $\eta^2 = .116$ (medium effect; Ferguson, 2009). Follow-up ANOVAs illustrated that the public health exercise recommendation groups significantly differed with the more than recommendation group reporting higher scores in every instance in which the groups significantly varied (see Table 3.3 for the estimated marginal means). Statistical test values were as follows:

3.4.1 Value of distal outcome expectations. $F(1, 355) = 3.99$, $p = .047$, partial $\eta^2 = .011$ (small effect; Cohen, 1988), in which the more than recommendation group reported significantly higher value scores.

3.4.2 Proximal satisfaction with outcome expectations. $F(1, 355) = 22.38$, $p < .0001$, partial $\eta^2 = .059$ (small effect; Cohen, 1988), in which the more than recommendation group reported significantly higher satisfaction scores.

3.4.3 Distal satisfaction with outcome expectations. $F(1, 355) = 9.74$, $p = .002$, partial $\eta^2 = .027$ (small effect; Cohen, 1988), in which the more than recommendation group reported significantly higher satisfaction scores.

3.4.4 Self-regulatory efficacy to overcome barriers. $F(1, 355) = 17.56$, $p < .0001$, partial $\eta^2 = .047$ (small effect; Cohen, 1988), in which the more than recommendation group reported significantly higher efficacy scores.

3.4.5 Recovery efficacy. $F(1, 355) = 14.29$, $p < .0001$, partial $\eta^2 = .039$ (small effect; Cohen, 1988), in which the more than recommendation group reported significantly higher efficacy scores.

3.4.6 Remaining psychosocial variables. No significant between group differences were found for value of proximal outcome expectations, $F(1, 355) = 3.55$, $p = .060$, partial $\eta^2 = .010$, and task self-efficacy, $F(1, 355) = 6.08$, $p = .014$, partial $\eta^2 = .017$.

Table 3.3

Estimated Marginal Means for Study Variables between Public Health Groups

Variable	Equal to/Less Than Recommendation (n = 71)	More Than Recommendation (n = 286)
	M (SEM)	*M (SEM)*
Value of proximal outcome expectations	8.94 (.14)[a]	9.23 (.07)[a]
Value of distal outcome expectations	8.94 (.14)[a]	9.27 (.07)[b]
Proximal satisfaction with outcome expectations	8.10 (.15)[a]	8.87 (.07)[b]
Distal satisfaction with outcome expectations	7.93 (.18)[a]	8.56 (.09)[b]
Self-regulatory efficacy to overcome barriers	6.13 (.21)[a]	7.13 (.11)[b]
Recovery efficacy	7.92 (.19)[a]	8.73 (.10)[b]
Task self-efficacy	4.45 (.27)[a]	5.18 (.13)[a]

Note. Within a row, means with different subscripts significantly differed from each other. Scale ranges were 1 (*minimal*) to 10 (*high)* for outcome expectations and satisfaction and 0 (*not at all confident*) to 10 (*highly confident*) for the self-efficacy measures.

3.5 Potential Alternative Explanations for Differences in Exercise Maintenance Groups

In order to examine whether alternatives existed that could explain differences in exercise maintenance groups used in the primary purpose, two possible alternatives were examined. One possible alternative explanation was that participants who reported the lowest frequency of exercise reported more health-related problems. To investigate this possibility, a Pearson chi-square test was performed to examine the relation between health-related problems and exercise

frequency (i.e., self-reported days of weekly exercise over prior six months). The relation between these variables was not significant, X^2 (18, N = 337) = 15.18, p = .65. See Table 3.4 for the distribution of health-related problems by frequency group. As seen in the Table, even participants in the high frequency of exercise group reported having the same health-related problems (e.g. asthma) as in the low frequency group.

Table 3.4

Health-Related Problems across Exercise Frequency Groups

Self-Reported Health-Related Problem	Low Frequency (2 or 3 days/week) (n = 79)	Medium Frequency (4 or 5 days/week) (n = 178)	High Frequency (6 or 7 days/week) (n = 100)	Overall (N = 357)
No Known	39	108	59	206
Arthritis	2	8	3	13
Asthma	7	23	13	43
Diabetes	-	1	1	2
High Blood Pressure	2	7	1	10
High Cholesterol	2	2	1	5
Cancer	1	-	-	1
Stomach Problems	8	9	8	25
Thyroid Problems	2	4	4	10
Other	19	28	14	61

A second possible alternative explanation was that knowledge of the public health recommendation was a motivator for the exercise frequency of participants. To examine this possibility, a Pearson chi-square test was performed to examine the relationship between knowledge of the public health recommendation and exercise frequency. The relation between these variables was not significant, X^2 (2, N = 357) = 2.77, p = .25. See Table 3.5 for the distribution for knowledge of the public health recommendation. Of note, the majority of participants across all maintenance frequency groups were either not aware of, or incorrectly identified the recommendation.

Table 3.5

Knowledge of Public Health Recommendation between Frequency Groups

Knowledge of Recommendation	Low Frequency (2 or 3 days/week) (*n* = 79)	Medium Frequency (4 or 5 days/week) (*n* = 178)	High Frequency (6 or 7 days/week) (*n* = 100)	Overall (*N* = 357)
Not Aware of Recommendation	38	82	40	160
Incorrectly Identified Recommendation	29	63	49	141
Correctly Identified Recommendation	12	33	11	56

CHAPTER 4

DISCUSSION

The present study investigated previously unexamined psychosocial differences in exercise maintenance among adults. Considering this study fits within a first generation stage of research (Zanna & Fazio, 1982), the primary purpose was to examine whether groups maintaining various exercise frequencies for 6+ months differed in psychosocial factors. Significant differences existed between the low, medium, and high frequency exercise maintenance groups. Consistent with study hypotheses, the high frequency exercise group reported significantly higher proximal satisfaction with outcome expectations, distal satisfaction with outcome expectations, self-regulatory efficacy to overcome barriers, and recovery efficacy than the low frequency exercise group. Also consistent with a study hypothesis, task self-efficacy did not significantly differ between groups. Study findings also illustrated that the medium frequency of exercise group reported significantly higher self-regulatory efficacy and recovery efficacy than the low frequency group. Following Cohen's conventions for psychosocial effects, effect sizes were small (Cohen, 1988). These findings are not surprising considering participants responded at the top of the response range with limited variability between groups. The significant differences seem to align with conclusions of Kwasnicka et al. (2016) in their review that maintenance motives and social cognitions about self-regulation are important for the maintenance of health behaviours. More specifically, variables reflecting the relative strength of motives and social cognitions differentiated the weekly frequency with which maintenance exercisers participated.

Understanding the general overall pattern of findings requires some theory-based speculation. Recall that the high frequency group reported exercising on 6 to 7 days each week and the medium frequency group reported exercising on 4 to 5 days each week. In contrast, the low frequency group reported exercising on 2 to 3 days each week. Kwasnicka et al (2016) suggests that behaviour occurring across varying contexts requires self-regulation to overcome challenges. Therefore, although not measured in the current study, perhaps the individuals exercising on the majority of days each week (i.e., medium and high frequency maintainers) experienced more challenges, which they successfully overcame in order to maintain their exercise frequency for 6+ months. According to social cognitive theory (agency aspect; Bandura, 1986), these individuals may have developed skills and strategies to overcome daily challenges. Therefore, these individuals should have higher values of the psychosocial variables

related to exercise maintenance than the low frequency group. This latter group may not have experienced the same frequency of challenges, given their exercise occurred on 2 to 3 days each week, and thus they had less potential mastery experiences.

No differences were found between medium and high frequency of exercise groups on any of the variables. Methodologically, this null result may have arisen due to the relative sensitivity of the measures used. More specifically, investigation of mean values illustrate that participants used the upper end of the response scale and the range of response was too narrow to differentiate all groups. In particular, the mean values for the high and medium frequency groups were particularly close together across the majority of variables. Further, group assignment based on weekly exercise frequency was arbitrary, and it is possible that a different grouping (e.g., 2 bouts versus 3 to 4 versus 5 to 7 bouts) might have reflected other differences. In retrospect, a weekly frequency threshold over which there are only differences between lower frequency exercisers and everyone else could exist. In the following sections, specific results within the two maintenance motive themes that were identified by Kwasnicka et al. (2016) are discussed.

4.1 Theme 1: Maintenance Motives

Contrary to a study hypothesis, proximal and distal value of outcome expectations did not significantly differ between the high and low frequency groups, nor did the value expectations differ between any of the exercise frequency groups. All groups reported near ceiling effects in their value of both proximal and distal outcome expectations (i.e., 9+ on a 0 to 10 response scale, with higher numbers reflecting higher value). Rothman (2000) and Bandura (1986) provide a plausible conceptual explanation of these findings. Outcome expectations involve an estimate that a given behaviour will lead to certain personally valued outcomes. When individuals have maintained a behaviour over time, they are aware of the outcomes achieved through participation. Individuals are better able to focus on the outcomes that are personally valued to them, which serve as motivational incentives for continued behavioural performance. Thus, in hindsight, given that all participants reported a typical exercise pattern that was maintained for a long-period of time, value was high across all maintenance frequency groups.

For example, if an individual engages in a certain form of training with the valued outcome of having less stress, each time an exercise session is completed, that person may be aware that their behaviour has led to this outcome. Therefore, the value the individual placed on this

outcome will remain constant no matter the number of days per week of exercise, as long as the individual is *satisfied* that the behaviour continues to lead to less stress. If the challenge had been the beginning a new exercise behaviour (e.g., asking participants to begin attending a new exercise class or a new form of training not previously experienced), differences in value may have been revealed due to respondents' lack of experience and awareness of the outcomes associated with the new behaviour.

When looking at the differences found between groups on satisfaction with proximal and distal outcome expectations, the results align with the suggestions of Rothman (2000). The more satisfied an individual is with an outcome, the more likely that person will sustain the behaviour. As a general example, if an individual has the outcome expectation of stress management through exercise, and that person feels good and without stress during and after exercise, the result is that exercisers' satisfaction is sustained, thereby encouraging weekly maintenance (Rothman, 2000). This type of causal pathway should be investigated in future research.

4.2 Theme 2: Self-Regulation

Self-regulation and related efficacy beliefs, which are key factors within social cognitive theory (Bandura, 1986a), have been primarily examined in the study of exercise adoption and not maintenance (Strachan et al., 2005). In the present study, both task self-efficacy and self-regulatory efficacy to overcome barriers were examined for differences between exercise maintenance frequency groups. Relative to task self-efficacy, no significant differences were found between any of the exercise frequency groups, which was as expected. The findings align with previous research and contentions from social cognitive theory (Bandura, 1986a) that task self-efficacy contributes to exercise initiation levels but, as behaviour is performed over time, may not contribute until a task-related challenge arises (Bandura, 1986a; Woodgate et al., 2005). For example, a task-related challenge might be an injury to a lower limb that makes one's usual exercise of running difficult to carry out. An individual's task self-efficacy might be reduced until the injury is rehabilitated. Indeed studying whether task self-efficacy differentiates maintenance groups when a real-world challenge arises would provide useful information around the speculation that task self-efficacy may differentiate exercise frequency maintainers.

In contrast, as individuals maintain their behaviour over time, self-regulatory efficacy is purported to play a crucial role in the face of challenging circumstances where confidence in self-regulatory actions is required in order to maintain exercise (Maddux & Gosselin, 2003). In

the present study, self-regulation was examined in the context of the challenge of overcoming barriers to regular exercise and in recovering from exercise lapses (i.e., gaps/periods of time with no exercise). Findings illustrated that the high and medium frequency groups reported significantly higher self-regulatory efficacy to overcome barriers and recovery efficacy than the low frequency group. Given the greater weekly exercise frequency, the two former groups may have experienced more challenges and related mastery experiences relative to overcoming barriers and recovering from lapses. Such mastery experiences are the strongest determinant of efficacy beliefs and if successful, continue to reinforce individuals' level of confidence (Bandura, 1997). At the same time, it would be remiss not to suggest that perhaps other unmeasured factors, such as resiliency, may also help individuals maintain behaviour.

4.3 Potential Alternative Explanations for Differences in Exercise Maintenance Groups

Recognizing the possibility that other factors may also explain differences in the exercise maintenance frequency groups, two possible post hoc alternative explanations were considered. First, were health-related problems of the participants part of the reason they may have been exercising at different weekly frequencies? For example, might a person with arthritis or asthma successfully managing their disease at a lower maintenance frequency? No significant relationships were found between self-reported health-related problems and exercise frequency groups. This means that within the current study sample, health-related problems were not a factor in the number of days per week the participants reported engaging in exercise. Interestingly, all groups of participants reported some health-related problems, illustrating that maintainers, as defined in the current study, are still able to exercise at different rates of weekly exercise regardless of any health-related problems.

Second, was it possible that exercise maintainers were motivated to exercise for health benchmarks? For example, do some groups of more frequent exercisers strive toward the recommendation of completing 150 minutes per week of moderate to vigorous exercise? Knowledge of the public health recommendation was investigated as a possible reason for the differentiation between exercise frequency groups. Interestingly, of the 357 total participants, only 56 correctly reported the public health exercise recommendation of 150+ minutes/week of moderate to vigorous exercise (CSEP, 2012). Further, a chi-square test illustrated that the relationship between knowledge of the public health recommendation and exercise frequency was not significant. Of note, the majority of participants across all maintenance frequency

groups were either not aware of or incorrectly identified the recommendation. Further, only 40 participants in the high frequency of exercise group (n = 100) correctly identified the recommendation. These findings suggest that knowledge of the public health recommendation does not appear to be a uniform motivating factor relative to the maintenance of participants' exercise. It is interesting that Dale et al. (2016) found a significant relationship was found between Canadian adults who self-reported meeting the recommendation and a simple yes response that they were aware of the recommendation. However, this finding is not directly comparable to the present study which focused exclusively on maintainers. Further, the present study went beyond Dale et al.'s measure of awareness (i.e., yes/no response) by also assessing whether those who were aware also reported the recommendation correctly. The Dale et al. (2016) study did find that in general, a low number of Canadians were aware of the recommendation (i.e., 12.9%; N = 1586) and 17.1% (n = 148) were aware and reported meeting the recommendation. In the present study, individuals who met and were aware of the recommendation were also a small percentage of the total maintainer sample (15.9%; n = 54). Overall, research needs to continue to focus on obtaining a better understanding of the motives underlying maintenance of exercise from an individual psychosocial perspective and how these may be the same and/or differ from maintenance in terms of meeting the public health recommendation.

4.4 Summary of Secondary Purpose Findings

Consistent with the exploratory nature surrounding the secondary purpose, psychosocial differences were examined between participants who approached/met the public health exercise recommendation versus those who exceeded the recommendation. Recall that the recommendation was not a clear motivator for the sample. Findings illustrated that those who exceeded the recommendation reported significantly higher value of distal outcome expectations, proximal and distal satisfaction with outcome expectations, self-regulatory efficacy to overcome barriers, and recovery efficacy than the less than/equal to recommendation group. Effect sizes were small as per Cohen's conventions for psychosocial effects (Cohen, 1988).

Perhaps this is not surprising given that 286 individuals in the sample exceeded the public health recommendation. Also, recall that the high frequency and medium frequency groups combined totaled 278 participants. This combined group exercised between 4 to 7 times weekly, therefore it seems likely that many of these people exceeded the recommendation. Thus, not

surprisingly, results between the primary purpose and secondary purpose seem quite similar (i.e., less than/equal to group having lower values on the majority of the measured variables than the exceeded group). These findings provide initial support for the notion that psychosocial factors involved in the successful self-management of individuals' maintenance of exercise frequency appear to be related to personal behavioral goals. This conclusion is strengthened by the finding that the present maintainer sample was unaware of or incorrect about public health recommendation.

4.5 Limitations and Strengths

Despite the novel findings of the present research, limitations exist. The generalizability of the results is constrained to white, female, English-speaking, middle-aged adults. Due to the operational definition of maintenance used for some of the inclusion criteria, some long-term exercise maintainers may have been missed. For example, individuals who exercised for days, weeks, and years but for bouts of 10 minutes and/or those who exercise one day per week would not have met the criteria for study participation. Further, participants tended to use the upper ends of the measurement response scales, which may have limited the opportunity to identify significant between-group differences. A third limitation was the identification of the maintenance groups was based on the self-reported exercise data obtained from this specific sample. Perhaps a different sample would have resulted in different exercise frequencies being used to form the three maintenance groups, yielding different findings. Finally, the use of the 6-month, minimum, timeframe for identifying exercise maintainers may have been a limitation. This timeframe was selected given the lack of a standardized minimal period of time that could be used to define maintenance (Kahlert, 2015). Thus, a timeframe was needed for use in the study. A review illustrated that the 6 month timeframe has been typically used in literature that concerned the Transtheoretical Model as well as reviews of observational studies and intervention studies that have used follow-up periods of at least 6 months (Howlett et al., 2018). Indeed, future research should identify if a specific timeframe exists when exercise has been maintained for a long enough duration that it significantly differs from prior inactive levels, which would align with the conceptual definition of maintenance proposed by Kwasnicka et al. (2016).

Relative to strengths, the present study was one of the first theoretically-driven studies to identify psychosocial factors associated with personally chosen behavioural maintenance at

varying weekly frequencies. Further, this is one of the few studies to examine longer-term maintenance (i.e., sample average of 7 years) from an individual behavioural perspective based upon maintenance motives and self-regulation themes identified by Kwasnicka et al. (2016). In the current study, participants self-identified as exercise maintainers. This method invited a new perspective of maintenance, previously unexamined in research that has typically used an empirically-driven, dose-response public health perspective (Dishman, 1986; Wankel, 1984). As well, the methodology gave participants opportunity to report their frequency of exercise, personal outcome expectancies, and barriers to exercise using an open-ended approach. This approach allowed for personally salient items to be assessed versus the provision of an investigator-provided list of items among experienced exercise maintainers.

4.6 Future Directions

This study was an initial step in the investigation of the relationship between previously unexamined personal frequency of exercise maintenance and exercise-related psychosocial factors. The study contributed to the understanding of the psychosocial factors related to longer-term exercise maintenance through the use of complementary theoretical perspectives (agency aspect: Bandura, 1986, 1997, 2004; satisfaction: Rothman, 2000) concerning maintenance motives and self-regulation (Kwasnicka et al., 2016). This foundation allowed for the identification and description of factors involved in personal behavioural maintenance, with several research avenues existing for the near future. First, to obtain a more representative sample, recruitment strategies might be expanded to include online organizations and national community centers serving a larger variety of ages, races, and gender identities (e.g. ParticipACTION, online exercise blogs, national fitness centers, such as YMCAs/YWCAs). Second, additional maintenance themes identified by Kwasnicka et al. (2016) could be explored. For example, as suggested by those researchers, psychosocial factors within the themes of habits and environmental and social influence could be explored to determine if these perspectives adequately differentiate exercise frequency maintenance (Strachan, Brawley, Spink, & Jung, 2009). Then, these themes could be investigated to determine the pattern of relationships between variables within and across themes and the outcome of exercise maintenance (Kwasnicka et al., 2016). Third, a prospective study design could be used to examine whether the psychosocial factors explored in the current study predict exercise maintenance in a similar or variable manner over time (e.g., a variable manner might be linked to key challenges and

barriers that arise and remain over weeks/months). If so, then a longer-term second generation research direction would be to explore whether moderators (e.g., modifiable barriers versus unmodifiable environmental barriers; resiliency) might change the relationships between psychosocial factors and exercise frequency (Zanna & Fazio, 1982). Fourth, examining maintenance over time would also permit determination of whether high weekly frequency of exercise is indeed associated with more challenges and related mastery experiences, as speculated in this discussion.

Also, the psychosocial factors related to exercise maintenance should be assessed in both asymptomatic and symptomatic populations. Only a small group of participants in the present study had health-related problems, and there was no distinct exercise frequency that showed a relation with a given health-related problem. Thus, it cannot be ruled out that a maintenance sample with a specific chronic disease may reveal psychosocial differences between maintenance frequency groups. Future studies should aim to examine exercise maintenance in groups who are managing chronic health-related problems in order to better understand unique challenges faced and strategies used within these populations to overcome barriers and maintain exercise. For example, research could examine maintainers who are managing a specific disease, such as arthritis. Such research should assess the psychosocial factors studied in the present research as well as disease factors (e.g., disease severity; time since diagnosis) to determine which factors explain differences in maintenance. Doing so holds the potential to provide a more robust explanation about maintenance when individuals manage long-term exercise while also experiencing the challenge of a chronic disease.

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APPENDIX A

Demographic Information of Study Participants

	Low (2-3 days/week)		Medium (4-5 days/week)		High (6-7 days/week)		Overall (2-7 days/week)	
Variable	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*
Age (years)	30.53	11.26	32.72	12.32	31.54	11.59	31.88	11.89
Years of maintenance	6.10	3.97	6.77	3.76	8.08	3.95	6.98	3.92

Variable	Count Low	Count Medium	Count High	Count Overall
Gender				
Male	20	58	31	109
Female	58	118	67	243
Nonbinary	1	-	2	3
Other	-	2	-	2
Ethnicity				
Aboriginal	1	4	4	9
Asian	4	7	5	16
Black	-	1	-	1
Latin American	1	4	1	6
South Asian	1	2	1	4
White	71	157	92	320
Other	2	5	-	7
Health Related Problems				
No known	39	108	59	206
Arthritis	2	8	3	13
Asthma	7	23	13	43
Diabetes	-	1	1	2
High blood pressure	2	7	1	10
High cholesterol	2	2	1	5
Cancer	1	-	-	1
Stomach problems	8	9	8	25
Thyroid problems	2	4	4	10
Other	19	28	14	61
Relationship Status				
Married	27	62	32	121
Divorced/Separated	1	8	3	12
Single	45	80	54	179

Common law	6	27	10	43
Not Specified	-	1	1	2
Education				
≤ High school diploma	-	5	2	7
Post-secondary student	28	54	28	110
University/College degree/diploma	47	107	62	216
Graduate Student/Degree	4	9	7	20
Other	-	3	1	4
Employment Status				
Full-time	35	78	45	158
Part-time	8	28	19	55
Student	35	61	31	127
Retired	-	4	2	6
Unemployed	1	6	3	10
Not specified	-	1	-	1
Income				
<$25 000	37	71	38	146
$25 000 - $49 999	6	29	13	48
$50 000 - $74 999	13	28	23	64
$75 000 - $99 999	9	26	14	49
>$100 000	13	17	12	42
Not specified	1	7	-	8
Dependents				
0	47	104	67	218
1 - 3	20	42	25	87
4 - 6	1	2	-	3
Not specified	11	30	8	49

APPENDIX B. PARTICIPANT SCREENING

Informed Consent

UNIVERSITY OF SASKATCHEWAN

Consent Form for Participating in Exercise Maintenance Research

Project Title: Understanding the maintenance of health behaviour change: Psychosocial factors that sustain or constrain long-term exercise

Researcher(s): Mackenzie Marchant, BHK, MSc Student, College of Kinesiology, University of Saskatchewan**.** Email: mackenzie.marchant@usask.ca

Supervisor: Lawrence Brawley, PhD, Professor and Canada Research Chair, College of Kinesiology, University of Saskatchewan. Email: larry.brawley@usask.ca

Purpose: To gather information to help us understand the psychological factors characteristic of individuals who do well at sticking to their exercise plans for long periods of time (e.g., 6+ months; years). Information from this study will help us to better understand psychological and behavioural aspects of successful longer-term exercise maintenance.

The purpose of this survey is to gather information to help us understand individuals who do well at sticking to their exercise plans for long periods of time (e.g., 6 months or more). Information from this study will help us to better understand psychological and behavioural aspects of successful longer-term exercise maintenance.

Participation in this study is voluntary. You can decide not to participate at any time by closing your browser. You can also decline to answer any questions with which you don't feel comfortable, however withdrawal of data is not possible.

Who is Eligible to Respond to the Survey? This study concerns people who have stayed with their exercise pattern or plan over very long periods of time. If you are a North American adult, over the age of 18, have engaged in regular exercise for a minimum of at least twice a week for 30 consecutive minutes or more per session over the past 6 months, and have plans to maintain or increase your exercise pattern during the next 6 months, we would like to hear from you and your thoughts about your personal pattern of exercise maintenance.

Procedures: To participate, you will be asked to fill out this one-time survey on the Internet. The survey will take you about 20-30 minutes. The survey is anonymous and can be completed on any computer at any location of your choosing. Survey responses will remain anonymous. Since the survey is anonymous, once it is submitted it cannot be removed. Once you start the survey, we would greatly appreciate it if you continue to finish it as your responses cannot be saved and continued later.

The survey will ask you questions about both your behaviour and thoughts about managing exercise. As an eligible, long term exerciser, you will be asked information about yourself, such as your age, health, and gender so we can paint a clear picture of the range of characteristics of our volunteer respondents. This information will only be used to describe the potential diversity of our entire group of volunteers and no individual will be identifiable. Your privacy is both respected and assured.

Interest in the Results of the Study: At the end of the survey, you will be asked if you want to receive a copy of the summary study results. If so, you will be asked to provide an email address through an independent second survey. Your email address will be stored separate from your survey responses and will be destroyed from our records once the research is complete.

Please contact one of the researchers using the information at the top of this page if you have any questions about the procedures, goals of the study, or your potential role in it.

Potential Risks: There are no known risks to participating in this survey.

This survey is hosted by Fluid Surveys, a USA owned company. Please see the following for more information on Fluid Surveys Data Privacy in Canada.

This research project has been approved on ethical grounds by the University of Saskatchewan Research Ethics Board on August 10th, 2017. Any questions regarding your rights as a participant may be addressed to that committee through the Research Ethics Office, email: ethics.office@usask.ca; or call 306-966-2975. Out of town participants may call toll free 1-888- 966-2975.

The data collected will be used for an independent research project, in the College of Kinesiology at the University of Saskatchewan.

By completing and submitting this survey, **your free and informed consent is implied and indicates that you understand the above conditions of participation in this study.**

Please print a copy of this form if you wish to keep it.

Informed consent:

☐ No - I do not want to participate in the study.

☐ Yes - I want to do the survey.

Inclusion Criteria

1. Do you have any current health restrictions or injuries that prevent you from engaging in regular exercise?

☐ Yes ☐ No

2. Have you engaged in regular exercise for a minimum of at least twice a week for 30 consecutive minutes or more per session over the past 6 months (*i.e., at least 3 of 4 weeks of every month*)?

☐ Yes ☐ No

3. Do you have plans to maintain or increase your exercise pattern during the next 6 months?

☐ Yes ☐ No

APPENDIX C.

Rationale for Outcome Expectation Analysis

Study participants self-selected a total of two proximal and two distal outcomes from the investigator provided list, with participants' specific choices varying across the sample. Investigation of the mean values illustrated that both proximal and distal value scores were at the ceiling of their response scales with only modest variability ($M_{outcome1}$ = 9.17, $SD_{outcome1}$ = 1.14; $M_{outcome2}$ = 8.46, $SD_{outcome2}$ = 1.29) and distal ($M_{outcome1}$= 9.20, $SD_{outcome1}$ = 1.22; $M_{outcome2}$ = 8.29, $SD_{outcome2}$ = 1.61). These scores were not surprising given that the sample was comprised of maintainers, self-selecting their salient outcomes. Theoretically, such outcomes should be rated highly and serve as a strong personal incentive for their exercise (Bandura, 1997; Kwasnicka et al., 2016).

However, in order to capture the strongest personal incentive that motivated maintainers, the decision was made to use the value for each participants' first listed proximal and distal outcome, respectively, in the study analyses. Indeed, a first listed response by individuals should be their most salient (Aberbach & Rockman, 2002; Reja, Manfreda, Hlebec, & Vehovar, 2003). Reflection of the mean scores seems to support this notion. Note that the scores for participants' first listed proximal and distal outcomes were slightly higher, on average, than their second listed proximal and distal outcome, respectively.

APPENDIX D. STUDY MEASURES

Demographic Information

IMPORTANT: The information below is strictly for the purpose of generally describing the range of characteristics of volunteer participants. This information will be kept private. Please select only one answer unless otherwise specified.

What is your age in years? _____ (*must be 18+ years to participate*)

What gender do you identify with?

☐ Male ☐ Female ☐ Not Listed _____ ☐ Prefer not to answer

What is your country of residence?

_____

Please specify your ethnicity. (Check all that apply)

☐ Aboriginal (*Métis, Inuit, First Nations*)

☐ Asian

☐ Black

☐ Latin American

☐ South Asian (*East Indian, Pakistani, Sri Lankan, etc*.)

☐ White

☐ Other (please specify) _____

What is your highest level of education? (Please check one)

☐ Some high school or less

☐ High school diploma

☐ Some post-secondary without diploma or degree

☐ University/College degree

☐ Other (please specify) _____

Are you currently employed?

☐ Full-time

☐ Part-time

☐ Not at all

☐ Student

☐ Retired

What is your average income range? (Please check one)

☐ Less than $25 000

☐ $25 000 to $49 999

☐ $50 000 to $74 999

☐ $75 000 to $99 999

☐ $100 000 or more

What is your relationship status?

☐ Married

☐ Divorced

☐ Separated

☐ Single

☐ Common law

☐ Widowed

How many children/dependents currently live with you, or will live with you over the next 6 months?

☐ 0

☐ 1

☐ 2

☐ 3

☐ 4

☐ 5

☐ 6

☐ 7

☐ Other _____

Do you have any health-related problems? (Check all that apply)

☐ Arthritis

☐ Asthma

☐ Diabetes

☐ High Blood Pressure

☐ High Cholesterol

☐ Any Cancer

☐ Stomach Problems (*e.g. crohn's disease, irritable bowel syndrome, celiac disease etc*.)

☐ Thyroid Problems *(Hashimoto's disease, Graves' disease, goiter, and thyroid nodules, etc.)*

☐ Other (*Specify*)_____

☐ No known health-related problems

Primary Purpose Study Variables

Exercise Frequency

Please note that for the purposes of this study the term '**exercise**' refers to planned activity lasting at least 30 minutes that causes you to breathe more heavily than normal. This may include (but is not limited to) running, biking, exercise classes, resistance training, etc.

1. On an average week during the last 6 months, how many days do you engage in exercise for at least 30 minutes?

0 1 2 3 4 5 6 7

Value of Proximal Outcome Expectations

It is important to know what aspects of exercise you value most and motivate you to sustain your current exercise pattern each day.

1. What day-to-day personal motivations help you sustain your exercise routine?

Check 2 that are most important which keep you exercising day-to-day. If none of the items from the list apply, then type in a clear explanation of your day-to-day motivation in the "other" space.

☐ Social recognition of the people that see me going for my regular exercise sessions exercise

☐ Feeling good during and after exercise

☐ Help me feel more energized each day

☐ Spending time with others who also exercise

☐ Making progress on my performance *(e.g. speed, weight lifted, distance covered)*

☐ Other _____

2. Please rate the value you place on each day-to-day motive. Choose the motive you selected from the dropdown menu, then score the value of that motive.

Your day-to-day motive #1

☐ Social recognition of the people that see me going for my regular exercise sessions exercise

☐ Feeling good during and after exercise

☐ Help me feel more energized each day

☐ Spending time with others who also exercise

☐ Making progress on my performance *(e.g. speed, weight lifted, distance covered)*

☐ Other _____

Value of motive #1

1 (minimal value), 5 (moderate value), 10 (highest value)

1 2 3 4 5 6 7 8 9 10

Your day-to-day motive #2

☐ Social recognition of the people that see me going for my regular exercise sessions exercise

☐ Feeling good during and after exercise

☐ Help me feel more energized each day

☐ Spending time with others who also exercise

☐ Making progress on my performance *(e.g. speed, weight lifted, distance covered)*

☐ Other _____

Value of motive #2

1 (minimal value), 5 (moderate value), 10 (highest value)

1 2 3 4 5 6 7 8 9 10

Value of Distal Outcome Expectations

It is important to know what aspects of exercise you value most and motivate you to sustain your current exercise pattern over time.

1. What long-term personal motivations help you sustain your exercise routine?

Check 2 that are most important which keep you exercising long-term. If none of the items from the list apply, then type in a clear explanation of your long-term motivation in the "other" space.

☐ Weight management

☐ To prevent my health condition from progressing

☐ Helps me know I am doing something good for my health

☐ Training for an event/competition

☐ Improve appearance

☐ Other _____

2. Please rate the value you place on each long-term motive. Choose the motive you selected from the dropdown menu, then score the value of that motive.

Your long-term motive #1

☐ Weight management

☐ To prevent my health condition from progressing

☐ Helps me know I am doing something good for my health

☐ Training for an event/competition

☐ Improve appearance

☐ Other _____

Value of motive #1

1 (minimal value), 5 (moderate value), 10 (highest value)

1 2 3 4 5 6 7 8 9 10

Your long-term motive #2

☐ Weight management

☐ To prevent my health condition from progressing

☐ Helps me know I am doing something good for my health

☐ Training for an event/competition

☐ Improve appearance

☐ Other _____

Value of motive #2

1 (minimal value), 5 (moderate value), 10 (highest value)

1 2 3 4 5 6 7 8 9 10

Satisfaction with Proximal Outcome Expectations

1. How satisfied are you with the two day-to-day motivations you listed above?

For example, "I highly value exercising with others, however I am not satisfied with my current interactions while exercising"

1 (minimal satisfaction), 5 (moderate satisfaction), 10 (high satisfaction)

1 2 3 4 5 6 7 8 9 10

Satisfaction with Distal Outcome Expectations

1. How satisfied are you with the two long-term motivations you listed above?

For example, "Exercise helps me know I am doing something good for my health and I am currently feeling like I am in the best shape of my life"

1 (minimal satisfaction), 5 (moderate satisfaction), 10 (high satisfaction)

1 2 3 4 5 6 7 8 9 10

Self-Regulatory Efficacy to Overcome Barriers

This next set of questions asks about your confidence to overcome barriers to manage your weekly exercise schedule. In this context, 'barriers' refer to obstacles or circumstances that make achieving exercise goals challenging during a normal week.

1. In the space below, please list up to three of the *most frequently occurring* challenges that make it hard/prevent you from maintaining your weekly exercise routine (e.g., three or more times a week).

For each challenge, please:

a. Rate how confident you are that you can still perform your exercise routine

Challenge #1

Challenge _____

Confidence to Overcome Challenge

1 (minimally confident), 5 (moderately confident), 10 (highly confident)

0 1 2 3 4 5 6 7 8 9 10

Challenge #2

Challenge _____

Confidence to Overcome Challenge

1 (minimally confident), 5 (moderately confident), 10 (highly confident)

0 1 2 3 4 5 6 7 8 9 10

Challenge #3

Challenge _____

Confidence to Overcome Challenge

1 (minimally confident), 5 (moderately confident), 10 (highly confident)

0 1 2 3 4 5 6 7 8 9 10

Recovery Efficacy

This section deals with time away from your regular exercise schedule.

DO NOT consider planned rest required for muscle recovery or fatigue (i.e. 'rest days'), nor any vacations where you continued to exercise.

1. Considering the exercise gaps you have had in the past, how confident are you that you could gradually build back up to the same exercise level you could complete currently…

0 (not at all confident), 5 (moderately confident), 10 (extremely confident)

a. After a one week gap

0 1 2 3 4 5 6 7 8 9 10

b. After a 2 week gap

0 1 2 3 4 5 6 7 8 9 10

c. After a 3 week gap

0 1 2 3 4 5 6 7 8 9 10

d. After a 4 week gap

0 1 2 3 4 5 6 7 8 9 10

e. After a >4 week gap

0 1 2 3 4 5 6 7 8 9 10

Task Self-Efficacy

1. If you maintained your exercise pattern but increased the time per session, how confident are you that you could

0 (not at all confident), 5 (moderately confident), 10 (extremely confident)

a. increase your average exercise session by 15 minutes?

0 1 2 3 4 5 6 7 8 9 10

b. increase your average exercise session by 30 minutes?

0 1 2 3 4 5 6 7 8 9 10

c. increase your average exercise session by 45 minutes?

0 1 2 3 4 5 6 7 8 9 10

d. increase your average exercise session by 1 hour?

0 1 2 3 4 5 6 7 8 9 10

Secondary Purpose Study Variables

Exercise Level Relative to the Public Health Recommendation

1. Do you know the current physical activity recommendations for adults 18-64 years?

☐ Yes ☐ No

2. If you answered yes, please provide the recommendations in the space below.

_____

Note: this question is designed to gather current knowledge/awareness of the recommendations – please refrain from looking up the recommendations before answering

The current physical activity recommendations for Canadian adults aged 18-64 are **150 minutes of moderate to vigorous physical activity each week.**

3. Given the weekly exercise pattern you have maintained for a long time, how does your exercise level compare to the recommendations of 150 minutes of moderate to vigorous physical activity each week?

☐ My exercise level is LESS THAN recommendations

☐ My exercise level is EQUAL TO recommendations

☐ My exercise level is MORE THAN recommendations