12-11-2014 12:00 AM

An Examination of Psychological Variables Influencing Perceptions of The Self Among a Sample of Female Exercise Initiates

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A thesis submitted in partial fulfillment of the requirements for the Doctor of Philosophy degree in Kinesiology

AN EXAMINATION OF PSYCHOLOGICAL VARIABLES INFLUENCING PERCEPTIONS OF THE SELF AMONG A SAMPLE OF FEMALE EXERCISE INITIATES

(Thesis format: Integrated Article)

by

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Graduate Program in Kinesiology

A thesis submitted in partial fulfillment
of the requirements for the degree of
Doctor of Philosophy

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Abstract

The general purpose of this dissertation was to explore the relationship among and within cognitive variables associated with exercise initiation and maintenance in a sample of female exercise initiates.

Manuscript 1 was structured to explore the changes to exercise identity among a population of female exercise initiates (*N*= 78) grouped into an imagery or control condition. Previous research has found that a strong exercise identity is associated with more frequent exercise (Strachan et al., 2009) and increases over time as a person continues to exercise (Cardinal & Cardinal, 1997). Participants were assessed multiple times (weeks 0, 5, 9, 18, 36) during their enrollment in an eight week cardiovascular exercise program. Findings revealed significant time effects for identity, exercise behaviour, and fitness. In addition, a significant group x time interaction effect was observed at week 9 for role identity in favour of the exercise imagery condition. Given exercise identity appears to serve as an important construct in the promotion of exercise adherence (Strachan et al., 2013) results of the imagery intervention in the current study are very promising.

Manuscript 2 aimed to explore the changes in an exercisers' self-efficacy (task, scheduling, and coping) and outcome expectations (appearance/health likelihood and value) over time, as well as to determine each variable's influence on future intentions to be active. Of particular interest in the present study was the previous suggestion that outcome expectations and self-efficacy may influence exercise behaviour at different time points within an exercise program (Rodgers & Brawley, 1996). Female participants (*N* = 78) completed various measures (i.e., outcome expectations, self-efficacy, and intentions at week 0, 9, 36). Employing regression analyses, significant results were observed at week 9, with task self-efficacy predicting intention to maintain behaviour. Scheduling self-efficacy was the strongest predictor of intentions to maintain behaviour at week 36, with additional contributions from appearance likelihood and task self-efficacy. Lastly, health value was a significant predictor of one's intention to increase activity level at week 36. It appears that outcome expectations and self-efficacy have an impact on intentions to engage in exercise behaviour, and this contribution changes over time.

Keywords: imagery, exercise, identity, self-efficacy, outcome expectancy, women

Co-Authorship Statement

The work contained within this dissertation is original and is the primary work of the first author. However, I would like to acknowledge the contribution of three co-authors who provided critical insight and assistance in completing this project. First, I would like to thank Dr. Craig Hall, my advisor and professor in the School of Kinesiology at Western University, for his mentorship, feedback, and assistance in all aspects of my dissertation. Second, I would like to thank Dr. Lindsay Duncan (Assistant Professor in the Department of Kinesiology and Physical Education at McGill University), for her contribution to the research protocol, review of imagery scripts, and feedback on various components of this work. Lastly, I would like to thank Dr. Wendy Rodgers (Vice Dean, Faculty of Physical Education and Recreation at University of Alberta) for her guidance on the research project, noting her beneficial contribution to data analysis on Manuscript 2 given her expertise in self-efficacy and outcome expectations.

Acknowledgments

I would like to express my sincere gratitude and appreciation to my advisor, Dr. Craig Hall. His ability to patiently encourage and guide me through the completion of this research is invaluable. I will be forever grateful to Craig and Dianne for their care and support over the last few years. I would also like to extend my appreciation to my committee members, Dr. Shauna Burke, Dr. Anita Cramp, Dr. Kimberly Gammage, and Dr. Harry Prapavessis. Your challenging and insightful questions will only further enhance the impact of this research. Thank you for your time and contribution to this endeavor. I am also extremely grateful to my fellow colleagues and friends who have helped me grow through this process. I appreciate your support, encouragement, and advice, whether you were near or far. This research would not have been possible without the commitment from my participants - thank you for giving your time to my research. Lastly, I would like to thank my family for their love and support throughout all of my education.

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INTRODUCTION

Being regularly active can lead to an abundance of physical and psychological health benefits (Penedo & Dahn, 2005). A recent systemic review supported the positive relationship between long-term physical activity and the reduction in selected diseases, including obesity, coronary heart disease, and type 2 diabetes mellitus (Reiner, Niermann, Jekauc, &Woll, 2013). Moreover, engagement in physical activity has been linked to beneficial mental health changes including, reductions in depression and stress, as well as improvements to self-confidence and emotional well-being (Gauvin & Spence, 1996). Yet despite the vast amount of research that has demonstrated the link between physical activity and health, many Canadians remain insufficiently active to obtain these benefits (Cameron, Craig, & Paolin, 2005). This is particularly evident by the rise in obesity within Canada over the past few decades (Tjepkema, 2006), with 14.7 percent of Canadians considered obese (Katzmarzyk & Janssen, 2004). There has also been reported increases in mean values for body mass index, waist circumference, and skin-fold measurements (Canadian Health Measures Survey [CHMS], 2011), as well as associated health care costs (economic burden of physical inactivity recorded at $5.3 billon; Katzmarzyk & Janssen, 2004). Moreover, measured levels of fitness including flexibility and muscle strength have declined within the past thirty years (Shields et al., 2010). It appears that approximately 85% of Canadian adults do not meet the current physical activity guidelines (i.e., 150 minutes of moderate intensity activity per week; CHMS, 2011), despite the fact that these guidelines are sufficient to elicit health benefits, particularly among sedentary individuals (Warburton, Nicol, & Bredin, 2006). Interestingly, there is an apparent positive linear relationship between physical activity and health status, such that an increase in activity and fitness will lead to additional health status improvements (Warburton et al., 2006). The current physical inactivity patterns of Canadian adults alludes to a significant amount of time spent being sedentary (68% per day for men, 69% per day for women; Colley, Garriguet, Janssen, Craig, Clarke, & Tremblay, 2011). Thus, it is critical we start to establish effective ways to increase physical activity and fitness and begin to reduce the rates of chronic disease and subsequent co-morbidities to inactive behaviours.

Exercise and women

Given the unique role of physical activity, both in health promotion and disease prevention, it is an important variable for continued investigation (Speck& Harrell, 2003). However it appears that examination needs to be targeted among genders as an apparent difference in physical activity patterns exists (Sallis, Calfas, Alcaraz, Gehrman, & Johnson, 1999). It appears that males are more likely to meet recommended physical activity guidelines (Martin, Morrow, Jackson, & Dunn, 2000), while females are less active, with 52% failing to maintain sufficient activity levels (Canadian Fitness and Lifestyle and Research Institute, 2005). Previous research has noted that various psychological variables have been linked to physical activity performed by women including self-efficacy (McAuley, Courneya, Rudolph, & Lox, 1994) and outcome expectations (likelihood/value; Rodgers & Brawley, 1996), in addition to social environmental factors (e.g., social support, perceived barriers, environmental barriers). Not surprisingly, a recent qualitative examination of exercise among older women found that many initiated the exercise program as a ‘means to an end’ (O’Dougherty, Kurzer, & Schmitz, 2010). Specifically, the female participants noted that they engaged in the exercise program to become healthier, feel good/better, as well as a result of concerns with body weight and image. However, approximately 67% changed the reason for engagement over the duration of the exercise program. Evidently, the reasons women engage in exercise are dynamic and require further exploration in order to reduce the current rate of inactivity among this population. As such, one component of this dissertation was to explore several psychological variables that contribute to exercise initiation and maintenance among a sample of previously inactive females.

Exercise imagery

Hall (2001) suggested that imagery is a universal mental skill such that any individual has the ability to create and use it. Although predominantly studied in the sport domain, Hall (1995) suggested that imagery may be an effective mental skill to enhance exercise behaviour. Hausenblas, Hall, Rodgers, and Munroe (1999) originally described exercise imagery as:

> … mentally seeing yourself exercising. The image in your mind should approximate the actual physical activity as closely as possible. Imagery may include sensations like hearing the aerobic music and feeling yourself move through the exercises. Imagery can also be associated with emotions (e.g., getting psyched up or energized), staying focused (e.g., concentrating on aerobic class and not being distracted), setting exercise plans/goals (e.g., imaging achieving the goal of losing weight), etc. (p. 173)

This definition has repeatedly emerged when conceptualizing exercise imagery within the literature, albeit adjustments to terminology are evident (Giacobbi, Hausenblas, Fallon, & Hall, 2003; Giacobbi, Hausenblas, & Penfield, 2005; Kim & Giacobbi, 2009).

Imagery research among exercise participants and the subsequent development of assessments stemmed from Hausenblas et al.’s (1999) investigation of exercise imagery. Their qualitative exploration revealed 75% of exercisers (N= 144) utilized exercise imagery, with a majority reporting use for motivational (e.g., imaging body image, feeling good about oneself) and cognitive purposes (e.g., strategies/techniques, goals). Variations in imagery use have been reported by high and low frequency exercisers (Gammage, Hall, & Martin Ginis, 2004). High frequency exercisers report stronger ability to generate desired images (e.g., being in shape, staying healthy, and fit) and consequently place greater importance on maintaining such images than low frequency exercisers. Exercise imagery has been linked to greater exercise intentions (Rodgers, Hall, Blanchard, McAuley, & Munroe, 2002), positive changes to exercise self-efficacy (Wesch, Milne, Burke, & Hall, 2006), and more autonomous motivational regulations (Hall, Rodgers, Wilson, & Norman, 2010). Moreover, Giacobbi et al. (2003) found that appearance-related exercise imagery served an important role in motivating exercise participation, while health-related images acted as a potential source of motivation for exercise participation among older adults (Kim & Giacobbi, 2009).

Employing the above research as a foundation, investigators have recently examined whether imagery interventions can positively influence exercise cognitions. In one study, sedentary women (n = 95) who wanted to regularly exercise were assigned to one of three imagery intervention groups or to an attention-control group (Duncan, Rodgers, Hall, & Wilson, 2011). Each imagery group was differentiated by imaging a different type of self-efficacy for exercise (task, coping, and scheduling; self-efficacy will be discussed in more detail below). In the task imagery group, participants imagined confidently engaging in the exercises and completing a session of moderate-intensity cardiovascular exercise. In the coping group, the participants imagined successfully overcoming some of the common barriers to regular exercise, such as exercising even if they were tired, stiff, or sore. In the scheduling group, women imagined successfully incorporating exercise into their daily and weekly routines. The findings from this study demonstrated that as the participants began and maintained an exercise program, their self-efficacy increased in all three of these areas; but, in each group, the specific type of self-efficacy that they used in the imagery sessions increased the most. These results showed that imagery can be used to increase self-efficacy for exercise and thus seems to be an effective intervention tool in the exercise domain.

In a similar study, Duncan, Hall, Wilson, and Rodgers (2012) sought to test the impact of an imagery intervention on the motivation of female non-exercisers as they initiated and maintained an 8-week cardiovascular exercise program. All women visited the study facility to exercise three times per week. The women were also assigned randomly to listen to an audio-recorded imagery script that targeted the development of integrated regulation (i.e., motivation related to a sense of personal importance and identity) or to an attention control script that provided information about the health benefits of exercise. At the conclusion of the 8-week intervention, the women assigned to the imagery intervention reported greater increases in integrated regulation than women in the control condition. Due to the fact that the exercise program was standardized and assigned to women in both conditions, the researchers were not able to extend their analyses to examine the impact of the intervention on behaviour.

The intervention studies conducted to date clearly show that imagery can positively affect cognitive variables important in determining exercise behaviour. As such, Manuscript 1 extended this intervention research by exploring whether imagery could influence one's exercise identity during participation in a structured exercise program and after the structure was removed.

Exercise identity

According to Stets and Burke (2003), the self is organized into multiple identities which are reflected in the context of a particular role. More specifically, the self is a psychological mechanism which permits self-reflection (Leary & Tangney, 2003) in various contexts including self-regulation of health (Leventhal, Brissette, & Leventhal, 2003). According to identity theory, identities aid in the regulation of behaviour by providing a personally relevant behavioural standard (Stryker & Burke, 2000). Evidence of identity-congruent behaviour has been investigated in health contexts as observed with literature pertaining to exercise. Strachan and colleagues examined the relationship between exercise identity and behaviour consistency (Strachan, Brawley, Spink, & Jung, 2009). Results suggested that a strong exercise identity was associated with more frequent exercise and perceptions of identity confirmation through exercise behaviour. Moreover, self-identity has been identified as a significant predictor of running frequency in conjunction with scheduling self-efficacy (Strachan, Woodgate, Brawley, & Tse, 2005). Given these relationships, exercise-identity strength may be useful in understanding exercise adherence (e.g., Anderson, Cychosz, & Franke, 1998; Strachan & Brawley, 2008). Evidence highlights that identity can increase over time as a result of involvement in exercise behaviour (Anderson & Cychosz, 1994; Cardinal & Cardinal, 1997). Clearly exercise identity is linked to exercise behaviour and to various cognitive variables important in the maintenance of exercise.

Recently, Wilson and Muon (2008) suggested that exercise identity should be examined using a two factor model posited by Stryker and Burke (2000) rather than as a single entity. As eloquently noted by Strachan et al. (2005), the two-factor structure denotes the salience with which the role of being an exerciser has been assimilated into one’s identity (i.e., role identity) accompanied by relevant beliefs about exercise (i.e., exercise beliefs). Findings using structural equation modeling procedures suggested that increased endorsement of role identity and exercise beliefs were linked to more frequent exercise behaviour among university students (Wilson & Muon, 2008). More recently, Vlachopoulos, Kaperoni, and Moustaka (2011) confirmed that the two-factor structure provided the best model fit to assess exercise identity.

Berry, Strachan, and Verkooijen (2014) examined the predictive ability of exercise-related schemas and exercise identity for exercise-related cognitions and behaviour. Given the suggestion that individuals are motivated to behave in a manner consistent with the meaning associated with an identity (Burke & Stets, 2009), Berry and colleagues hypothesized that exerciser schematics would have higher role identity and exercise beliefs, where as non-exerciser schematics would be lower on these constructs. Findings revealed that more frequent exercisers reported higher role identity and exercise beliefs than non-exercisers. While differences between activity level and identity have been reported, further exploration is warranted in an effort to track the changes of one's identity in relationship to changes in their fitness and exercise behaviour.

Given evidence that identity contributes to various health behaviours including exercise and the shortage of research in this domain, one purpose of the present research was to further examine the role of exercise identity within an exercise context. Manuscript 1 explored the influence of exercise imagery on ones' reported exercise identity and the subsequent changes to identity over the course of a structured exercise program.

Exercise self-efficacy

Self-efficacy theory as proposed by Bandura (1986; 1997) is comprised of expectations about outcomes (i.e., outcome expectations) and one's confidence in performing a given behaviour (i.e., self-efficacy). It is suggested that both outcome expectations and self-efficacy contribute to behaviour change and subsequent maintenance of that behaviour (Bandura, 1986). Not surprisingly, self-efficacy theory has been consistently used in the examination of exercise behaviour to help further understand the link to adoption and maintenance of a healthy lifestyle (Keller, Fluery, Gregor-Holt, & Thompson, 1999).

Self-efficacy is conceptualized as one's perceived capability to engage in a specific behaviour and is reflective not of the skills one possesses, but what one can do with such skills (Bandura, 1977). As noted by Bandura (1986), self-efficacy is a context-specific evaluation of the capabilities one has, is multidimensional in evaluation, and is largely influenced by four key sources. As summarized by Samson and Solmon (2011), the contributors to self-efficacy include past performance or mastery experience. For example, an individual successful at completing a dead-lift will have a greater efficacy to engage in the same behaviour than an individual with an unsuccessful experience. A second source of self-efficacy is vicarious experience or modeling. For example, by watching a like-other successfully complete an exercise test will contribute to one's self-efficacy for the same test. Moreover, self-efficacy is influenced by social persuasion, where feedback pertaining to a specific task may promote or decrease ones efficacy to try the behaviour. Finally, physiological and affective states will further influence one's self-efficacy. Not surprisingly, there is an abundance of support in the literature for the impact of self-efficacy on exercise behaviour (McAuley, Bane, & Mihalko, 1995; Rodgers & Gauvin, 1998; Rodgers et al., 2002; Strachan et al., 2005).

Given that self-efficacy is a context-specific construct and not a global trait (Bandura, 1986), it is important to establish specific mechanisms which contribute to exercise behaviour. Not surprisingly, a lack of mastery experience among adults engaging in an acute exercise task results in lower self-reported self-efficacy scores (Focht, Knapp, Gavin, Raedeke, & Hickner, 2007). Thus, continued participation in exercise should enhance one's level of mastery experience, thereby enhancing their self-efficacy. Manipulation of interpretative responses to these experiences, such that one sees exercise as enhancing enjoyment or understands that muscle soreness is a positive response to an exercise bout, may further contribute to enhancement of self-efficacy beliefs and indirectly exercise behaviour. The role of outcome expectations may also help explain why some individuals engage in exercise programs, while others avoid or drop out regardless of their self-efficacy.

As evident in the theory proposed by Bandura (1986) there is a relationship between self-efficacy, outcome expectation, and behaviour. Outcome expectancy is described as the probability that a certain action will lead to a certain outcome (Bandura, 1977). More specifically, outcome expectancies are comprised of two factors: one's perception of the likelihood an outcome will result given a particular behaviour (i.e., outcome likelihood), as well as the subjective value or perceived importance of that expected outcome (i.e., outcome value) (Kirsch, 1995; Rodgers & Brawley, 1991). Research has indicated the possible independent influence of outcome expectations on behaviour apart from self-efficacy (e.g., Rodgers & Brawley, 1991) while in other instances no influential differences were observed by each variable (Rovniak, Anderson, Winett, & Stephen, 2002). Moreover, preliminary evidence has found that outcome expectations may exert various levels of influence on one's exercise intentions and behaviour at different stages in an exercise program (e.g., Gao, Xiang, Lee, & Harrison, 2008; Rodgers & Brawley, 1996). A recent review conducted by Williams and colleagues highlights the applicability of outcome expectations and diversity within various theories (Williams, Anderson, & Winett, 2005). The authors noted that there is limited research exploring the relationship and contribution of self-efficacy and outcome expectations on exercise behaviour. Of the existing evidence, there appears to be diversity in the noted relationships as a result of the demographics among the sample being investigated. Interestingly, the authors suggested that interventions targeting physical activity behaviour should shift from educating individuals on the “naturally occurring outcomes of exercise to creating environments that produce incentives for, or reduce barriers to, physical activity” (p. 73; Williams et al., 2005).

As such, one aim of the present research was to further investigate the relationships among self-efficacy, outcome expectations, and exercise. Manuscript 2 explored the changes in self-efficacy and outcome expectations over the course of a structured exercise program among a sample of novice exercisers. The findings aimed to support the emerging evidence suggesting that outcome expectations have an individual contribution on one’s intention for exercise behaviour, and those expectations change over time as a result of engagement in exercise.

Overview of present research

The overall purpose of this dissertation was to explore the relationships among and within cognitive variables associated with exercise initiation and maintenance in a sample of female exercise initiates. The dissertation is divided into two manuscripts, labeled Manuscript 1 and Manuscript 2. Manuscript 1 was structured to explore the utility of exercise imagery in enhancing the exercise-related cognition of identity, while Manuscript 2 aimed to explore the changes in an exercisers’ self-efficacy and outcome expectations as a result of her engagement in a longitudinal exercise program. The material is presented in alignment with the integrated-article format permitted by the School of Graduate and Post-doctoral Studies at Western University. Given each manuscript measured a separate research question and will be individually submitted to an academic journal, some overlap between the general introduction and each manuscript introduction is evident.

References

Anderson, D. F., & Cychosz, C. M. (1994).Development of an exercise identity scale. *Perceptual and Motor Skills*, *78*(3), 747-751. doi: http://dx.doi.org/10.2466/pms.1994.78.3.747

Anderson, D. F., Cychosz, C. M., & Franke, W. D. (1998). Association of exercise identity with measures of exercise commitment and physiological indicators of fitness in a law enforcement cohort. *Journal of Sport Behaviour*, *21*, 233-241.

Bandura, A. (1977). Self-efficacy: Toward a unifying theory of behavioral change. *Psychological Review*, *84*, 191-215.

Bandura, A. (1986). *Social foundations of thought and action.* Eaglewood Cliffs, NJ: Prentice-Hall, Inc.

Bandura, A. (1997). *Self-efficacy: The exercise of control.* New York, NY: W.H. Freeman and Company.

Berry, T. R., Strachan, S. M., & Verkooijen, K. T. (2014).The relationship between exercise schema and identity. *International Journal of Sport and Exercise Psychology*, *12*(1), 49-63. doi: http://dx.doi.org/10.1080/1612197X.2013.775742

Burke, P. J., & Stets, J. E. (2009). *Identity theory*. New York, NY: Oxford University Press.

Canadian Fitness and Lifestyle and Research Institute (2005).*Physical Activity Levels across Canada*. Retrieved from http://www.cflri.ca/eng/levels/index.php

Canadian Health Measures Survey (2011). *Physical Activity of Youth and Adults*. Retrieved from http://www.statcan.gc.ca/dailyquotidien/110119/dq110119b-eng.htm

Cameron, C., Craig, C. L., & Paolin, S. (2005). *Local opportunities for physical activity and sport: Trends from 1999-2004*. Ottawa, ON: Canadian Fitness & Lifestyle Research Institute.

Cardinal, B. J., & Cardinal, M. K. (1997). Changes in exercise behavior and exercise identity associated with a 14-week aerobic exercise class. *Journal of Sport Behavior, 20*(4), 377-386.

Colley, R. C., Garriguet, D., Janssen, I., Craig, C. L., Clarke, J., & Tremblay, M. S. (2011). *Physical activity of Canadian adults: Accelerometer results from the 2007 to 2009 CHMS* (Statistics Canada, Catalogue no. 82-003-XPE). Retrieved from http://www.statcan.gc.ca/pub/82-003-x/2011001/article/11396-eng.htm

Duncan, L. R., Hall, C. R., Wilson, P. M., & Rodgers, W. M. (2012).The use of a mental imagery intervention to enhance integrated regulation for exercise among women commencing an exercise program. *Motivation and Emotion*, *36*(4), 452-464. doi: http://dx.doi.org/10.1007/s11031-011-9271-4

Duncan, L. R., Rodgers, W. M., Hall, C. R., & Wilson, P. M. (2011).Using imagery to enhance three types of exercise self-efficacy among sedentary women.*Applied Psychology: Health and Well-Being*, *3*(1), 107-126.

Focht, B. C., Knapp, D. J., Gavin, T. P., Raedeke, T. D., & Hickner, R. C. (2007). Affective and self-efficacy responses to acute aerobic exercise in sedentary older and younger adults. *Journal of Aging and Physical Activity, 15*, 123-138.

Gammage, K. L., Hall, C. R., & Martin Ginis, K. A. (2004). Self-presentation in exercise contexts: Differences between high and low frequency exercisers. *Journal of Applied Social Psychology, 34*, 1638-1651. doi: http://dx.doi.org/10.1111/j.1559-1816.2004.tb02791.x

Gao, Z., Xiang, P., Lee, A. M., & Harrison, L., Jr. (2008). Self-efficacy and outcome expectancy in beginning weight training class: Their relations to students' behavioral intention and actual behaviour. *Research Quarterly for Exercise and Sport, 79*(1), 92-100.doi: http://dx.doi.org/10.5641/193250308X13086753543059

Gauvin, L., & Spence, J. C. (1996). Physical activity and psychological well-being: Knowledge base, current issues, and caveats. *Nutrition Reviews*, *54*(4), S53-S65.

Giacobbi, P. R., Jr., Hausenblas, H. A., Fallon, E. A., & Hall, C.R. (2003). Even more about exercise imagery: A grounded theory of exercise imagery. *Journal of Applied Sport Psychology, 15,* 160-175. doi: http://dx.doi.org/10.1080/10413200305391

Giacobbi, P. R., Jr., Hausenblas, H. A., & Penfield, R. D. (2005). Further refinements in the measurement of exercise imagery: The exercise imagery inventory. *Measurement in Physical Education and Exercise Science, 9,* 251-266.

Hall, C. R. (1995). The motivational function of mental imagery for participation in sport and exercise. In J. Annett, B. Cripps, & H. Steinberg (Eds.), *Exercise addiction: Motivation for participation in sport and exercise* (pp. 15-21). Leicester, England: British Psychological Society.

Hall, C. R. (2001). Imagery in sport and exercise. In R. N. Singer, H. A. Hausenblas, & C. M. Janelle (Eds.), *Handbook of sport psychology* (2nd ed., pp.529-549). New York, NY: John Wiley & Sons.

Hall, C. R., Rodgers, W. M., Wilson, P. M., & Norman, P. (2010).Imagery use and self-determined motivations in a community sample of exercisers and non-exercisers. *Journal of Applied Social Psychology, 40*, 135–152. doi: 10.1111/j.1559-1816.2009.00566.x

Hausenblas, H. A., Hall, C. R., Rodgers, W. M., & Munroe, K. J. (1999). Exercise imagery: Its nature and measurement. *Journal of Applied Sport Psychology*, *11*, 171-180.doi: http://dx.doi.org/10.1080/10413209908404198

Katzmarzyk, P.T., & Janssen, I. (2004). The economic costs associated with physical inactivity and obesity in Canada: An update. *Canadian Journal of Applied Physiology*,*29*(1), 90-115.doi: http://dx.doi.org/10.1139/h04-008

Keller, C., Fleury, J., Gregor-Holt, N., & Thompson, T. (1999). Predictive ability of social cognitive theory in exercise research: An integrated literature review. *The Online Journal of Knowledge Synthesis for Nursing*,*6*(1), 19-31.

Kim, B. H., & Giacobbi, P. R., Jr. (2009).The use of exercise-related mental imagery by middle-aged adults. *Journal of Imagery Research in Sport and Physical Activity, 4,* 1-38.doi: http://dx.doi.org/10.2202/1932-0191.1031

Kirsch, I. (1995). Self-efficacy and outcome expectancies: A concluding commentary. In J. E. Maddux (Ed.), *Self-efficacy, adaptation, and adjustment*: *Theory research and application* (pp. 331-345). New York, NY: Plenum.

Leary, M. R. & Tangney, J. P. (Eds.).(2003). *Handbook of self and identity*.New York, NY: Guilford Press.

Leventhal, H., Brissette, I., & Leventhal, E. A. (2003).The common-sense model of self-regulation of health and illness. In L. Cameron & H. Leventhal (Eds.), *The self-regulation of health and illness behaviour* (pp. 42-65). New York, NY: Routledge.

Martin, S. B., Morrow, J. R., Jackson, A. W., & Dunn, A. L. (2000). Variables related to meeting the CDC/ACSM physical activity guidelines. *Medicine and Science in Sports and Exercise*, *32*(12), 2087-2092.doi: http://dx.doi.org/10.1097/00005768-200012000-00019

McAuley, E., Bane, S. M., & Mihalko, S. L. (1995). Exercise in middle-aged adults: Self-efficacy and self-presentational outcomes. *Preventive Medicine*, *24*(4), 319-328. doi: http://dx.doi.org/10.1006/pmed.1995.1053

McAuley, E., Courneya, K. S., Rudolph, D. L., & Lox, C. L. (1994).Enhancing exercise adherence in middle-aged males and females. *Preventive Medicine*, *23*(4), 498-506.doi: http://dx.doi.org/10.1006/pmed.1994.1068

O'Dougherty, M., Kurzer, M. S., & Schmitz, K. H. (2010).Shifting motivations: Young women's reflections on physical activity over time and across contexts. *Health Education & Behavior*, *37*(4), 547-567.doi: http://dx.doi.org/10.1177/1090198110361316

Penedo, F. J., & Dahn, J. R. (2005). Exercise and well-being: A review of mental and physical health benefits associated with physical activity. *Current Opinion in Psychiatry*, *18*(2), 189-193. doi: http://dx.doi.org/10.1097/00001504-200503000-00013

Reiner, M., Niermann, C., Jekauc, D., & Woll, A. (2013). Long-term health benefits of physical activity: A systematic review of longitudinal studies. *BMC Public Health*, *13*(1), 813-822.doi: http://dx.doi.org/10.1186/1471-2458-13-813

Rodgers, W. M., & Brawley, L. R. (1991).The role of outcome expectancies in participation motivation. *Journal of Sport and Exercise Psychology*, *13*(41), 411-427.

Rodgers, W. M., & Brawley, L. R. (1996).The influence of outcome expectancy and self-efficacy on the behavioral intentions of novice exercisers. *Journal of Applied Social Psychology*, *26*(7), 618-634.doi: http://dx.doi.org/10.1111/j.1559-1816.1996.tb02734.x

Rodgers, W. M., & Gauvin, L. (1998).Heterogeneity of incentives for physical activity and self-efficacy in highly active and moderately active women exercisers. *Journal of Applied Social Psychology*, *28*, 1016-1029. doi: http://dx.doi.org/10.1111/j.1559-1816.1998.tb01665.x

Rodgers, W. M., Hall, C. R., Blanchard, C. M., McAuley, E., & Munroe, K. J. (2002). Task and scheduling self-efficacy as predictors of exercise behavior. *Psychology and Health*, *17*(4), 405-416.doi: http://dx.doi.org/10.1080/0887044022000004902

Rovniak, L. S., Anderson, E. S., Winett, R. A., & Stephen, R .S. (2002). Social cognitive determinants of physical activity in young adults: A prospective structural equation analysis. *Annals of Behavioral Medicine, 24*, 149–156. doi: http://dx.doi.org/10.1207/S15324796ABM2402_12

Sallis, J. F., Calfas, K. J., Alcaraz, J. E., Gehrman, C., & Johnson, M. F. (1999). Potential mediators of change in a physical activity promotion course for university students: Project GRAD. *Annals of Behavioral Medicine*, *21*(2), 149-158.doi: http://dx.doi.org/10.1007/BF02908296

Samson, A., & Solmon, M. (2011).Examining the sources of self-efficacy for physical activity within the sport and exercise domains. *International Review of Sport and Exercise Psychology, 4(1)*, 70-89. doi: 10.1080/1750984X.2011.564643

Shields, M., Tremblay, M. S., Laviolette, M., Craig, C. L., Janssen, I., & Connor Gorber, S. (2010). *Fitness of Canadian adults: Results from the 2007-2009 Canadian Health Measures Survey*. (Statistics Canada.Catalogue no. 82-003-XPE).Retrieved from: http://www.statcan.gc.ca/pub/82-003-x/2010001/article/11064-eng.htm

Speck, B. J., & Harrell, J. S. (2003).Maintaining regular physical activity in women: Evidence to date. *Journal of Cardiovascular Nursing*, *18*(4), 282-291.doi: http://dx.doi.org/10.1097/00005082-200309000-00007

Stets, J. E., & Burke, P. J. (2003).A sociological approach to self and identity. In M. R. Leary & J. P. Tangney (Eds.), *Handbook of self and identity* (pp. 128-152). New York, NY: Guilford Press.

Strachan, S. M., & Brawley, L. R. (2008). Reactions to a perceived challenge to identity: A focus on exercise and healthy eating. *Journal of Health Psychology*, *13*(5), 575-588. doi: http://dx.doi.org/10.1177/1359105308090930

Strachan, S. M., Brawley, L. R., Spink, K. S., & Jung, M. E. (2009).Strength of exercise identity and identity-exercise consistency affective and social cognitive relationships. *Journal of Health Psychology*, *14*(8), 1196-1206. doi: http://dx.doi.org/10.1177/1359105309346340

Strachan, S. M., Woodgate, J., Brawley, L. R., & Tse, A. (2005).The relationship of self-efficacy and self-identity to long-term maintenance of vigorous physical activity. *Journal of Applied Biobehavioral Research*, *10*(2), 98-112.

Stryker, S., & Burke, P. J. (2000).The past, present, and future of an identity theory.*Social Psychology Quarterly*, *63*, 284-297.doi: http://dx.doi.org/10.2307/2695840

Tjepkema, M. (2006). *Adult obesity*. (Statistics Canada, Catalogue 82-003). Retrieved from: http://publications.gc.ca/site/archivee-archived.html?url=http://publications.gc.ca/Collection-R/Statcan/82-003-XIE/82-003-XIE2005003.pdf#page=11

Vlachopoulos, S. P., Kaperoni, M., & Moustaka, F. C. (2011).The relationship of self-determination theory variables to exercise identity. *Psychology of Sport and Exercise*, *12*(3), 265-272.doi: http://dx.doi.org/10.1016/j.psychsport.2010.11.006

Warburton, D. E., Nicol, C. W., & Bredin, S. S. (2006). Health benefits of physical activity: The evidence. *Canadian Medical Association Journal*, *174*(6), 801-809.doi: http://dx.doi.org/10.1503/cmaj.051351

Wesch, N. N., Milne, M. I., Burke, S. M., & Hall, C. R. (2006). Self-efficacy and imagery use in older adult exercisers. *European Journal of Sport Sciences, 6*(4), 197-203.doi: http://dx.doi.org/10.1080/17461390601012512

Williams, D. M., Anderson, E. S., & Winett, R. A. (2005). A review of the outcome expectancy construct in physical activity research. *Annals of Behavioral Medicine*, *29*(1), 70-79.doi: http://dx.doi.org/10.1207/s15324796abm2901_10

Wilson, P. M., & Muon, S. (2008). Psychometric properties of the exercise identity scale in a university sample. *International Journal of Sport and Exercise Psychology*, *6*(2), 115-131. doi: http://dx.doi.org/10.1080/1612197X.2008.9671857

MANUSCRIPT 1

AN EXAMINATION OF CHANGES IN EXERCISE IDENTITY DURING A MENTAL IMAGERY INTERVENTION FOR FEMALE EXERCISE INITIATES

Not surprisingly, a vast amount of research has demonstrated the need for Canadians to increase their levels of daily physical activity. Exercising regularly can lead to an abundance of physical and psychological health benefits, and has been linked to the prevention of cardio-vascular disease, type-2 diabetes, cancer, hypertension, obesity, osteoporosis, and depression (Warburton, Nicol, & Bredin, 2006). As put forth by the Canadian Society for Exercise Physiology (CSEP, 2003), adults between the ages of 18 and 64 years should engage in at least 150 minutes of moderate to vigorous intensity aerobic activity per week (in bouts of 10 minutes or more). However, it appears that the majority of Canadian adults are sedentary during their waking hours, as noted by recent accelerometer data that captured men being sedentary for 68% of their day (excluding sleep hours), and women being sedentary for 69% of their day (Colley, Garriguet, Janssen, Craig, Clarke, & Tremblay, 2011). It has been observed that men are more likely to be moderately active than women, suggesting that women are at greater risk for negative outcomes associated with inactivity (Colley et al., 2011; Warburton, Katzmarzyk, Rhodes, & Shepard, 2007). Moreover, it appears that approximately 30-50% of women who adopt exercise (moderate or vigorous) drop out within the first 12 months (Sallis, Haskell, Fortmann, Vranizan, Taylor, & Solomon, 1986). Not surprisingly, this lack of physical activity has contributed to increased mean values for body mass index (BMI), waist circumference, and skin-fold measurements (Statistics Canada, 2011), all of which are common indicators of health risk. Moreover, Hu and colleagues have noted that excess weight (i.e., a BMI greater than 25) combined with physical inactivity, was associated with a higher risk of premature death, cardiovascular disease and cancers, among women (Hu, Willett, Li, Stampfer, Colditz, & Manson, 2014). Given the low rate of exercise participation among overweight women, and the need to establish patterns of physical activity that can be sustained over the long term (Kuntzleman & Reiff, 1992), further examination of the social and cognitive variables which contribute to initiating exercise and sustaining the behaviour among this population is warranted.

One factor that contributes to both the social and cognitive aspects of health behaviour is the *self (*Contrada & Ashmore, 1999), a component outlined in identity theory (Stets & Burke, 2003). According to Stets and Burke (2003), the self is organized into multiple identities which are reflected in the context of a particular role. More specifically, the self is a psychological mechanism which permits self-reflection (Leary & Tangney, 2003) in various contexts including self-regulation of health (Leventhal, Brissette, & Leventhal, 2003). Likewise, Stryker and Burke (2000) refer to identity as the parts and meanings that are attached to the multiple roles they typically play in societies. For example, a middle-aged woman may identify with familial roles such as a sister, mother, wife; career roles such as a teacher or manager; and other social roles such as an exerciser, coach, or volunteer. It is suggested that identities within the self are organized into a hierarchy of salience, such that identities in higher order would be reflected into greater behavioural expressions in accordance with the associated identity. As such, a woman who highly values her identity as a mother and as a volunteer might devote significant time to behaviours that allow her to fulfil these roles, and less time to behaviours associated with being an exerciser or a teacher.

According to Burke (1980) and further supported by Burke and Reitzes (1981), identities are self-meanings and these meanings develop in the context of roles. Identities, however, predict behaviour only when the meaning of the identity corresponds to the meaning of the behaviour. For example, a woman who identifies as a volunteer will engage in activities such as community events or fundraising for her organization to further support her identity as a volunteer. Evidently, individuals are motivated to reaffirm their identities by engaging in identity-congruent behaviours (Stets & Burke, 2003). More simply, identities are suggested to encourage identity-congruent behaviour by providing individually relevant behavioural standards (Burke & Harrod, 2005). Lastly, it is important to note that Ryan and Deci (2003) have suggested that the acquisition and maintenance of identity is a dynamic process. As such, given that behavioural expression tends to map onto an individual's identity, and one's identity may change over time, an examination of the construct of identity over time may aid in the understanding of individual behaviours.

Evidence of identity-congruent behaviour has been investigated in a variety of health contexts, including exercise. In a cross-sectional study, undergraduate students were asked to self-report on their exercise identity, identity meaning, past exercise behaviour, identity-behaviour consistency, affective reactions to consistency, and self-efficacy (Strachan, Brawley, Spink, & Jung, 2009). Strachan and colleagues found that a strong exercise identity was associated with more frequent exercise and perceptions of identity confirmation through exercise behaviour. In addition, perceptions of identity-behaviour consistency were positively related to positive affect and negatively related to negative affect (Strachan et al., 2009). Self-identity has also been acknowledged as a significant predictor of running frequency in conjunction with scheduling self-efficacy (Strachan, Woodgate, Brawley, & Tse, 2005) among a sample of participants in active running groups. Given these relationships, it is not surprising that researchers have highlighted exercise-identity strength as a useful means to understand exercise adherence (e.g., Anderson, Cychosz, & Franke, 1998; Strachan & Brawley, 2008).

The relationship between physical activity behaviour and physical activity identity has also been assessed among older adults (M_{age} = 79.5 years) (Strachan, Brawley, Spink, & Glazebrook, 2010).The physical activity identity of older adults, as indicated by a modified version of the Exercise Identity Scale (Anderson & Cychosz, 1994), and self-regulatory efficacy beliefs both contributed to the prediction of how much they intended to engage in physical activity behaviour. The researchers suggested that although physical activity identities may attain different meanings across the lifespan, the implication of these identities at certain stages may have influence on one's behaviour (Strachan et al., 2010). More recently, Berry, Strachan, and Verkooijen (2014) examined the predictive ability of exercise-related schemas and exercise identity for exercise-related cognitions and behaviour. Given the suggestion that individuals are motivated to behave in a manner consistent with the meaning associated with an identity (Burke & Stets, 2009), Berry and colleagues hypothesized that exerciser schematics would have higher role identity and exercise beliefs, where as non-exerciser schematics would be lower on these constructs. Using an undergraduate psychology participant pool, the authors found that regular exercisers reported higher role identity (M = 5.35) and exercise beliefs (M = 5.40) than non-exercisers on role identity (M = 2.00) and exercise beliefs (M = 3.71), respectively (measured on a 7-point Likert scale; Berry et al., 2014). While differences between activity level and identity have been reported, further exploration is warranted in an effort to track the changes of one's identity in relationship to changes in their fitness and exercise behaviour.

Despite these highlighted trends, much of the existing literature has only employed a correlational design to assess the relationship between identity and exercise behaviour.

Moreover, the samples used in previous studies are consistently comprised of current exercisers or undergraduate students (e.g., Strachan, Fortier, Perras, & Lugg, 2013; Verkooijen & de Bruijn, 2013; Vlachopoulos, Kaperoni, & Moustaka, 2011). As previously noted, the acquisition and maintenance of identity is a dynamic process (Ryan & Deci, 2003), and when coupled with the limited diversity of individuals currently examined, it may be of value to examine the changes to exercise identity in a different population, such as adult female exercise initiates - a group who are especially prone to dropping out of an exercise program.

Preliminary evidence has emerged on the benefits for examining changes in exercise identity over time among different populations. Cardinal and Cardinal (1997) explored the changes to the identity of female exercisers (M_{age} = 27.3 years) over a 14-week span using a prospective research design. Two pre-existing groups were compared (i.e., a class of exercisers versus a non-exercising control group) to determine the changes to exercise identity using the Exercise Identity Scale (one factor model; Anderson & Cychosz, 1994). Not surprisingly, the results showed an increase in exercise identity and exercise behaviour for the exercise class participants, whereas no change in exercise identity was observed for the control group. Although the authors demonstrated that exercise identity changed during engagement in an exercise program, they did not assess the potential mechanisms that spawned this change. It has been previously noted that an increase in exercise involvement alone may not account for the observed changes in identity (Markus, 1977; Markus & Kunda, 1986). As such, Cardinal and Cardinal (1997) suggested that future research should aim to manipulate the exercise identity construct. If an effective manipulation tool is established, an increase in exercise identity would likely contribute to increased engagement in exercise behaviour and subsequently influence the current health status of adults. One tool that can be explored as a means to manipulate exercise identity is exercise imagery.

Hausenblas, Hall, Rodgers, and Munroe (1999) originally described exercise imagery as:

> … mentally seeing yourself exercising. The image in your mind should approximate the actual physical activity as closely as possible. Imagery may include sensations like hearing the aerobic music and feeling yourself move through the exercises. Imagery can also be associated with emotions (e.g., getting psyched up or energized), staying focused (e.g., concentrating on aerobic class and not being distracted), setting exercise plans/goals (e.g., imaging achieving the goal of losing weight), etc. (p. 173).

Results from previous research have noted the beneficial application of employing exercise imagery. High-frequency exercisers report a stronger ability to generate desired images (e.g., being in shape, staying healthy, and fit) and consequently placed greater importance on maintaining such images than low-frequency exercisers (Gammage, Hall, & Martin Ginis, 2004). Furthermore, exercise imagery has been linked to greater exercise intentions (Rodgers, Hall, Blanchard, McAuley, & Munroe, 2002), positive changes to exercise self-efficacy (Duncan, Rodgers, Hall, & Wilson, 2011; Wesch, Milne, Burke, & Hall, 2006), and more autonomous motivational regulations (Hall, Rodgers, Wilson, & Norman, 2010). Given that a primary component of exercise imagery involves seeing oneself exercising, the use of this skill may promote the development of one's exercise identity (and subsequent behaviour engagement). As purported by Stryker (1980), identities may be more important or salient to some individuals as compared to others, and this identity salience may increase the probability for a particular behaviour. If individuals are guided to picture themselves exercising (i.e., exercise imagery), they may be more likely to see themselves as an exerciser (i.e., exercise identity) and thus more readily engage in exercise to maintain their identity-congruent behaviour.

Given that the breadth of previous research has examined healthy young adults (Strachan & Brawley, 2008; Strachan et al., 2009; Strachan, Flora, Brawley, & Spink, 2011), more experimental studies are needed to extend the literature of psychological interventions targeting exercise identity. We suggest there is a need to explore the ability of exercise imagery to enhance the salience of one's exercise identity in a sample of female exercise initiates. Given the lack of exercise behaviour among women and the noted link between exercise imagery and other exercise-related cognitions, our results may highlight a mechanism to increase exercise identity, which in turn should be reflected in changes to exercise behaviour and fitness level. Physical fitness serves as an effective and objective proxy for the measurement of exercise behaviour (Warburton et al., 2006). Whereas self-reports of behaviour may be subject to social desirability bias, physical fitness can only change as a function of actual engagement in exercise. Thus, both self-reported exercise behaviour and physical fitness were used as outcomes in the present study. As such, the purpose of the current study was to examine the impact of an exercise imagery intervention (vs. an attention control) on exercise identity of female initiates during their involvement in a structured 8 week exercise program (with two follow-up assessments). It was hypothesized that participants allocated to the exercise imagery condition would report a greater increase in their reported exercise identity, and thus their exercise behaviour and subsequently, their level of fitness would be greater than the control condition.

Methods

Participants

Healthy female adults (*N* = 145), between the ages of 22 and 52 years (M_{age} = 35.2, *SD* = 9.5), were recruited from a mid-sized Canadian city. Participants were eligible if they were a non-exerciser (i.e., engaged in less than one bout of exercise per week over the last six months) and had a self-reported body mass index (BMI) score greater than 25 (i.e., above normal weight). The mean BMI score for participants was 30.8 (*SD* = 4.4) with females representing both overweight (BMI of 25.0-29.9; *n* = 79) and obese (BMI of 30.0 and above; *n* = 66) classifications (World Health Organization, 2000). The most common racial identities reported by participants included, Caucasian (67%), Black (5%), East Indian (3%), and Asian (2%). Females reported being single (39%) or married (42%) most frequently, with over half (56%) reporting no children.

Measures

Demographics. Participant demographic information can be found in Table 1. At the initial assessment, participants reported their age, ethnicity, annual income, education, marital status, occupation, and number of children. Physiological data including height, weight, resting heart rate, body mass index, and cardiovascular fitness were measured by trained researchers at baseline, week 9, and both follow-up assessments (see Figure 1).

Exercise identity. Participants completed the Exercise Identity Scale (EIS; Anderson & Cychosz, 1994), a 9-item measure which assesses the extent to which individuals identify with being an exerciser. Each item is measured using a 7-point Likert scale ranging from 1 (*strongly disagree*) to 7 (*strongly agree*) with higher scores reflecting a stronger identity with exercise. In accordance with findings from Wilson and Muon (2008) and Vlachopoulos et al. (2011), the EIS was analyzed using two factors – role identity (i.e., the extent to which exercise has been incorporated into one's identity) and exercise beliefs (i.e., concern with relevant beliefs about exercise). Sample items include, "I consider myself an exerciser" (role identity; $k = 3$) and "I need exercise to feel good about myself" (exercise beliefs; $k = 6$). Cronbach's alpha coefficients in the present study were acceptable at .90 for role identity and .85 for exercise beliefs (Cronbach, 1951).

Exercise behaviour. Exercise behaviour was measured using self-reported logs. Participants recorded their intended exercise session (which aligned to the minimum prescribed frequency) and evaluated that intention the following week to reflect their actual behaviour. These data were obtained from week 1 to week 7 during each participant's visit to the exercise facility. Participants also completed the Leisure Time Exercise Questionnaire (LTEQ; Godin, Jobin, & Bouillon, 1986; Godin & Shepard, 1985) at their week 36 assessment to report the frequency, intensity, and duration of their exercise activity over the previous week. In line with recent recommendations from Godin (2011), the physical activity score was calculated using only moderate and vigorous types of activity (a score greater than 24 suggests substantial health benefits; Godin, 2011).

Fitness level. Participants completed a sub-maximal fitness test at each assessment point (baseline, week 9, 18, and 36) which predicted their aerobic physical fitness (Bruce, 1971). The sub-maximal fitness assessment (predicted $V0_2$) was utilized in the data analysis.

Procedure

Recruitment. After obtaining ethical approval from a university's research ethics board, participants were recruited from a mid-sized Canadian community. Various methods (posters, word of mouth, emails, and newspaper advertisements) were used to recruit interested women to participate in a cardiovascular exercise program. The recruitment materials outlined that participants would engage in exercise four times per week, be assessed on various psychological and physiological responses to exercise, and be provided with an individualized structured program. Potential participants were screened by researchers via telephone or email to ensure they met the eligibility criteria (age, approximate body mass index, current level of activity) before progressing to the next stage of enrolment (refer to Figure 2 for a procedural flow diagram).

Information session. Eligible participants were invited to attend a group information session to obtain additional information about the exercise program. The session provided details on the structured exercise program, location of facility amenities and hours of operation, and provided participants with an opportunity to ask questions about the research study protocol. The researchers outlined that participants would complete multiple assessments (questionnaires and physiological evaluations) throughout the study, and were reassured on the confidentiality of information obtained throughout the study. Participants were further informed they would listen to a brief audio recording (3-5 min) at the beginning of each new exercise week and be randomly assigned to one of the two treatment groups (differing only with regards to the information that was presented in the recording). Finally, potential participants reviewed the letter of information, provided written consent and completed the Physical Activity Readiness Questionnaire (PAR-Q; Thomas, Reading, & Shephard, 1992). Upon completion of the information session, interested participants scheduled a baseline assessment.

Baseline assessment. Upon arrival for the baseline assessment, participants provided contact information and completed various questionnaires including demographics and a baseline measurement of exercise identity (i.e., EIS; Anderson & Cychosz, 1994). Physiological characteristics including height, weight, and resting heart rate were measured and recorded. Each participant completed a sub-maximal aerobic fitness test (modified Bruce protocol; Bruce, 1971) conducted by a certified personal trainer (CSEP-CPT©) or a Masters-level researcher trained on the testing protocol, as outlined by the American College of Sports Medicine (ACSM, 2010). Prior to completion of the assessment, participants were provided with a tour of the exercise facility, oriented on the use of the heart rate monitor, and provided instruction on how to properly operate available exercise equipment (stair climber, treadmill, rowing machine, and stationary bike). Lastly, participants were provided a schedule of the facility hours, their participant identification number (to be used for confidentially on attendance forms), and confirmed their starting date with the researcher.

Randomization. Prior to arrival at the first exercise session, each participant was randomly assigned to one of two treatment conditions, exercise imagery or control group. Given the need to provide participants with the correct audio recording (each week), the researcher was not blinded to the treatment groups.

Exercise imagery condition.

Script creation. The intended purpose of the exercise imagery scripts was to evoke responses related to an individual's exercise identity. The process of developing the scripts included identifying key words or phrases utilized in exercise identity measurement tools, reviewing previous research (Cumming & Stanley, 2009; Duncan, Hall, Wilson, & Rodgers, 2012; Duncan et al., 2011) and drawing from identity theory literature. The resultant process led to the development of eight imagery scripts that could be broadly interpreted by all participants in the treatment group. The content of the scripts changed in line with the natural progression of the program to reflect the acquisition of exercise behaviours. For example, early in the program, the imagery scripts focused on orientation to the facility, normative responses to exercise engagement, and starting to imagine oneself as a possible exerciser. As the program progressed, the imagery scripts included more affirmative statements regarding their role as an exerciser, as well as highlighted their known reactions to exercise engagement and the facility.

Overall, the key messages of the scripts linked closely to the dimensions of role identity and exercise beliefs. For example, the following is an excerpt from one script participants listened to, “Remind yourself of how great you feel now that you have completed your exercise session” which aligns with the exercise belief item, “I need exercise to feel good about myself”. Additional examples include, “You notice that you don’t just feel like an exerciser when you are at the lab, you feel like an exerciser all the time”, “Other people in the lab see you as an exerciser too”, and “You look like a regular exerciser, you feel like a regular exerciser, you are a regular exerciser”.

In accordance with recommendations from previous literature, the exercise imagery scripts were brief, focused on positive images, and aimed to reflect the exercise environment as closely as possible (Bull, Albinson, & Shambrook, 1996; Hall, 2001; Holmes & Collins, 2001). Given the novelty of imagery scripts to this population, consideration was given to ensure the script mirrored the actual experiences of the exercise session as closely as possible. Ultimately, the length and specific content was developed to align with the individuals receiving the script and the location of the imagery environment (Williams, Cooley, Newell, Weibull, & Cumming, 2013). Specifically, the script included references to the physical layout of the facility, actual procedures of the facility, as well as acknowledged their novelty to exercising regularly. All scripts included components on preparing to exercise by wearing your proper attire, tying running shoes, warming up, progressing through the main workout, cooling down, and finishing the session. Moreover, the scripts were created to reflect the multidimensional sensory approach needed when engaging in imagery. As described by Hausenblas et al. (1999), imagery may include sensations like hearing the aerobic music and feeling yourself move through the exercises. Imagery can also be associated with emotions (e.g., getting psyched up or energized), staying focused (e.g., concentrating on the exercise task and not being distracted), and setting exercise plans and goals (e.g., imaging achieving the goal of losing weight), etc. (p. 173). As such, each imagery script progressed through an entire workout.

Script delivery. As suggested by Holmes and Collins (2001), various techniques can be employed to ensure the imagery script achieves its intended outcome. As such, participants completed their imagery session at the beginning of each week before commencing their workout while wearing their exercise attire. The protocol for administering the scripts mimicked similar designs (i.e., Duncan et al., 2012; Duncan et al., 2011) whereby participants met with the researcher in a quiet room and were reminded to imagine the described events as vividly as possible. Participants listed to the audio script (lasting between 3-5 minutes) using headphones in a private room.

Control condition. Participants in the attention control condition listened to an audio script (lasting between 3-5 minutes) which described health information with no reference to exercise identity. Topics of sessions discussed different benefits of regular exercise including reductions in stress and depression, improved bone health, or improved cardiovascular health. The health information sessions were delivered on the same weekly schedule as the imagery intervention. In line with the protocol for the exercise imagery group, participants in the control group used headphones to listen to recorded health information sessions in a private room.

Exercise program. Each participant was given an individualized, cardiovascular program to follow for eight weeks. The program included exercising four times per week, with durations ranging from 30 to 60 minutes. We used the results of the baseline sub-maximal fitness assessment and recorded resting heart rate to provide each participant with a specific target heart rate range to achieve during their exercise sessions (ranged from moderate to high intensity). The target heart rate range was adjusted every few weeks in the study to accommodate for acclimatization to increasing activity. More specifically, over the first four weeks, participants engaged in exercise intensities between 50 – 65 percent of their heart rate reserve (HRR; calculated using Karvonen formula; ACSM, 2010). The latter three weeks involved exercise intensities between 60 – 70 percent of their HRR. Participants were encouraged to stay within their prescribed heart rate range throughout the duration of their exercise session. However, they were permitted to lower the intensity if they perceived the prescribed heart rate range to be more reflective of a vigorous level than moderate.

In addition to intensity, the duration of each exercise session was increased each week. Specifically, participants commenced the program with a minimum duration of 30 minutes per session and gradually increased their duration to 45-60 minutes by the program completion (week 8). As noted on their individualized exercise prescription plan, each participant was required to begin their exercise session with a 2-5 minute warm-up period (light intensity; approaching their target heart rate zone) and complete their session with an active cool down (i.e., self-paced exercise) until their heart rate neared pre-exercise heart rate levels. Both the warm-up and cool down duration were included in the entire exercise session duration.

The final component of the structured portion of the exercise program (8 weeks) focused on exercise location. In weeks 1 and 2, three exercise sessions took place within the exercise research facility, and one session occurred in a preferred exercise location (e.g., at home, at their local community centre, or fitness facility) chosen by the participant. In weeks 3, 4, and 5, the participants exercised in the research facility for two sessions, with the remaining sessions (two) occurring in their preferred exercise location. In weeks 6, 7, and 8, the participants only exercised in the research facility once, with the remaining sessions (three) occurring in their preferred location. In an attempt to reflect natural environmental conditions, the exercise facility was available for use at various times throughout the week and participants engaged in sessions on a drop in basis (i.e., did not need to schedule a time with the researcher).

Results

Attrition

Over the duration of the intervention, 145 females completed a baseline assessment and were allocated to one of the two treatment conditions (exercise imagery, $n = 72$; control, $n = 73$). At the final follow up (week 36), only 78 participants remained ($n = 43$ for exercise imagery condition; $n = 35$ for control condition) (see Figure 2) representing 53% of the baseline sample. Previous longitudinal intervention research has noted similar attrition rates (Dishman, 1982; Duncan et al., 2012; Duncan et al., 2011).

A series of ANOVAs revealed no significant differences at baseline on BMI, $F(1, 143) = .008$, $p = .930$; role identity, $F(1, 143) = 1.65$, $p = .200$; and exercise beliefs, $F(1, 143) = .009$, $p = .926$, between participants who adhered to the intervention or dropped out. A significant difference was noted between these groups for age, $F(1, 143) = 7.49$, $p = .007$, with participants who dropped out representing a lower mean age (32.9 years old) versus those who remained in the intervention (37.1 years old). In order to accurately report on the findings of the exercise imagery condition, all remaining analyses were conducted using only the participants who completed the entire intervention (36 weeks) and corresponding assessment points.

Descriptive statistics

In accordance with recommendations from Tabachnick and Fidell (2013), all data were screened and cleaned prior to conducting further statistical analysis. Descriptive statistics on demographics and exercise behaviour are reported in Table 1. A chi-square analysis was conducted to examine the relationship between the treatment condition and attrition rates. The results revealed no significant differences between the two conditions on attrition rates, χ^2 (1, *n* = 145) = 1.6, *p* = .21, *phi* = -.12. Comparisons on age, BMI, fitness level, role identity, and exercise belief demonstrated that randomization was successful as no statistical differences were observed between conditions at baseline.

Bivariate correlations were computed between exercise identity variables, exercise behaviour (week 36 only), and predicted $V0_2$ max scores (reflective of aerobic physical fitness; Bruce, 1971) at baseline, week 9, week 18, and week 36 (Table 2). The analysis revealed significant correlations between constructs.

Main analysis

Exercise behaviour. Self-reported exercise frequency during the structured exercise program (measured seven times; see Figure 3) was examined using a 2 (Condition) × 7 (Time) repeated measures ANOVA. There was a significant main effect for time, $F(6,71) = 4.15$, $p = .001$, partial $\eta^2 = .260$, but no main effect for condition and no condition × time interaction. Significant effects for time were observed between week 1 and week 4 as participants behaviour increased over this period, as well as for week 7 when participants' behaviour declined and thus was different than their behaviour at weeks 2 – 4.

The two conditions (i.e., imagery and control) were also compared on self-reported activity scores at week 36 using a t-test. No significant difference was observed between the conditions.

Fitness level .Analysis of aerobic physical fitness (predicted $V0_2max$) was examined using a 2 (Condition) × 4 (Time) repeated measures ANOVA. The four times were baseline, week 9, week 18, and week 36. There was only a significant main effect of time, $F(4, 74) = 27.4$, $p = .000$, partial $\eta^2 = .527$, but no other effects (Figure 4).

Identity. Separate 2 (Condition) × 5 (Time) repeated measures ANOVAs were conducted for role identity and exercise beliefs. The five assessment times were baseline, week 5, week 9, week 18, and week 36. Data revealed significant main effects for both role identity, $F(4, 304) = 45.0$, $p = .000$, partial $\eta^2 = .372$, and exercise beliefs, $F(4, 304) = 23.5$, $p = .000$, partial $\eta^2 = .237$. More importantly, there was a significant condition × time interaction for role identity, $F(4, 304) = 2.93$, $p = .021$, partial $\eta^2 = .037$. Follow-up analyses revealed a significant difference at week 9, $F(1, 76) = 4.76$, $p = .032$, partial $\eta^2 = .059$, in favour of the exercise imagery group (Figure 5). A non-significant interaction effect, $F(4, 304) = .726$, $p = .58$, partial $\eta^2 = .009$, was observed for exercise beliefs (Figure 6).

Discussion

The purpose of the current study was to examine the impact of an exercise imagery intervention (vs. an attention control) on the reported exercise identity of female initiates during their involvement in an 8 week structured exercise program (with additional assessments occurring at week 18 and 36). It was hypothesized that participants allocated to the exercise imagery condition would report a greater increase in their exercise identity (both role identity and exercise beliefs), and thus their level of exercise behaviour and fitness would be greater than the control condition. Overall, the findings offer some support for our predictions; however, further discussion is warranted.

Although both conditions reported an increase in their identity during the 8 week structured program, a significant interaction effect was observed at week 9 for role identity. Specifically, females in the exercise imagery condition reported higher levels of the construct than their control counterparts. Thus, they more strongly agreed with statements such as, "I consider myself an exerciser" and "others see me as someone who exercises regularly". Given the suggestion that exercise engagement alone may not increase exercise identity (Markus, 1977; Markus & Kunda, 1986), it can be interpreted that exercise imagery contributed to the female exercisers greater role identity at week 9. Wilson and Muon (2008) reported that role identity is a stronger predictor of exercise than exercise beliefs. This claim appears to be supported in the present study given the stronger correlations between role identity and both fitness levels and exercise behaviour at each assessment compared to exercise beliefs. Berry et al. (2014) suggested that role identity should be low in non-exercisers as they have yet to integrate exercise into their identity, but should report similar exercise belief values to that of a regular exerciser. These authors found that regular exercisers reported higher role identity (M = 5.35, 5.63) and exercise beliefs (M = 5.40, 5.72) than non-exercisers on role identity (M =2.00, 2.60) and exercise beliefs (M= 3.71, 5.03), respectively. Interestingly, female exercisers in the current study reported role identity scores (M = 4.7 for exercise imagery at week 9) that approached those of regular exercisers from Berry et al. (2014), despite their initial mean score of 2.3 at baseline (similar to non-exercisers). As such, participants in the exercise imagery group appear comparable to regular exercisers in role identity after only 9 weeks of exercise participation and imagery training.

The influence of imagery on cognitive exercise variables has been previously explored. For example, Duncan et al. (2011) successfully manipulated distinct types of self-efficacy using imagery among female exercise initiates. Moreover, Cumming and Stanley (2009) found that imagery interventions can enhance positive-exercise induced feeling states among inactive participants. The results of these studies combined with the present findings indicate that imagery is a valuable technique for influencing exercise cognitions. Given the strength of endorsement of a particular identity is linked to engagement in behaviour that agrees with that identity (i.e., identity-consistent behaviour; Anderson, Cychosz, & Franke, 2001; Ryan & Deci, 2003), female initiates in the exercise imagery condition in the present study were provided with affirmation of their exercise identity on a weekly basis (via content of audio scripts). These imagery scripts facilitated the development of the participants' exercise identity over the 8 week structured portion of the intervention, however, this identity was challenged after the structure of the exercise program and imagery scripts were removed. This led to a reduction in the salience of their role identity, thus likely contributed to a reduction in their corresponding behaviour (as noted by the mean scores in fitness and self-reported exercise behaviour; i.e., identity-consistent behaviour relationship; Burke & Stets, 2009).

Regardless of treatment condition, participants showed a statistically significant increase in both identity constructs over the duration of the structured exercise program. These findings are in line with another longitudinal exercise identity study. Cardinal and Cardinal (1997) found females enrolled in an exercise class reported a significant increase in their exercise identity over the 7 week program but did not experience any further increase after the 7 week follow-up.

With respect to self-reported exercise behaviour during the structured program (8 weeks) and subsequent follow-up assessment (i.e., week 36), a significant main effect for time was observed. Specifically, both treatment conditions increased their exercise behaviour within the first four weeks of the structured program, but significantly declined in the latter part of the program. However, for the most part behaviour was consistent, as was expected. It appears that the highest levels of exercise behaviour were reported when participants were attending the exercise facility most frequently. As the schedule shifted from the research facility to the external locations, a decline in self-reported behaviour occurred. Given the associated link between exercise behaviour and fitness (Warburton et al., 2006), all participants increased their $V0_2$ level during the 8 week program but decreased in aerobic fitness once the structured exercise program within the exercise facility was completed. This reduction was similar for both conditions. Not surprisingly, previous research has noted reductions in individual fitness level and exercise behaviour after being removed from a controlled exercise program (Andersen, Wadden, Bartlett, Zemel, Verde, & Franckowiak, 1999; Dunn, Marcus, Kampert, Garcia, Kohl III, & Blair, 1999; Turner, Hayes, & Reul-Hirche, 2004). Given the recommendation that a successful behaviour change can be defined after six months of regular physical activity (Dunn et al., 1999; Pate et al., 1995), it is possible that participants did not have sufficient time to incorporate consistent exercise behaviour into their daily routines. Despite the transition built into the program between using the exercise facility and an external location (e.g., 3:1 in week 1 versus 1:3 in week 8), participants were unable to maintain their level of activity once the controlled environment was removed. It may have been more advantageous to provide accountable exercise sessions (e.g., continue to use the exercise facility) for a longer period of time to determine if behaviour and associated fitness levels could be sustained. Although it appears that exercise, like most health behaviours, can be episodic – individuals start, stop, and resume at different times in their lives (Stetson, Rahn, Dubbert, Wilner, & Mercury, 1997), training participants on how to problem-solve and overcome their barriers should be integrated into exercise intervention programs (McAuley & Courneya, 1993). Although the use of exercise imagery did not buffer the reduction in activity level (as measured by behaviour and fitness) for participants, it did contribute to one's exercise identity, which in time may more readily contribute to one's sustainment of exercise behaviour.

The present study is not without limitations. Reported role identity scores in the current study for the exercise imagery participants approached similar scores to that of a regular exerciser (e.g., Berry et al., 2014) at week 9 but then dropped off. Therefore, even though our participants were engaged in what can be defined as regular exercise, there still appears to be a difference between the participants in our study and participants who self-identified as regular exercisers in previous research. A longer intervention (i.e., use of exercise imagery) may have prevented a decrease in role identity after week 9 and the accompanying decline in exercise behaviour. In our study, participants used the exercise facility for 8 weeks; however during that time, the ratio of use shifted such that participants were using the research facility less and less frequently. It may have been more practical to extend the time in the exercise facility to facilitate a greater increase in one's role identity, which may have mitigated the decrease in fitness after leaving the facility.

It is important to note that the sample examined in the present study limits the generalizability of the results. Specifically, only women who had a measured BMI of 25 or greater (i.e., overweight and obese) were utilized, as this population tends to be less active (Hu et al., 2004). Thus, it is cautioned to avoid generalization of the results to a non-overweight women given the influence of imagery may differ in addition to potential differences in their reported indentity scores and exercise behaviours compared to women with a lower BMI.

Participants may have benefited from more exercise imagery sessions during the intervention to continue to reaffirm their identity, and possibly influence their behaviour. Researchers have found that more frequent exercisers utilize exercise imagery more (Gammage et al., 2004) and it is recommended that imagery should be practiced regularly (Hale, Seiser, McGuire, & Weinrich, 2005). In the future, researchers should provide scripts for each participant that they can use outside the structured exercise environment and test if this additional imagery helps to further influence the target variables.

Despite these limitations, the current study provides insight into the pattern of change in exercise identity over time in a sample of female initiates. Moreover, given exercise identity appears to serve as an important construct in the promotion of exercise adherence (Strachan et al., 2013) and that individuals are motivated to behave in a consistent manner with their endorsed identity (Burke & Stets, 2009), results of the imagery intervention in the current study are very promising. Future research should aim to further explore the influence of exercise imagery on one's identity and subsequent behaviour.

References

American College of Sports Medicine (ACSM) (2010).*ACSM's guidelines for exercise testing and prescription* (8th ed). Philadelphia, PA: Lippincott Williams &Wilkins.

Anderson, D. F., & Cychosz, C. M. (1994).Development of an exercise identity scale. *Perceptual and Motor Skills*, *78*(3), 747-751. doi: http://dx.doi.org/10.2466/pms.1994.78.3.747

Anderson, D. F., Cychosz, C. M., &Franke, W. D. (1998). Association of exercise identity with measures of exercise commitment and physiological indicators of fitness in a law enforcement cohort. *Journal of Sport Behaviour*, *21*, 233-241.

Anderson, D. F., Cychosz, C. M., & Franke, W. D. (2001). Preliminary exercise identity scale (EIS) norms for three adult samples. *Journal of Sport Behaviour*, *24,* 1431-1439.

Andersen, R. E., Wadden, T. A., Bartlett, S. J., Zemel, B., Verde, T. J., & Franckowiak, S. C. (1999). Effects of lifestyle activity vs structured aerobic exercise in obese women: A randomized trial. *JAMA*, *281*(4), 335-340. doi: http://dx.doi.org/10.1001/jama.281.4.335

Berry, T. R., Strachan, S. M., &Verkooijen, K. T. (2014).The relationship between exercise schema and identity. *International Journal of Sport and Exercise Psychology*, *12*(1), 49-63. doi: http://dx.doi.org/10.1080/1612197X.2013.775742

Bruce, R. A. (1971). Exercise testing of patients with coronary artery disease: Principles and normal standards for evaluation. *Annals of Clinical Research, 3*, 323–332.

Bull, S.J., Albinson, J.G., & Shambrook, J. (1996). *The mental game plan: Getting psyched for sport.* Brighton, UK: Sports Dynamic.

Burke, P. J. (1980). The self: Measurement requirements from an interactionist perspective. *Social Psychology Quarterly*, *43,* 18-29. doi: http://dx.doi.org/10.2307/3033745

Burke, P. J., & Harrod, M. M. (2005).Too much of a good thing? *Social Psychology Quarterly, 68*(4), 359-374. doi: http://dx.doi.org/10.1177/019027250506800404

Burke, P. J., & Reitzes, D. C. (1981).The link between identity and role performance. *Social Psychology Quarterly, 44*(2), 83-92. doi: http://dx.doi.org/10.2307/3033704

Burke, P. J., & Stets, J. E. (2009). *Identity theory*. New York, NY: Oxford University Press.

Canadian Society for Exercise Physiology (CSEP)(2003).*Canadian physical activity, fitness and lifestyle approach protocol (CPAFLA) manual (3rd ed.)*. Ottawa, ON: Public Health Agency of Canada.

Cardinal, B. J., & Cardinal, M. K. (1997). Changes in exercise and exercise identity associated with a 14-week aerobic exercise class. *Journal of Sport Behavior*, *20*(4), 377-386.

Colley, R. C., Garriguet, D., Janssen, I., Craig, C. L., Clarke, J., & Tremblay, M. S. (2011). *Physical activity of Canadian adults: Accelerometer results from the 2007 to 2009 CHMS* (Statistics Canada, Catalogue no. 82-003-XPE). Retrieved from http://www.statcan.gc.ca/pub/82-003-x/2011001/article/11396-eng.htm

Contrada, R. J., & Ashmore, R. D. (Eds.). (1999). *Self, social identity, and physical health: Interdisciplinary explorations* (Vol. 2). New York, NY: Oxford University Press.

Cronbach, L. (1951). Coefficient alpha and the internal structure of tests. *Psychometrika*, *16,* 297–334. doi: http://dx.10.1007/BF02310555

Cumming, J., & Stanley, D. M. (2009). Are images of exercising related to feeling states? *Journal of Imagery Research in Sport and Physical Activity*, *4*(1).doi: http://dx.doi.org/10.2202/1932-0191.1033

Dishman, R. K. (1982). Compliance/adherence in health-related exercise. *Health Psychology, 1*(3), 237-267. doi: http://dx.doi.org/10.1037/0278-6133.1.3.237

Duncan, L. R., Hall, C. R., Wilson, P. M., & Rodgers, W. M. (2012).The use of a mental imagery intervention to enhance integrated regulation for exercise among women commencing an exercise program. *Motivation and Emotion*, *36*(4), 452-464. doi: http://dx.doi.org/10.1007/s11031-011-9271-4

Duncan, L. R., Rodgers, W. M., Hall, C. R., & Wilson, P. M. (2011).Using imagery to enhance three types of exercise self-efficacy among sedentary women. *Applied Psychology: Health and Well-Being*, *3*(1), 107-126.

Dunn, A. L., Marcus, B. H., Kampert, J. B., Garcia, M. E., Kohl III, H. W., & Blair, S. N. (1999). Comparison of lifestyle and structured interventions to increase physical activity and cardiorespiratory fitness: A randomized trial. *Journal of the American Medical Association*, *281*(4), 327-334. doi: http://dx.doi.org/10.1001/jama.281.4.327

Gammage, K. L., Hall, C. R., & Martin Ginis, K. A. (2004). Self-presentation in exercise contexts: Differences between high and low frequency exercisers. *Journal of Applied Social Psychology, 34,* 1638-1651. doi: http://dx.doi.org/10.1111/j.1559-1816.2004.tb02791.x

Godin, G. (2011). The Godin-Shephard leisure-time physical activity questionnaire. *The Health & Fitness Journal of Canada*, *4*, 18-22.

Godin, G., Jobin, J., & Bouillon, J. (1986).Assessment of leisure time exercise behaviour by self-report: A concurrent validity study. *Canadian Journal of Public Health, 77,* 359-361.

Godin, G., & Shepherd, R. J. (1985). A simple method to assess exercise behaviour in the community. *Canadian Journal of Applied Sport Sciences, 10,* 141-146.

Hale, B. D., Seiser, L., McGuire, E.J., &Weinrich, E. (2005). Mental imagery. In J. Taylor & G. Wilson (Eds.), *Applying sport psychology: Four perspectives* (pp. 117 - 135). Champaign, IL: Human Kinetics.

Hall, C. R. (2001). Imagery in sport and exercise. In R. N. Singer, H. A. Hausenblas, & C. M. Janelle (Eds.), *Handbook of sport psychology* (2nd ed., pp.529-549). New York, NY: John Wiley & Sons.

Hall, C. R., Rodgers, W. M., Wilson, P. M., & Norman, P. (2010). Imagery use and self-determined motivations in a community sample of exercisers and non-exercisers. *Journal of Applied Social Psychology*, *40*, 135–152. doi:10.1111/j.1559-1816.2009.00566.x

Holmes, P. S., & Collins, D. J. (2001). The PETTLEP approach to motor imagery: A functional equivalence model for sport psychologists. *Journal of Applied Sport Psychology*, *13*(1), 60-83. doi: http://dx.doi.org/10.1080/10413200109339004

Hausenblas, H. A., Hall, C. R., Rodgers, W. M., & Munroe, K. J. (1999). Exercise imagery: Its nature and measurement. *Journal of Applied Sport Psychology*, *11*, 171-180. doi: http://dx.doi.org/10.1080/10413209908404198

Kuntzleman, C.T., & Reiff, G.G. (1992).The decline in American children's fitness levels. *Research Quarterly for Exercise and Sport*, *63*, 107-111.doi: http://dx.doi.org/10.1080/02701367.1992.10607567

Leary, M. R., & Tangney, J. P. (Eds.).(2003). *Handbook of self and identity*. New York, NY: Guilford Press.

Leventhal, H., Brissette, I., & Leventhal, E. A. (2003).The common-sense model of self-regulation of health and illness. In L. Cameron & H. Leventhal (Eds.), *The self-regulation of health and illness behaviour*(pp. 42-65). New York, NY: Routledge.

Markus H. (1977). Self-schemata and processing information about the self. *Journal of Personality and Social Psychology*, *35*, 63-78.doi: http://dx.doi.org/10.1037/0022-3514.35.2.63

Markus, H., & Kunda, Z. (1986).Stability and malleability of the self-concept. *Journal of Personality and Social Psychology*, *51*(4), 858-866.doi: http://dx.doi.org/10.1037/0022-3514.51.4.858

McAuley, E., & Courneya, K. S. (1993). Adherence to exercise and physical activity as health-promoting behaviours: Attitudinal and self-efficacy influences. *Applied and Preventive Psychology*, *2*(2), 65-77. doi: http://dx.doi.org/10.1016/S0962-1849(05)80113-1

Pate, R. R., Pratt, M., Blair, S. N., Haskell, W. L., Macera, C. A., Bouchard, C., & Wilmore, J. H. (1995). Physical activity and public health: A recommendation from the Centers for Disease Control and Prevention and the American College of Sports Medicine. *JAMA*, *273*(5), 402-407. doi: http://dx.doi.org/10.1001/jama.273.5.402

Rodgers, W. M., Hall, C. R., Blanchard, C. M., McAuley, E., & Munroe, K. J. (2002). Task and scheduling self-efficacy as predictors of exercise behavior. *Psychology and Health*, *17*(4), 405-416. doi: http://dx.doi.org/10.1080/0887044022000004902

Ryan, R. M., & Deci, E. L. (2003). On assimilating identities to the self: A self-determination theory perspective on internalization and integrity within cultures. In M. R. Leary & J. P. Tangney (Eds.), *Handbook of self and identity* (pp. 253-272). New York, NY: Guilford Press.

Sallis, J. F., Haskell, W. L., Fortmann, S. P., Vranizan, K. M., Taylor, C. B., & Solomon, D. S. (1986). Predictors of adoption and maintenance of physical activity in a community sample. *Preventive Medicine*, *15*(4), 331-341. doi: http://dx.doi.org/10.1016/0091-7435(86)90001-0

Statistics Canada (2011). *Canadian Health Measures Survey: Cycle 2 Data Tables* (Catalogue no. 82-626-X). Retrieved from http://www5.statcan.gc.ca/access_acces/alternative_alternatif.action?teng=82-626-x2012002-eng.pdf&tfra=82-626-x2012002-fra.pdf&l=eng&loc=82-626-x2012002-eng.pdf

Stets, J. E., & Burke, P. J. (2003).A sociological approach to self and identity. In M. R. Leary & J. P. Tangney (Eds.), *Handbook of self and identity* (pp. 128-152). New York, NY: Guilford Press.

Stetson, B. A., Rahn, J. M., Dubbert, P. M., Wilner, B. I., & Mercury, M. G. (1997).Prospective evaluation of the effects of stress on exercise adherence in community-residing women. *Health Psychology*, *16*(6), 515-520. doi: http://dx.doi.org/10.1037/0278-6133.16.6.515

Strachan, S. M., & Brawley, L. R. (2008).Reactions to a perceived challenge to identity a focus on exercise and healthy eating. *Journal of Health Psychology*, *13*(5), 575-588. doi: http://dx.doi.org/10.1177/1359105308090930

Strachan, S. M., Brawley, L. R., Spink, K., & Glazebrook, K. (2010). Older adults' physically-active identity: Relationships between social cognitions, physical activity and satisfaction with life. *Psychology of Sport and Exercise*, *11*(2), 114-121. doi: http://dx.doi.org/10.1016/j.psychsport.2009.09.002

Strachan, S. M., Brawley, L. R., Spink, K. S., & Jung, M. E. (2009).Strength of exercise identity and identity-exercise consistency affective and social cognitive relationships. *Journal of Health Psychology*, *14*(8), 1196-1206. doi: http://dx.doi.org/10.1177/1359105309346340

Strachan, S. M., Flora, P. K., Brawley, L. R., & Spink, K. S. (2011).Varying the cause of a challenge to exercise identity behaviour: Reactions of individuals of differing identity strength. *Journal of Health Psychology*, *16*(4), 572-583. doi: http://dx.doi.org/10.1177/1359105310383602

Strachan, S. M., Fortier, M. S., Perras, M. G., & Lugg, C. (2013).Understanding variations in exercise-identity strength through identity theory and self-determination theory. *International Journal of Sport and Exercise Psychology*, *11*(3), 273-285.doi: http://dx.doi.org/10.1080/1612197X.2013.749005

Strachan, S. M., Woodgate, J., Brawley, L. R., & Tse, A. (2005).The relationship of self-efficacy and self-identity to long-term maintenance of vigorous physical activity. *Journal of Applied Biobehavioral Research*, *10*(2), 98-112.

Stryker, S. (1980).*Symbolic interactionism: A social structural version*. Menlo Park, CA: Benjamin/Cummings Publishing Company.

Stryker, S., & Burke, P. J. (2000).The past, present, and future of an identity theory. *Social Psychology Quarterly*, *63*,284-297.doi: http://dx.doi.org/10.2307/2695840

Tabachnick, B. G., & Fidell, L. S. (2013).*Using multivariate statistics* (6th ed.). Boston, MA: Pearson.

Thomas, S., Reading, J.,& Shephard, R.J. (1992). Revision of the Physical Activity Readiness Questionnaire (PAR-Q).*Canadian Journal of Sport Sciences, 17*(4), 338–345.

Turner, J., Hayes, S., & Reul-Hirche, H. (2004). Improving the physical status and quality of life of women treated for breast cancer: A pilot study of a structured exercise intervention. *Journal of Surgical Oncology*, *86*(3), 141-146. doi: http://dx.doi.org/10.1002/jso.20065

Verkooijen, K. T., & de Bruijn, G. J. (2013). Exercise self-identity: interactions with social comparison and exercise behaviour. *Psychology, Health & Medicine*, *18*(4), 490-499.doi: http://dx.doi.org/10.1080/13548506.2012.750727

Vlachopoulos, S. P., Kaperoni, M., & Moustaka, F. C. (2011).The relationship of self-determination theory variables to exercise identity. *Psychology of Sport and Exercise*, *12*(3), 265-272.doi: http://dx.doi.org/10.1016/j.psychsport.2010.11.006

Warburton, D. E., Katzmarzyk, P. T., Rhodes, R. E., & Shephard, R. J. (2007). Evidence-informed physical activity guidelines for Canadian adults. *Applied Physiology, Nutrition, and Metabolism*, *32*(Suppl. 2E), S16-S68.

Warburton, D. E., Nicol, C. W., & Bredin, S. S. (2006). Health benefits of physical activity: The evidence. *Canadian Medical Association Journal*, *174,* 801-809.doi: http://dx.doi.org/10.1503/cmaj.051351

Wesch, N. N., Milne, M. I., Burke, S. M., & Hall, C. R.(2006). Self-efficacy and imagery use in older adult exercisers. *European Journal of Sport Science, 6*, 197-203.

Williams, S. E., Cooley, S. J., Newell, E., Weibull, F., & Cumming, J. (2013).Seeing the difference: Developing effective imagery scripts for athletes. *Journal of Sport Psychology in Action*, *4*(2), 109-121. doi: http://dx.doi.org/10.1080/21520704.2013.781560

Wilson, P. M., & Muon, S. (2008). Psychometric properties of the exercise identity scale in a university sample. *International Journal of Sport and Exercise Psychology*, *6*(2), 115-131. doi: http://dx.doi.org/10.1080/1612197X.2008.9671857

World Health Organization. (2000). Obesity: Preventing and managing the global epidemic. *World Health Organization Technical Report Series*, *894*, 1-253.

Table 1

Means (and standard deviations) of Demographic Characteristics by Condition at Baseline

Variable	Exercise Imagery (*n* = 43)	Control (*n* = 35)
Demographics:		
Age (years)	35.8 (9.0)	38.7 (8.7)
Height (cm)	164.2 (7.0)	164.4 (5.6)
Weight (kg)	84.3 (16.1)	82.2 (12.5)
Body Mass Index (kg/m^2)	31.1(4.4)	30.4 (4.4)
Exercise behaviour (frequency per week)		
Week 1	3.4 (1.1)	3.4 (1.0)
Week 2	4.0 (.79)	3.8 (.94)
Week 3	3.8 (.50)	3.7 (.68)
Week 4	3.8 (.84)	3.7 (.74)
Week 5	3.6 (.67)	3.5 (.89)
Week 6	3.6 (.86)	3.2 (1.1)
Week 7	3.1 (1.2)	3.4 (1.0)
Activity Score (LTEQ)		
Week 36	26.2 (23.7)	26.4 (18.0)
Predicted $V0_2$ Max (mL/kg/min):		
Baseline	33.3 (5.3)	32.7 (4.7)
Week 9	35.2 (4.8)	35.1 (5.5)
Week 18	30.9 (10.4)	32.6 (9.7)
Week 36	31.3 (10.5)	32.7 (10.2)

Note. Exercise behaviour was self-reported using the frequency of exercise sessions per week within the 8 week program. Activity score was calculated using the Leisure Time Exercise Questionnaire (Godin & Shepard, 1986) and recommendations from Godin (2011).

Table 2

Bivariate Correlations for Role Identity, Exercise Beliefs, Fitness, and Exercise Behaviour from Week 0 to 36

Measure	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.
1. RI Wk 0	-												
2. EB Wk 0	.58**	-											
3. RI Wk 9	.46**	.35**	-										
4. EB Wk 9	.28*	.42**	.75**	-									
5. RI Wk 18	.42**	.34**	.76**	.52**	-								
6. EB Wk 18	.32**	.47**	.67**	.70**	.80**	-							
7. RI Wk 36	.47**	.48**	.62**	.46**	.82**	.68**	-						
8. EB Wk 36	.32**	.60**	.53**	.67**	.61**	.77**	.69**	-					
9. FIT Wk 0	.30**	.15	.19	.08	.12	.09	.10	.03	-				
10. FIT Wk 9	.32**	.25*	.23*	.19	.21	.24*	.17	.11	.78**	-			
11. FIT Wk 18	.34**	.22*	.17	.10	.24*	.27*	.20	.12	.64**	.77**	-		
12. FIT Wk 36	.47**	.32**	.42**	.26*	.42**	.34**	.30**	.21	.60**	.68**	.72**	-	
13. LTEQ Wk 36	.04	.17	.23*	.24*	.30**	.30**	.31**	.28*	.12	.19	.22	.10	-

** significant at 0.01

Note. FIT = Fitness (predicted $V0_2$ max); RI = Role Identity; EB = Exercise Belief; LTEQ = Leisure Time Exercise Questionnaire (exercise behaviour)

Figure 1. Schedule of Assessments

Assessment	**Week 0**	**Week 5**	**Week 9**	**Week 18**	**Week 36**
Demographic Questionnaire	**X**				
Exercise Identity Scale	**X**	**X**	**X**	**X**	**X**
Leisure Time Exercise Questionnaire (frequency)	**X**	**X**			**X**
Anthropometrics (height/weight)	**X**		**X**	**X**	**X**
Sub-maximal fitness test	**X**		**X**	**X**	**X**

Figure 2. Procedural Flow Diagram

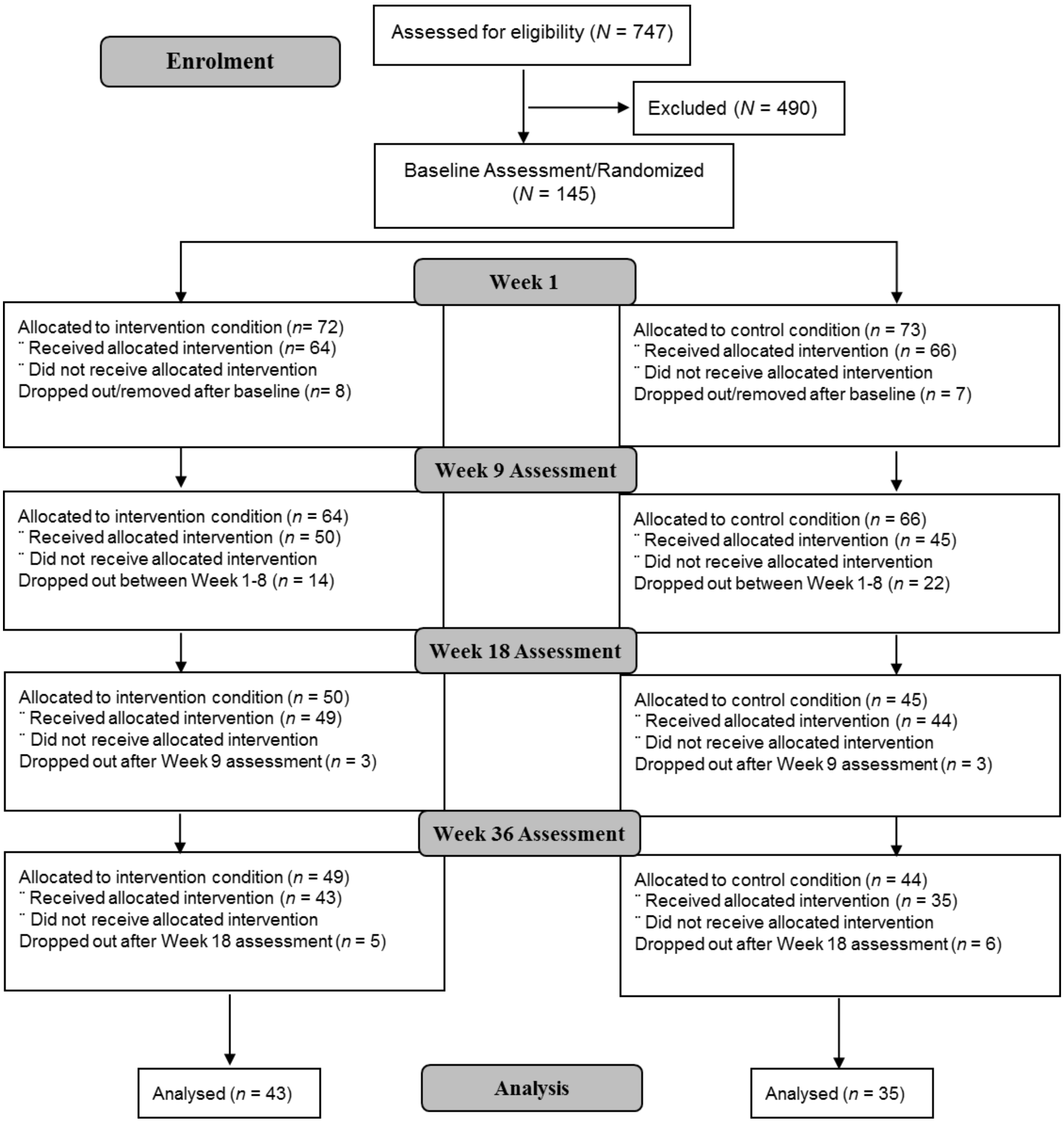


Figure 3. Self-Reported Exercise Frequency by Group Assignment Over Structured Program

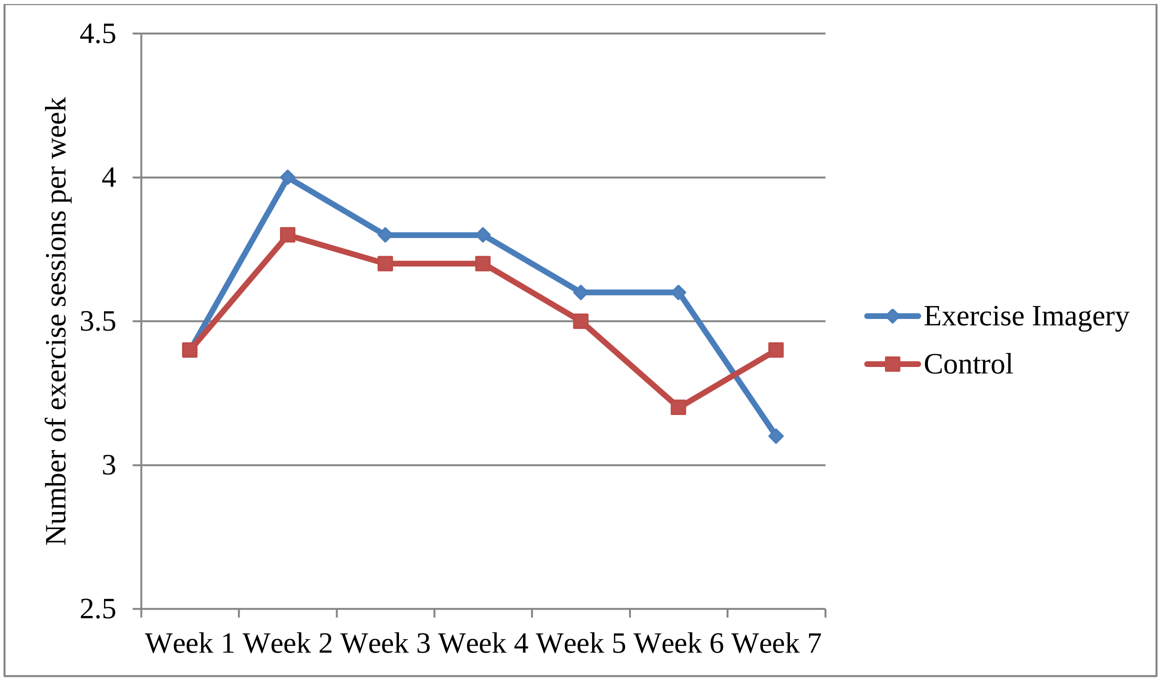


Figure 4. Fitness Level (predicted $V0_2$) by Group Assignment at Each Assessment Point

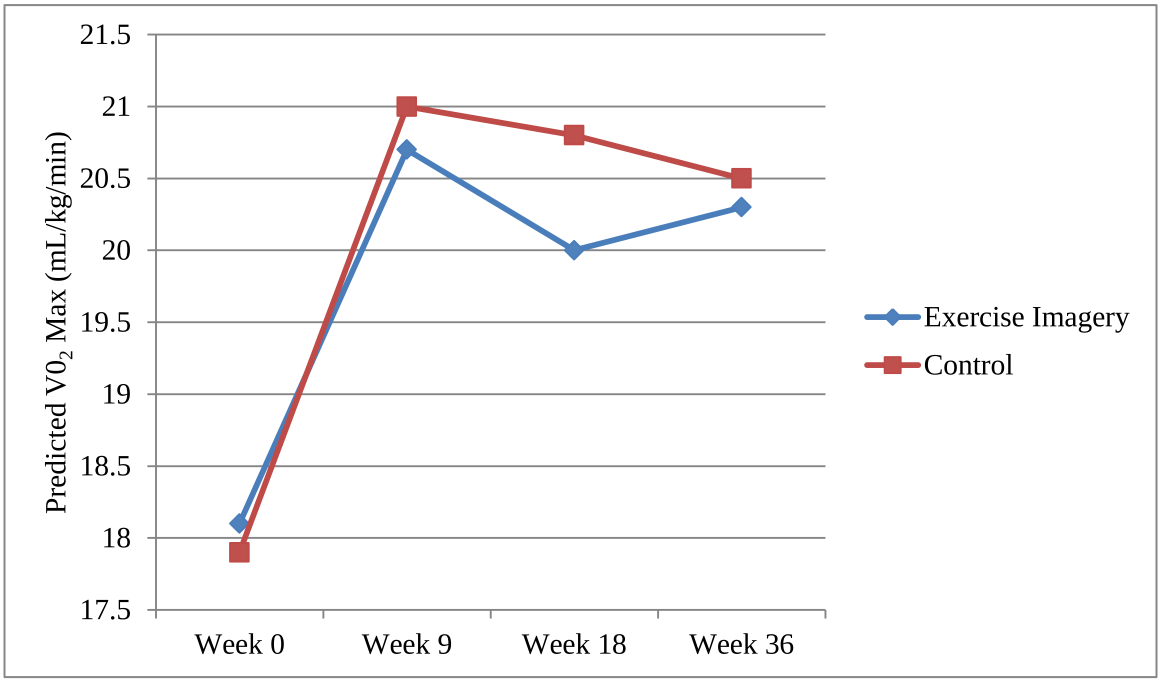
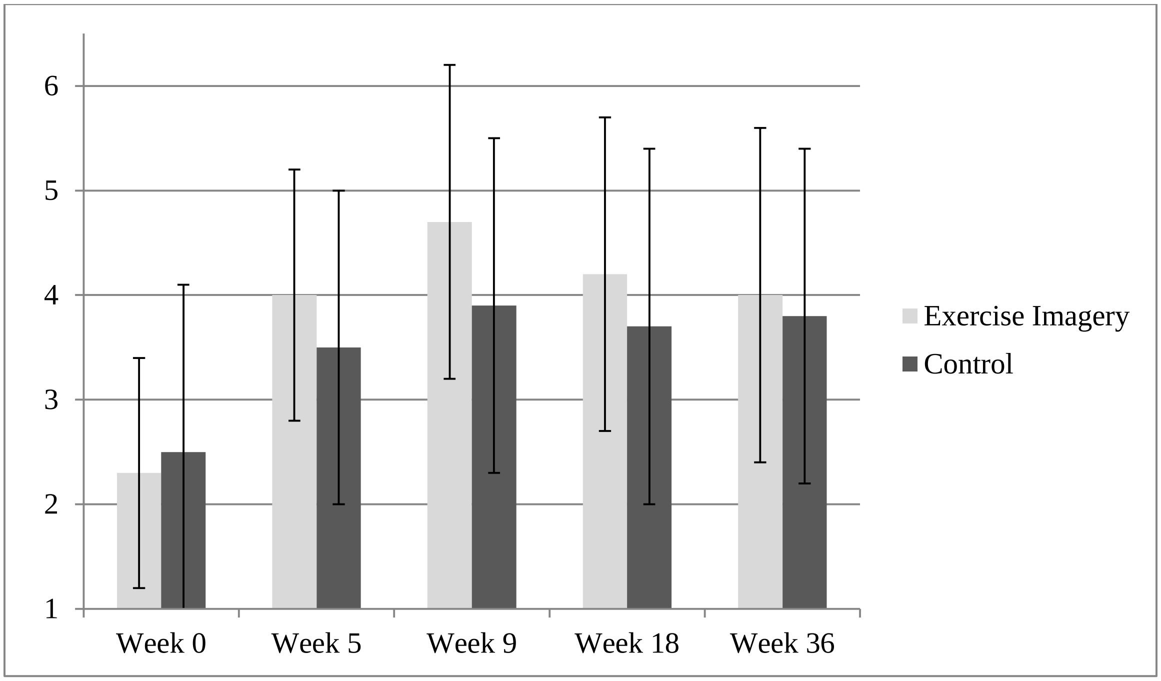
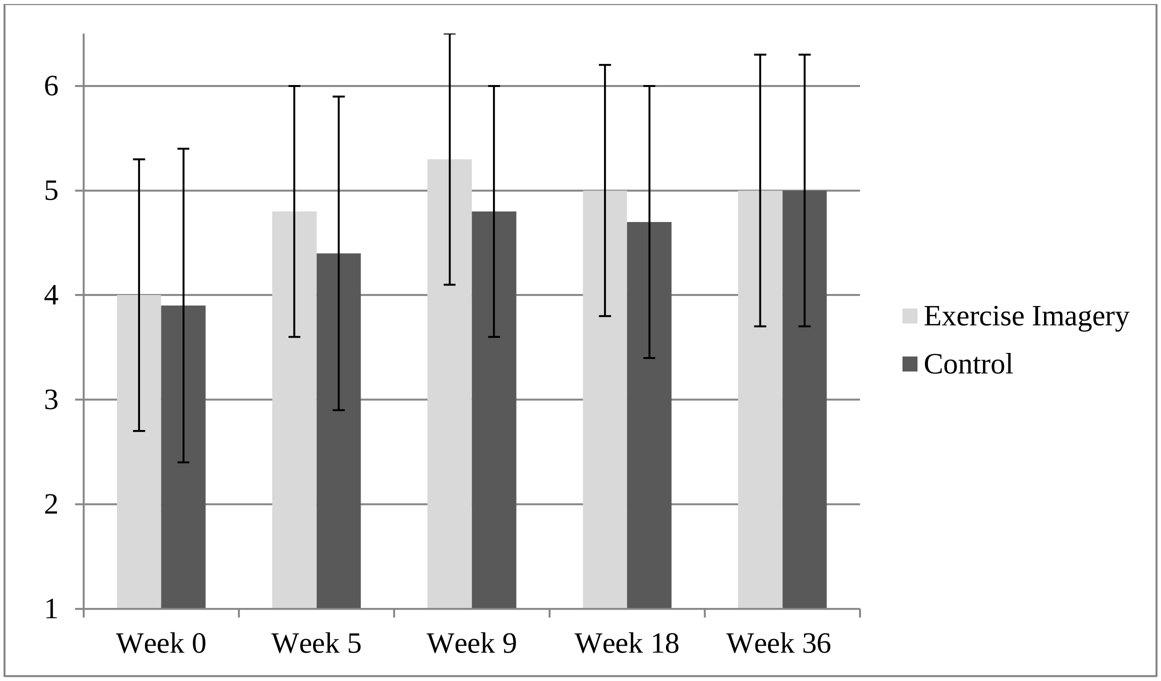


Figure 5. Role Identity by Group Assignment at Each Assessment Point



Note. Role identity was rated on a 7-point Likert scale ranging from 1 = *strongly disagree* to 7 = *strongly agree*.

Figure 6. Exercise Beliefs by Group Assignment at Each Assessment Point



Note. Exercise beliefs was rated on a 7-point Likert scale ranging from 1 = *strongly disagree* to 7 = *strongly agree*.

MANUSCRIPT 2

AN EXPLORATION OF FEMALE EXERCISE INITIATES' INTENTIONS TO MAINTAIN OR INCREASE THEIR EXERCISE BEHAVIOUR AS INFLUENCED BY THEIR OUTCOME EXPECTATIONS AND SELF-EFFICACY

As the need for effective exercise interventions increases due to the rising obesity epidemic (Wadden, Brownell, & Foster, 2002), it is important to identify possible contributors to maintaining exercise behaviour. This is particularly critical for female populations, as their reported level of physical activity is less than their male counterparts (Martin, Morrow, Jackson, & Dunn, 2000) and the physiological benefits of exercise, including lower blood pressure, reduced risk of osteoporosis, and lowered obesity (e.g., Norris, Carroll, & Cochrane, 1990; Warburton, Nicol, &Bredin, 2006) are more prominent among females. Much of the messages promoting exercise adoption target the long-term outcomes of participation (Brawley & Latimer, 2007; Hall & Fong, 2007; Segar, Eccles, & Richardson, 2011). This is surprising given that among a sample of sedentary women, 77% cited a different reason for engagement in regular exercise (O'Dougherty, Kurzer, & Schmitz, 2010). Thus, further understanding of changes in expectations about exercise behaviour (i.e., outcome expectations) may enhance our ability to develop more targeted and sustainable interventions and messaging for sedentary female populations.

According to Williams, Anderson, and Winett (2005), exercise interventions have been based on various social cognitive theories. One prominent theory is self-efficacy (Bandura, 1997) which incorporates both self-efficacy and outcome expectations. Notably, much of the existing literature has highlighted the contribution of self-efficacy on behaviour change, while there is a limited amount on the examination of outcome expectations. This is unfortunate as outcome expectations might play a role in influencing motivation and decisions to change one's behaviour (Bandura, 1997). Outcome expectancy is described as the probability that a certain action will lead to a certain outcome (Bandura, 1977). More specifically, outcome expectancy is comprised of two factors: the perception of the likelihood an outcome will result given a particular behaviour (i.e., outcome likelihood), as well as the subjective value or perceived importance of that expected outcome (i.e., outcome value; Kirsch, 1995; Maddux, 1993; Rodgers & Brawley, 1991). For example, an individual may believe he or she have the ability to perform a given behaviour (self-efficacy) and expect the likelihood of a particular outcome is high (outcome likelihood). However, the value associated to that expected outcome (outcome value) might influence whether they actually engage in the behaviour (Speck & Harrell, 2003). Despite the possibility of outcome expectancies predicting exercise behaviour, a review of previous research suggests varied relationship strengths (Williams et al., 2005). For example, Maddux, Brawley, and Boykin (1995) suggested the importance of outcomes and the degree of their influence on behaviour might have a great deal of variability among individuals, thus it is crucial not to presume that expectancies are always an incentive to motivate behaviour. However, relationships, albeit small, have been reported between outcome expectancy and physical activity in both positive (Conn, 1998; Resnick, Palmer, Jenkins, & Spellbring, 2000) and negative directions (Steptoe, Rink, & Kerry, 2000).

Given the theoretical link between outcome expectancy and self-efficacy, it has been suggested that, when an outcome is reliant on the quality of the performance for predicting a particular behaviour, outcome expectancy does not account for significant variation beyond what is explained by self-efficacy (Bandura 1986; 1997). This is supported in previous literature, as results around outcome expectancy have been equivocal, possibly due to the purported relationship with self-efficacy. At times, outcome expectancy and self-efficacy have been found to have independent influences on predicting behaviour (Gao, Xiang, Lee, & Harrison, 2008) while in other instances, outcome expectancy adds little variance to the predictive ability of self-efficacy on behaviour (Rovniak, Anderson, Winett, & Stephen, 2002). Despite the mixed results, a positive relationship between outcome expectancy and self-efficacy may suggest that individuals who are more efficacious tend to imagine more positive versus negative outcomes (Gao, Lee, & Harrison, 2008). In an effort to establish effective techniques for increasing exercise engagement and promoting positive behaviour changes, it is important to further examine the concurrent role of outcome expectancy and self-efficacy within exercise research.

Preliminary research conducted by Maddux, Sherer, and Rogers (1982) aimed to establish this relationship. Using a 3 X 3 factorial design, the authors examined the ‘broken record’ technique used in assertiveness training. Participants were assigned to read an essay that differed on the effectiveness of using the technique (i.e., outcome expectancy) and the level of difficulty of using the ‘broken record’ technique (i.e., self-efficacy). Results revealed that high levels of outcome expectancy (e.g., the technique had beneficial results) had a significant, positive impact on reported self-efficacy. Moreover, increments in outcome expectancy shared a strong relationship with increased intentions to perform the behaviour (Maddux et al., 1982). These results have further been validated in more recent research. Gao and colleagues found that self-efficacy and outcome expectancy were positively related to behavioural intention to complete future weight training sessions (i.e., three times per week over next eight weeks) and actual behaviour (i.e., attendance at weight training class; Gao, Xiang et al., 2008). Among the sample of young adult weight lifters, differences in relationship strength between measured variables were found at varying time points within the exercise program. Further findings from

Anderson, Wojcik, Winett, and Williams (2006) also support the theoretical relationship, whereby self-regulatory behaviours (e.g., exercise) increase as self-efficacy and outcome expectations improve. Gao, Xiang, and colleagues (2008) purported that the influence of self-efficacy on motivating an individual's behaviour is only observed when adequate outcomes are present. As such, it appears the relationship between self-efficacy and outcome expectancy needs further clarity to determine how the variables interact, change over an extended period of time, and are conceptualized among a sample of exercise initiates.

Of particular interest to the present study was the suggestion that outcome expectations and self-efficacy may influence exercise behaviour at different time points of a program (Rodgers & Brawley, 1996). Gao, Xiang, et al. (2008) found that outcome expectations had a stronger influence in predicting behavioural intention and actual behaviour than self-efficacy during the initial weeks of a weight training program. However, self-efficacy explained more variability in novice students' future intentions and actual behaviour at the program midpoint. This is in line with the suggestion from Bandura (1986) in which outcome expectations (e.g., health and appearance) may have a stronger influence during the initial phase of behaviour adoption while self-efficacy may take a more influential role once an individual enhances their experience.

Therefore the purpose of the current study was to examine the use of outcome expectancy (likelihood and value) and self-efficacy in predicting intention for exercise over time. As previously noted, it appears that women are engaging in less physical activity then men (Martin et al., 2000) and different patterns of physical activity behaviour are reported between genders (Sallis, Calfas, Alcaraz, Gehrman, & Johnson, 1999). Thus, patterns of exercise cognitions (e.g., role of self-efficacy and outcomes expectancy) were exclusively examined among female exercise initiates to aid in the development of more targeted and effective intervention strategies. In addition, given women typically report appearance/weight management and fitness/health management as primary incentives for undertaking exercise behaviour (e.g., Cash, Now, & Grant, 1994; O'Dougherty et al., 2010; Rodgers & Gauvin, 1998), outcome expectations targeting health and appearance were studied.

In line with previous research, we hypothesized that outcome expectations would be a stronger predictor of exercise intentions during the initial phase of the exercise program, while self-efficacy would be more predictive later in the program.

Methods

Participants

Female adults (N = 145), between the ages of 22 – 52 (M_{age} = 35.2, SD = 9.5), who were self-reportedly healthy, participated in this study. Eligibility criteria required participants to have a body mass index (BMI; self-reported) greater than twenty five (i.e., above normal weight) and to be currently sedentary (i.e., had engaged in less than one bout of exercise per week over the last six months). On average, participants reported a BMI of 30.8 (SD = 4.4), with representation of both overweight (BMI of 25.0-29.9) (n = 79) and obese or greater (BMI of 30.0 and above) (n = 66) categories (World Health Organization, 2000). Almost half of the female participants reported being married (42%), and having no children (56%). The most common racial identities reported by participants included, Caucasian (67%), Black (5%), East Indian (3%), and Asian (2%).

Measures

The participants providing data for the current study were part of a larger trial examining factors associated with exercise adherence.

Demographics. At the initial assessment, participants reported their age, ethnicity, annual income, education, marital status, occupation, and number of children. Physiological data including height, weight, resting heart rate, and body mass index was measured at baseline, week 9, and week 36 assessments (see Figure 7).

Self-efficacy. Participants completed the Multi-dimensional Self-Efficacy for Exercise Scale (MSES; Rodgers, Wilson, Hall, Fraser, & Murray, 2008), a 9-item measure assessing three types of self-efficacy evident with exercise behaviour. Using the stem, "How confident are you that you can....", participants rated their confidence level, ranging from 0 (*no confidence*) to 100 (*completely confident*), on task self-efficacy (k = 3; e.g., "Perform all the required movements"), coping self-efficacy (k = 3; e.g., "Exercise when you lack energy"), and scheduling self-efficacy (k = 3; e.g., "Include exercise in your daily routine). Cronbach's alpha coefficients in the present study were acceptable at .75 for task self-efficacy, .79 for coping self-efficacy, and .83 for scheduling self-efficacy (Cronbach, 1951).

Outcome Expectancy. In accordance with recommendations from Bandura (2004), and a review of previous literature measuring outcome expectations (McAuley, Motl, White, & Wójcicki, 2010; Resnick, 2005; Resnick, Zimmerman, Orwig, Furstenberg, & Magaziner, 2000), single items were purposely developed for this study to assess expectations in distinct domains (e.g., physical, social). Specifically, participants were asked to report their agreement with the likelihood of appearance and health outcomes as a result of their exercise engagement as well as the associated value they place on these outcomes. Health and appearance expectations were targeted given women typically report appearance/weight management and fitness/health management as primary incentives for undertaking exercise behaviour (e.g., Cash et al., 1994; O'Dougherty et al., 2010; Rodgers & Gauvin, 1998). Likelihood items were, "If I exercise I expect my appearance to improve" and "If I exercise I expect my physical health to improve". Both were rated on a 9 point Likert scale ranging from 1 (*definitely do not expect this to happen*) to 9 (*definitely expect this to happen*). Each outcome likelihood was paired with an outcome value rated on a Likert scale ranging from 1 (*undesirable*) and 9 (*desirable*). Value items were, "For me, improving my appearance is" and "For me, improving my physical health is". Given the mixed support for multiplicative combination of likelihood and value (Dawson, Gyurcsik, Culos-Reed, & Brawley, 2001; Evans 1991), items were analyzed separately to assess contribution on dependent variables.

Exercise intentions. Participants' strength of exercise intentions was measured using two items rated on a 7-point Likert scale ranging from 1 (*strongly disagree*) to 7 (*strongly agree*). Previous research has utilized items with varying intentional specificity to more readily assess participant readiness (e.g., DuCharme & Brawley, 1995; Murray, Rodgers, & Fraser, 2009). The first item reflected the participant's intention to maintain their current activity level (until their next assessment; 4 weeks to 9 weeks) while the second item assessed the participants intention to increase their current activity level (over the same time period). Previous research has employed a single item measure to assess behavioural intention (Gao, Xiang, et al., 2008; Rodgers & Brawley, 1991; Rodgers & Gauvin, 1998).

Procedure

Recruitment. Upon ethical approval from the university's research ethics board, participants were recruited from a mid-sized Canadian city utilizing various methods (posters, word of mouth, emails, and newspaper advertisements). The research study advertisements solicited inactive females interested in participating in an eight week structured cardiovascular exercise program. Recruitment methods outlined that participants would engage in exercise four times per week, be assessed on various psychological/physiological responses to exercise, and be provided with an individualized structured program. To ensure alignment with eligibility criteria (e.g., age, BMI, activity level) potential participants were screened via telephone or email before progressing to the next stage of enrolment.

Information session. Eligible participants were invited to attend a group information session to obtain additional information about the exercise program. The session outlined the specific components of the research study including, the structure of the exercise program, facility location/amenities, and a tour of the research facility to highlight available equipment. Females interested in participating reviewed the letter of information and provided written consent and then completed the Physical Activity Readiness Questionnaire (PAR-Q; Thomas, Reading, & Shephard, 1992). Upon completion of the information session, interested participants scheduled a baseline assessment.

Baseline assessment. Upon arrival for the baseline assessment, participants provided emergency contact information and completed questionnaires including demographics, a baseline measurement of self-efficacy (i.e., MSES; Rodgers et al., 2008), and outcome expectations. Physiological characteristics including height, weight, and resting heart rate were measured and recorded. In addition to anthropometric measures, participants provided individualized data for the exercise program guidelines. Prior to completion of the assessment, participants were instructed on how to use the heart rate monitor and available exercise equipment (stair climber, treadmill, rowing machine, and stationary bike). Prior to leaving, participants were provided a schedule of the facility hours (drop in), their participant identification number (to be used for confidentially on attendance forms), and confirmed their starting date with the researcher.

Exercise program .Each participant was given an individualized, cardiovascular program to follow for eight weeks. The program was structured to increase exercise duration and intensity, as well as vary the location of exercise sessions (i.e., research facility versus location of their choice). At the initiation of the program, participants were asked to exercise four times per week, between 30 to 60 minutes. Utilizing the outcome of the baseline sub-maximal fitness assessment and recorded resting heart rate, each participant was provided with a specific target heart rate range to achieve during their exercise sessions (ranged from moderate to vigorous intensity). Each participant's target heart rate range was adjusted every few weeks in the study to accommodate for acclimatization to increasing activity. Using the guidelines from the American College of Sports Medicine (ACSM; 2010), the first four weeks required participants to engage in exercise intensities between 50 – 65 percent of their heart rate reserve (HRR; calculated using Karvonen formula; ACSM, 2010). The latter four weeks involved exercise intensities between 60 – 70 percent of their HRR. Participants were encouraged to stay within their prescribed heart rate range throughout the duration of their exercise session, but were permitted to lower the intensity if they felt it was too vigorous.

As noted, both the intensity and duration were modified over the exercise sessions in the research facility. At the beginning of the program, participants were asked to exercise for a minimum of 30 minutes per session, and increase this duration to 45-60 minutes by the program completion (week 8). All participants were required to start their exercise session with an adequate warm-up (2-5 minutes) and an active cool down until their heart rate neared pre-exercise levels. Both the warm-up and cool down duration were included in the entire exercise session duration.

Finally, the location of exercise sessions was altered over the eight week program. In weeks 1 and 2, three exercise sessions took place within the exercise research facility, while one session occurred in the participant's location of choice (e.g., at home, at their local community centre, or fitness facility). In weeks 3, 4, and 5, the participants exercised in exercise research facility for two sessions, with the remaining sessions (two) occurring in their preferred exercise location. In weeks 6, 7, and 8, the participants only exercised in the research facility once, with the remaining sessions (three) occurring in their preferred location. The hours of the exercise facility were set for the duration of the research study to allow participants the ability to drop in when they were available. Moreover, the hours provided aimed to capture realistic availability of participants (i.e., early weekday morning, lunch hour, evening hours, and Saturday mornings).

Results

Attrition

As evident in similar longitudinal research, approximately half of the enrolled participants typically withdraw from the exercise program (Dishman, 1982; Duncan, Hall, Wilson, & Rodgers, 2012; Duncan, Rodgers, Hall, & Wilson, 2011). In the current sample, approximately 46% of females assessed at baseline, dropped out of the exercise program, leaving only 78 participants at the end of the study (i.e., week 36 assessment).

A multivariate analysis of variance revealed no significant differences at baseline on BMI, health or appearance outcomes (likelihood and value), self-efficacy (task, coping, scheduling) and exercise intentions (maintain and increase) between participants who adhered to the intervention or dropped out (see Table 3 for descriptive statistics between groups). A significant difference was noted between adherers and dropouts for age, $F(11, 133) = 7.49$, $p = .007$, with participants who dropped out representing a lower mean age (32.9 years old) versus those who remained (37.1 years old) in the intervention. Given the purpose of the current study, further analyses were conducted utilizing only the participants who completed all assessment points (up to week 36).

Descriptive statistics

Descriptive statistics for self-efficacy, outcome expectations, and intentions are reported in Table 4. Bivariate correlations were computed, showing significant relationships between measured variables (i.e., self-efficacy, outcome expectations, and intentions) at baseline, week 9, and week 36 (Table 5).

Analysis of each type of self-efficacy revealed significant time effects for task self-efficacy, $F(2, 76) = 17.3$, $p = .000$, partial $\eta^2 = .312$, scheduling self-efficacy, $F(2, 76) = 19.9$, $p = .000$, partial $\eta^2 = .343$, and coping self-efficacy, $F(2, 76) = 24.6$, $p = .000$, partial $\eta^2 = .393$ over the assessment points (week 0, 9, and 36).

Similarly, changes in reported health likelihood, $F(2, 76) = 4.5$, $p = .014$, partial $\eta^2 = .106$, appearance value, $F(2, 76) = 5.23$, $p = .007$, partial $\eta^2 = .121$, and appearance likelihood, $F(2, 76) = 3.89$, $p = .026$, partial $\eta^2 = .092$, were significant. No significance was noted for health value between assessment points.

Main analysis

Hierarchical multiple regression analyses were conducted at each time point to examine the hypothesized relationships between social cognitive variables (i.e., outcome expectations and self-efficacy) and intentions. Given the existing evidence linking self-efficacy and intentions (Gao, Lodewyk, & Zhang, 2009; Lippke, Wiedemann, Ziegelmann, Reuter, & Schwarzer, 2009; Maddux et al., 1982; Rodgers & Brawley, 1996) and previous research noting outcome expectations may be more prone to subjective experiences over time (Gao, Xiang, et al., 2008;

Loehr, Baldwin, Rosenfield, & Smits, 2014), outcome expectations were entered first, followed by self-efficacy and intentions. Outcome expectations (i.e., appearance/health likelihood and value) were independently included in the regression to determine their respective influences on intentions to maintain or increase their exercise behaviour (Table 6 and Table 7).

Prediction of Intention at Baseline. A non-significant full model was observed for intentions to increase current activity level at baseline, $F(7, 70) = 1.07$, $p = .391$. The lack of significant contributions of outcome expectations and self-efficacy at baseline for behavioural intention is surprising and will be considered in the discussion section.

Prediction of Intention at Week 9. Outcome expectations entered in Step 1, explained 9% of the variance in intentions to maintain current activity level. Upon addition of self-efficacy at Step 2, the total variance explained by the model as a whole was 33%, $F(7, 70) = 6.39$, $p = .000$. At Step 1, appearance likelihood was significant at $\beta = .25$, $p = .023$. However in the final model, only task self-efficacy was statistically significant, recording a beta value of .27 ($p = .023$).

Outcome expectations did not significantly contribute to intention to increase activity level at week 9, however the addition of self-efficacy explained 11% of the variance in intention, R square change = .11, F change (3, 70) = 3.09, $p = .032$. Although the model as a whole was not significant, scheduling self-efficacy approached significance ($\beta = .28$, $p = .071$) suggesting possible underpowered effects.

Prediction of Intention at Week 36. The full model (outcome expectations and self-efficacy) significantly predicted intention to maintain current activity level, $F(7, 70) = 7.08$, $p = .000$. In the final model, three variables were statistically significant, with scheduling self-efficacy recording a higher beta value ($\beta = .53$, $p = .000$) than both appearance likelihood ($\beta = .41$, $p = .004$) and task self-efficacy ($\beta = -.35$, $p = .008$).

Finally, as seen in Table 7, the outcome expectation - health value (β= .43, *p* = .003), was the only significant predictor of intention to increase activity level. None of the self-efficacy constructs made any additional contribution to the prediction, however the full model was significant, $F(7, 70) = 2.60$, $p = .020$.

Discussion

The purpose of the current study was to examine outcome expectancy (appearance/health likelihood and value) and self-efficacy (task, scheduling, and coping) in predicting intention for exercise over time among a sample of female exercise initiates. Female exercisers' intentions to maintain her current activity level (until the next assessment) as well as her intentions to increase current activity level (over the same time period) were measured. It was hypothesized that outcome expectations would be a stronger predictor in the early stages of exercise adoption (i.e., week 0) while self-efficacy would be more predictive of exercise intention in the latter weeks (i.e., week 9, week 36). Overall the findings offer some support for the hypotheses.

A non-significance effect was observed when examining the predictive ability of outcome expectations and self-efficacy on intention to increase level of activity at baseline. The reported self-efficacy scores of participants are in line with previous research among novice exercisers (e.g., DuCharme & Brawley, 1995; Duncan et al., 2011; Rodgers & Gauvin, 1998). Marcus, Selby, Niaura, and Rossi (1992) found that individuals who had yet to experience exercise had less confidence in their ability to engage versus those who exercise regularly. The authors found that participants in early phases of exercise adoption may benefit from informational and motivational experiences designed to increase the appeal of physical activity (e.g., outcome expectations). Thus, given the lower confidence of participants at program initiation, it was hypothesized that outcome expectancy would significantly predict intention to increase behaviour, similar to previous findings (Gao, Xiang, et al., 2008; Rodgers & Brawley, 1996). This was not supported. One possible explanation is the proximity of outcomes measured. Recent research by Evans and colleagues found that less active individuals who were primed about the positive proximal outcomes associated with exercise (versus positive distal) elicited greater intrinsic motivation than active individuals (Evans, Cooke, Murray, & Wilson, 2014). As such, the lack of predictive ability of the outcomes in the current study may be a result of their distal occurrence – that is, one's health and appearance will take longer to achieve than non-measured outcomes such as enjoyment or social engagement. This is further supported by Anderson et al. (2006) who suggested that physical activity success may depend on outcome expectations that are easy to realize – in terms of both time and effort – particularly for those with low self-efficacy. As suggested by Evans et al. (2014), targeting proximal outcomes of exercise may be more suitable for less-frequent exercisers at the beginning of their programs.

Examination of intentions at week 9 revealed that appearance likelihood significantly predicted intention to maintain current levels of activity, however, only task self-efficacy remained significant within the full model. Interestingly, Maddux and colleagues (1982) found that when a behaviour was difficult (e.g., exercise participation), those who believed the behaviour was more likely to result in a favourable outcome (i.e., outcome likelihood) expressed greater confidence (i.e., self-efficacy) in their ability to perform. This is consistent with the current findings as expectations that appearance would improve by engaging in exercise (i.e., appearance likelihood) contributed to intention to maintain activity level, but overall the effect was attenuated by task self-efficacy.

No significant findings were observed at week 9 for participant's intention to increase their activity level. By this time in the program, it appears that they have achieved the targeted level of participation in terms of frequency and duration of exercise sessions. However, it is important to note that scheduling self-efficacy approached significance (β = .28, p = .071). Rodgers and Sullivan (2001) found that task self-efficacy may be necessary but not a sufficient condition for regular exercisers, thus it is important or possibly even more important to train individuals in scheduling exercise behaviour once they have confidence for performing the task. It appears that task is related to behaviour maintenance, and thus is critical at the initiation of a program. Once task self-efficacy is established, scheduling and coping self-efficacy are needed to help influence future increases in behaviour, as noted by the trend in the present study. As such, current findings suggest that those wishing to increase their level of activity may have been more likely to do so as a result of their scheduling self-efficacy. Incorporating more tools for planning exercise behaviour may have assisted participants intending to increase their current level of activity, as planning interventions have been found to be effective in increasing health behaviour (Gollwitzer & Sheeran, 2006).

This suggestion is supported in the data collected at the last assessment of the exercise program (i.e., week 36). The analysis highlighted that scheduling self-efficacy was the strongest predictor of intentions to maintain current level of activity, with additional contribution from appearance likelihood and task self-efficacy. The role of self-efficacy (i.e., scheduling and task) in predicting intention to maintain current activity level is reflective of previous literature with novice participants. Gao and colleagues found that after participants passed the midpoint of their weight training program, self-efficacy played a more important role (Gao, Xiang, et al., 2008). Specifically, after students mastered basic skills and increased their knowledge of training, self-efficacy explained most of the variability in future intentions and actual behaviour (Gao, Xiang, et al., 2008). It appears that different challenges have to be met during the course of a physical activity change and self-efficacy is required to master these tasks successfully (Luszczynska &Tryburcy, 2008; Rodgers, Murray, Courneya, Bell, & Harber, 2009). It is important to note that task self-efficacy appears to be exhibiting net suppression, as it appears to enhance the effect of other variables in the set of independent variables (Tabachnick & Fidell, 2013). Specifically, the regression weight sign is opposite to what is theoretically expected and observed in the correlation with the dependent variable (i.e., absolute value of correlation smaller than beta weight of independent variable). Unfortunately, there is a lack of statistical analysis to assess the degree of difference required between a regression weight and correlation to identify suppression (Smith, Ager, & Williams, 1992).

As previously mentioned, women tend to report appearance/weight management and fitness/health management as the primary incentives for undertaking exercise behaviour (e.g., Cash et al., 1994; O'Dougherty et al., 2010; Rodgers & Gauvin, 1998). This is supported in the current findings as intention to maintain current activity levels was also predicted by the likelihood that appearance would increase as a result of that activity. Rodgers and Gauvin (1998) found that regardless of exercise frequency, both moderately and highly active women had parallel incentives for appearance (e.g., maintain weight, look good in clothes). Evidently, both outcome expectations and self-efficacy are necessary for behaviour maintenance. This is supported by the suggestion put forth by Bandura (1986) whereby self-efficacy and incentives (i.e., outcome expectations) are individually insufficient to motivate behaviour; a person must be both efficacious and have the necessary incentives.

Finally, it appears that participants' intentions to increase their activity level at week 36 are a result of the perceived importance of physical health (i.e., outcome value). Given health is one of the seven "life goals" (Ingledew, Markland, & Ferguson, 2009), it is not surprising that this is the only outcome contributing to future intentions to increase behaviour. Ingledew and Markland (2008) found that health is highly valued among older adults (M_{age} = 40.3 years; current sample M_{age} = 37 years) and health/fitness motives are positively correlated with exercise participation. Moreover, Dzewaltowski (1989) found that outcome expectations may operate independently, such that the belief in a valued outcome provides enough incentive to allow other cognitive mechanisms to mediate the number of days exercised per week. Findings from Evans et al. (2014) contribute to this suggestion as proximal outcomes (e.g., reduction in stress, enjoyment) did not influence the intrinsic motivation of high frequency exercisers. As such, more experienced exercisers (i.e., participants assessed at week 36) may be able to recognize the distal benefits of exercise such as improved health, unlike less active participants who doubt they will be achieved (Ouellette & Wood, 1998), or who need more immediate rewards to motivate participation. Interestingly, perceived importance of health has previously been found to predict a physically active lifestyle. Among a sample of American adults (61% women), only gender and perceived importance of health significantly predicted meeting the prescribed physical activity guidelines. Additionally, increased perceptions of health risks of physical inactivity improved the odds of meeting the guidelines by 40% (Martin et al., 2000).

The present study is not without limitations. First, more micro-level observations in the changes of outcome expectations and self-efficacy could be achieved with additional assessment points. More specifically, use of measurement tools within the 8 week structured program (i.e., every two weeks) may have shed light on the incremental changes to allow improved interpretation on predictive behaviour. For example, given the change in significance at week 0 to week 9 on both outcome expectations and self-efficacy, more frequent measurement of these variables may highlight patterns of change. Second, despite the novel investigation of overweight and obese women, generalization of the results is cautioned. More lean women may not report the same influence of imagery on their identity score, and differences in self-reported exercise behaviour may be observed. Lastly, the lack of diversity on outcome expectations may have contributed to a non-significant finding at baseline for intention to increase activity. As previously noted, women tend to report appearance/weight management and fitness/health management as the primary incentives for undertaking exercise behaviour (e.g., Cash et al., 1994; O'Dougherty et al., 2010; Rodgers & Gauvin, 1998). However evidence further alludes to the diversity of outcome expectations associated with exercise engagement among sedentary females (O'Dougherty et al., 2010), and the possible differences in temporality of said outcomes (Evans et al., 2014). As such, future research may aim to include more varied outcome expectations (e.g., physical, social, emotional; distal/proximal) to identify contributors which are more salient on intention at the initiation of an exercise program and over time. Finally, the current study utilized participants who self-selected into the exercise program, and thus may have already held expectations or previous experience with exercise engagement. Therefore results are restricted to populations who were previously inactive but held a desire to begin regular activity.

In conclusion, the findings of the current study support the suggestions of Rodgers and Brawley (1996), in that self-efficacy and outcome expectations have independent influence on intentions. The current study extends the literature in showing that the patterns of influence of self-efficacy and outcome expectations on behaviour change over time, albeit at particular stages in exercise adoption. Specifically, when an individual initiates an exercise program, the need to achieve a particular outcome (e.g., improved health, reduced stress) may contribute to regular exercise as much as level of confidence. However, once exercise is adopted, particular cognitions (e.g., self-efficacy) may be more effective at sustaining the behaviour. It appears that outcome expectations and self-efficacy have an impact on intentions to engage in exercise behaviour, and this contribution changes over time. Future research should aim to further explore these changes in novel populations in an effort to develop targeted messages to implement at appropriate times in exercise adoption/maintenance.

References

American College of Sports Medicine (ACSM) (2010). *ACSM's guidelines for exercise testing and prescription* (8th ed). Philadelphia, PA: Lippincott Williams &Wilkins.

Anderson, E. S., Wojcik, J. R., Winett, R. A., & Williams, D. M. (2006). Social-cognitive determinants of physical activity: The influence of social support, self-efficacy, outcome expectations, and self-regulation among participants in a church-based health promotion study. *Health Psychology, 25,* 510-520. doi: http://dx.doi.org/10.1037/0278-6133.25.4.510

Bandura, A. (1977). Self-efficacy: Toward a unifying theory of behavioral change. *Psychological Review, 84,* 191-215. doi: http://dx.doi.org/10.1037/0033-295X.84.2.191

Bandura, A. (1986). *Social foundations of thought and action.* Eaglewood Cliffs, NJ: Prentice-Hall, Inc.

Bandura, A. (1997). *Self-efficacy: The exercise of control*. New York, NY: Freeman.

Bandura, A. (2004). Health promotion by social cognitive means. *Health Education & Behavior, 31*(2), 143-164. doi: http://dx.doi.org/10.1177/1090198104263660

Brawley, L. R., & Latimer, A. E. (2007). Physical activity guides for Canadians: Messaging strategies, realistic expectations for change, and evaluation. *Canadian Journal of Public Health*, *98*(Suppl. 2), S170-184.

Cash, T. F., Now, P. L., & Grant, J. R. (1994). Why do women exercise? Factor analysis and further validation of the Reasons for Exercise Inventory.*Perceptual and Motor Skills*, *78*(2), 539-544. doi: http://dx.doi.org/10.2466/pms.1994.78.2.539

Conn, V. S. (1998). Older women: Social cognitive theory correlates of health behavior. *Women & Health*, *26*(3), 71-85. doi: http://dx.doi.org/10.1300/J013v26n03_05

Cronbach, L. (1951). Coefficient alpha and the internal structure of tests.*Psychometrika*, *16*, 297–334. doi: http://dx.10.1007/BF02310555

Dawson, K. A., Gyurcsik, N. C., Culos-Reed, S. N., & Brawley, L. R. (2001). Perceived control: A construct that bridges theories of motivated behavior. In G. C. Roberts (Ed.), *Advances in motivation in sport and exercise* (pp. 321-356). Champaign, IL: Human Kinetics.

Dishman, R. K. (1982). Compliance/adherence in health-related exercise.*Health Psychology*, *1*(3), 237-267. doi: http://dx.doi.org/10.1037/0278-6133.1.3.237

DuCharme, K. A., & Brawley, L. R. (1995).Predicting the intentions and behavior of exercise initiates using two forms of self-efficacy. *Journal of Behavioral Medicine, 18*(5), 479-497. doi: http://dx.doi.org/10.1007/BF01904775

Duncan, L. R., Hall, C. R., Wilson, P. M., & Rodgers, W. M. (2012).The use of a mental imagery intervention to enhance integrated regulation for exercise among women commencing an exercise program. *Motivation and Emotion*, *36*(4), 452-464. doi: http://dx.doi.org/10.1007/s11031-011-9271-4

Duncan, L. R., Rodgers, W. M., Hall, C. R., & Wilson, P. M. (2011).Using imagery to enhance three types of exercise self-efficacy among sedentary women. *Applied Psychology: Health and Well-Being*, *3*(1), 107-126.

Dzewaltowski, D. A. (1989).Toward a model of exercise motivation. *Journal of Sport & Exercise Psychology*, *11*, 251-269.

Evans, M. G. (1991). The problem of analyzing multiplicative composites: Interactions revisited. *American Psychologist*, *46,* 6-15. doi: http://dx.doi.org/10.1037/0003-066X.46.1.6

Evans, M. B., Cooke, L. M., Murray, R. A., & Wilson, A. E. (2014).The sooner, the better: Temporally proximal exercise outcomes promote intrinsic motivation. *Applied Psychology: Health and Well-Being, 6*(3), 347-361.doi:10.1111/aphw.12032

Gao, Z., Lee, A. M., & Harrison, L. (2008). Understanding students' motivation in sport and physical education: From the expectancy-value model and self-efficacy theory perspectives. *Quest*, *60*(2), 236-254. doi: http://dx.doi.org/10.1080/00336297.2008.10483579

Gao, Z., Lodewyk, K., & Zhang, T. (2009). The role of ability beliefs and incentives in middle school students' intentions, cardiovascular fitness, and effort. *Journal of Teaching in Physical Education*, *28*(1), 3-20.

Gao, Z., Xiang, P., Lee, A. M., & Harrison, L., Jr. (2008). Self-efficacy and outcome expectancy in beginning weight training class: Their relations to students' behavioral intention and actual behavior. *Research Quarterly for Exercise and Sport, 79*(1), 92-100. doi: http://dx.doi.org/10.5641/193250308X13086753543059

Gollwitzer, P. M., & Sheeran, P. (2006). Implementation intentions and goal achievement: A meta-analysis of effects and processes. *Advances in Experimental Social Psychology*, *38*, 69-119.doi: http://dx.doi.org/10.1016/S0065-2601(06)38002-1

Hall, P. A., & Fong, G. T. (2007). Temporal self-regulation theory: A model for individual health behavior. *Health Psychology Review, 1*, 6-52. doi: http://dx.doi.org/10.1080/17437190701492437

Ingledew, D. K., & Markland, D. (2008). The role of motives in exercise participation. *Psychology and Health*, *23*(7), 807-828. doi: ttp://dx.doi.org/10.1080/08870440701405704

Ingledew, D. K., Markland, D., & Ferguson, E. (2009). Three levels of exercise motivation. *Applied Psychology: Health and Well-Being*, *1*(3), 336-355.

Kirsch, I. (1995). Self-efficacy and outcome expectancies: A concluding commentary. In J. E. Maddux (Ed.), *Self-efficacy, adaptation, and adjustment*: *Theory research and application* (pp. 331-345). New York, NY: Plenum.

Lippke, S., Wiedemann, A. U., Ziegelmann, J. P., Reuter, T., & Schwarzer, R. (2009). Self-efficacy moderates the mediation of intentions into behavior via plans. *American Journal of Health Behavior*, *33*(5), 521-529. doi: http://dx.doi.org/10.5993/AJHB.33.5.5

Loehr, V. G., Baldwin, A. S., Rosenfield, D., & Smits, J. (2014). Weekly variability in outcome expectations: Examining associations with related physical activity experiences during physical activity initiation. *Journal of Health Psychology*, *19*, 1309-3019. doi: http://dx.doi.org/10.1177/1359105313488981

Luszczynska, A., & Tryburcy, M. (2008). Effects of a self-efficacy intervention on exercise: The moderating role of diabetes and cardiovascular diseases. *Applied Psychology*, *57*(4), 644-659.doi: http://dx.doi.org/10.1111/j.1464-0597.2008.00340.x

Maddux, J. E. (1993). Social cognitive models of health and exercise behavior: An introduction and review of conceptual issues. *Journal of Applied Sport Psychology*, *5*, 116-140.doi: http://dx.doi.org/10.1080/10413209308411310

Maddux J. E., Brawley L., & Boykin A. (1995).Self-efficacy and healthy behavior: Prevention, promotion, and detection. In J. E. Maddux (Ed.), *Self-efficacy, adaptation, and adjustment: Theory research and application* (pp. 173-202).New York, NY: Plenum.

Maddux, J. E., Sherer, M., & Rogers, R. W. (1982). Self-efficacy expectancy and outcome expectancy: Their relationship and their effects on behavioral intentions. *Cognitive Therapy and Research, 6*(2), 207-211. doi: http://dx.doi.org/10.1007/BF01183893

Marcus, B. H., Selby, V. C., Niaura, R. S., & Rossi, J. S. (1992). Self-efficacy and the stages of exercise behavior change. *Research Quarterly for Exercise and Sport*, *63*(1), 60-66.doi: http://dx.doi.org/10.1080/02701367.1992.10607557

Martin, S. B., Morrow, J. R., Jackson, A. W., & Dunn, A. L. (2000). Variables related to meeting the CDC/ACSM physical activity guidelines. *Medicine and Science in Sports and Exercise*, *32*(12), 2087-2092. doi: http://dx.doi.org/10.1097/00005768-200012000-00019

McAuley, E., Motl, R. W., White, S. M., & Wójcicki, T. R. (2010).Validation of the multidimensional outcome expectations for exercise scale in ambulatory, symptom-free persons with multiple sclerosis. *Archives of Physical Medicine and Rehabilitation*, *91*(1), 100-105. doi: http://dx.doi.org/10.1016/j.apmr.2009.09.011

Murray, T. C., Rodgers, W. M., & Fraser, S. N. (2009).Examining implementation intentions in an exercise intervention: The effects on adherence and self-efficacy in a naturalistic setting. *Journal of Applied Social Psychology*, *39*(10), 2303-2320. doi: http://dx.doi.org/10.1111/j.1559-1816.2009.00527.x

Norris, R., Carroll, D., & Cochrane, R. (1990).The effects of aerobic and anaerobic training on fitness, blood pressure, and psychological stress and well-being. *Journal of Psychosomatic Research*, *34*(4), 367-375. doi: http://dx.doi.org/10.1016/0022-3999(90)90060-H

O'Dougherty, M., Kurzer, M. S., & Schmitz, K. H. (2010).Shifting motivations: Young women's reflections on physical activity over time and across contexts. *Health Education & Behavior*, *37*(4), 547-567. doi: http://dx.doi.org/10.1177/1090198110361316

Ouellette, J. A., & Wood, W. (1998). Habit and intention in everyday life: The multiple processes by which past behavior predicts future behavior. *Psychological Bulletin, 124,* 54-74. doi: http://dx.doi.org/10.1037/0033-2909.124.1.54

Resnick, B. (2005). Reliability and validity of the Outcome Expectations for Exercise Scale-2.*Journal of Aging and Physical Activity*, *13*(4), 382-394.

Resnick, B., Palmer, M. H., Jenkins, L. S., & Spellbring, A. M. (2000). Path analysis of efficacy expectations and exercise behaviour in older adults. *Journal of Advanced Nursing*, *31*(6), 1309-1315. doi: http://dx.doi.org/10.1046/j.1365-2648.2000.01463.x

Resnick, B., Zimmerman, S. I., Orwig, D., Furstenberg, A., & Magaziner, J. (2000). Outcome expectations for exercise scale: Utility and psychometrics. *Journal of Gerontology*, *55B,* S352-S356.doi: http://dx.doi.org/10.1093/geronb/55.6.S352

Rodgers, W. M., & Brawley, L. R. (1991).The role of outcome expectancies in participation motivation. *Journal of Sport and Exercise Psychology*, *13*(41), 1-427.

Rodgers, W. M., & Brawley, L. R. (1996).The influence of outcome expectancy and self-efficacy on the behavioral intentions of novice exercisers. *Journal of Applied Social Psychology, 26*(7), 618-634. doi: http://dx.doi.org/10.1111/j.1559-1816.1996.tb02734.x

Rodgers, W. M., & Gauvin, L. (1998).Heterogeneity of incentives for physical activity and self-efficacy in highly active and moderately active women exercisers. *Journal of Applied Social Psychology*, *28*, 1016-1029. doi: http://dx.doi.org/10.1111/j.1559-1816.1998.tb01665.x

Rodgers, W. M., Murray, T. C., Courneya, K. S., Bell, G. J., & Harber, V. J. (2009).The specificity of self-efficacy over the course of a progressive exercise programme. *Applied Psychology: Health and Well-Being*, *1*(2), 211-232.

Rodgers, W. M., & Sullivan, M. J. (2001).Task, coping, and scheduling self-efficacy in relation to frequency of physical activity .*Journal of Applied Social Psychology*, *31*(4), 741-753.doi: http://dx.doi.org/10.1111/j.1559-1816.2001.tb01411.x

Rodgers, W. M., Wilson, P. M., Hall, C. R., Fraser, S. N., & Murray, T. C. (2008).Evidence for a Multidimensional Self-Efficacy for Exercise Scale. *Research Quarterly for Exercise and Sport, 79(2),* 1-13. doi: http://dx.doi.org/10.5641/193250308X13086753543590

Rovniak, L. S., Anderson, E. S., Winett, R. A., & Stephen, R .S. (2002). Social cognitive determinants of physical activity in young adults: A prospective structural equation analysis. *Annals of Behavioral Medicine, 24,* 149–156. doi: http://dx.doi.org/10.1207/S15324796ABM2402_12

Sallis, J. F., Calfas, K. J., Alcaraz, J. E., Gehrman, C., & Johnson, M. F. (1999). Potential mediators of change in a physical activity promotion course for university students: Project GRAD. *Annals of al Medicine*, *21*(2), 149-158. doi: http://dx.doi.org/10.1007/BF02908296

Segar, M. L., Eccles, J. S., & Richardson, C. R. (2011). Rebranding exercise: Closing the gap between values and behavior. *International Journal of Behavioral Nutrition and Physical Activity*, *8*, 94-108. doi: http://dx.doi.org/10.1186/1479-5868-8-94

Smith, R. L., Ager, J. W. Jr., & Williams, D. L. (1992). Supressor variables in multiple regression/correlation. *Educational and Psychological Measurement*, *52*, 17-29.

Speck, B. J., & Harrell, J. S. (2003).Maintaining regular physical activity in women: Evidence to date. *Journal of Cardiovascular Nursing*, *18*(4), 282-291. doi: http://dx.doi.org/10.1097/00005082-200309000-00007

Steptoe, A., Rink, E., & Kerry, S. (2000). Psychosocial predictors of changes in physical activity in overweight sedentary adults following counseling in primary care. *Preventive Medicine*, *31*(2), 183-194. doi: http://dx.doi.org/10.1006/pmed.2000.0688

Tabachnick, B. G., & Fidell, L. S. (2013).*Using multivariate statistics* (6th ed.). Boston, MA: Pearson.

Thomas, S., Reading, J., & Shephard, R.J. (1992).Revision of the Physical Activity Readiness Questionnaire (PAR-Q). *Canadian Journal of Sport Sciences*, *17*(4), 338–345.

Wadden, T. A., Brownell, K. D., & Foster, G. D. (2002). Obesity: Responding to the global epidemic. *Journal of Consulting and Clinical Psychology*, *70*, 510-525. doi: http://dx.doi.org/10.1037/0022-006X.70.3.510

Warburton, D. E., Nicol, C. W., & Bredin, S. S. (2006). Health benefits of physical activity: the evidence. *Canadian Medical Association Journal*, *174*, 801-809.doi: http://dx.doi.org/10.1503/cmaj.051351

Williams, D. M., Anderson, E. S., & Winett, R. A. (2005). A review of the outcome expectancy construct in physical activity research. *Annals of Behavioral Medicine*, *29*(1), 70-79. doi: http://dx.doi.org/10.1207/s15324796abm2901_10

World Health Organization. (2000). Obesity: Preventing and managing the global epidemic. *World Health Organization Technical Report Series, 894*, 1-253.

Table 3

Means (and Standard Deviations) of Demographic Characteristics of Entire Sample at Baseline

Variable	Adherers (*n* = 78)	Drop-outs (*n* = 67)
Age (years)	37.1 (8.9)	32.9 (9.7)
Height (cm)	164.3 (6.4)	165.7 (6.1)
Weight (kg)	83.4 (14.5)	84.0 (14.4)
Body Mass Index (kg/m^2)	30.8 (4.4)	30.8 (4.5)

Table 4

Means (and Standard Deviation) for Self-efficacy, Outcome Expectations, and Intentions

Variable	Time 1 (Baseline) M (SD)	Time 2 (Week 9) M (SD)	Time 3 (Week 36) M (SD)	α
Self-efficacy				
Task	80.1 (13.7)	87.6 (11.2)	82.2 (15.6)	.75
Scheduling	68.3 (18.4)	80.3 (15.6)	70.1 (22.6)	.83
Coping	49.9 (20.6)	67.6 (18.9)	61.9 (23.3)	.79
Outcome Expectation				
Appearance Likelihood	7.8 (1.2)	8.1 (1.2)	8.0 (1.4)	
Appearance Value	8.0 (1.1)	8.4 (.87)	8.3 (1.2)	
Health Likelihood	8.3 (.95)	8.6 (.81)	8.4 (.90)	
Health Value	8.7 (.55)	8.8 (.52)	8.7 (.72)	
Intention				
To maintain	2.7 (2.2)	6.0 (1.2)	4.6 (2.1)	
To increase	6.7 (.63)	4.9 (1.7)	5.9 (1.3)	

Note. Self-efficacy is rated on a confidence scale ranging from 0% = *no confidence* to 100% = *completely confident*. Outcome likelihood is rated on a 9-point Likert scale anchored at 1 = *definitely do not expect this to happen* and 9 = *definitely expect this to happen*. Outcome value items are rated on a 9-point Likert scale anchored at 1 = *undesirable* and 9 = *desirable*. Exercise intentions (maintain and increase) are rated on a 7-point Likert scale ranging from 1 = *strongly disagree* to 7 = *strongly agree*.

Table 5

Zero Order Correlations of Self-efficacy, Outcome Expectations, and Intentions at Weeks 0, 9, and 36.

Measure	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.	16.	17.	18.	19.	20.	21.	22.	23.	24.	25.	26.	27.
1. AL Wk 0	-																										
2. AV Wk 0	.42**	-																									
3. HL Wk 0	.49**	.08	-																								
4. HV Wk 0	.38**	.12	.52**	-																							
5. TST Wk 0	.07	.03	-.01	.28*	-																						
6. SSE Wk 0	-.05	-.00	-.04	.06	.41**	-																					
7. CSE Wk 0	.00	.04	.07	.17	.41**	.59**	-																				
8. IntMWk 0	.02	.11	-.00	-.12	-.18	-.13	-.18	-																			
9. IntIWk 0	.08	.02	.15	.23*	-.04	-.13	.05	-.32**	-																		
10. AL Wk 9	.51**	.16	.34**	.24*	.14	.02	-.08	.04	-.09	-																	
11. AV Wk 9	.45**	.56**	.24*	.11	-.05	.12	.06	-.01	.04	.43**	-																
12. HL Wk 9	.43**	.06	.49**	.31**	.04	-.08	-.05	-.02	.10	.63**	.31**	-															
13. HV Wk 9	.33**	-.01	.32**	.58**	.39	.21	.15	-.28*	.07	.43**	.32**	.39**	-														
14. TST Wk 9	-.03	-.21	.10	.15	.54**	.15	.13	-.12	-.03	.23*	-.04	.19	.38**	-													
15. SSE Wk 9	-.05	-.07	.03	.09	.23*	.34**	.15	-.14	-.01	.35**	.19	.19	.29*	.47**	-												
16. CSE Wk 9	-.13	-.21	.16	.15	.28*	.26*	.37**	-.25*	.12	.13	.14	.12	.27*	.40**	.60**	-											
17. IntMWk 9	-.08	.07	.18	.08	.35**	.11	.10	.05	-.03	.35**	.09	.20	.25*	.48**	.51**	.45**	-										
18. IntIWk 9	.19	.13	.06	.22	.04	.23*	.01	-.01	.05	.19	.10	.15	.18	.04	.32**	.28*	.03	-									
19. AL Wk 36	.51**	.21	.53**	.34**	.00	-.03	.02	.13	.03	.77**	.36**	.52**	.35**	.12	.27*	.19	.35**	.21	-								

Measure	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.	16.	17.	18.	19.	20.	21.	22.	23.	24.	25.	26.	27.
20. AV Wk 36	.31**	.45**	.16	-.00	-.31	-.07	-.17	.09	.07	.32**	.66**	.19	.06	-.22	.04	.01	.04	.09	.44**	-							
21. HL Wk 36	.33**	.06	.62**	.23*	.04	.06	.04	.17	.14	.42**	.26*	.56**	.14	.07	.08	.15	.26*	.10	.53**	.26*	-						
22. HV Wk 36	.32**	.05	.45**	.53**	.23*	.09	.18	-.18	.11	.50**	.27*	.40**	.69**	.26*	.35**	.30**	.37**	.18	.62**	.15	.38**	-					
23. TST Wk 36	.10	-.19	.31**	.37**	.51**	.21	.32**	-.10	.02	.25*	-.07	.13	.36**	.61**	.33**	.43**	.34**	.16	.30**	-.10	.24*	.47**	-				
24. SSE Wk 36	.11	-.03	.15	.17	.19	.27*	.18	-.01	.11	.20	.15	.09	.14	.19	.47**	.36**	.12	.29**	.24*	.09	.26*	.31**	.52**	-			
25. CSE Wk 36	.06	-.09	.26*	.18	.23*	.27*	.46**	-.07	.18	.19	.19	.17	.16	.22	.33**	.66**	.16	.23*	.28*	.12	.34**	.29*	.59**	.71**	-		
26. IntMWk 36	.05	.15	.09	-.07	-.12	-.16	-.12	.23*	-.02	.13	.12	.01	-.11	-.13	.12	.11	.07	.12	.28*	.20	.13	.04	-.10	-.01	-.07	-	
27. IntIWk 36	.22	-.07	.15	.23*	.07	.17	.24*	-.21	.18	.14	.12	.15	.27*	.10	.11	.24*	.08	.44**	.09	.07	.14	.31**	.02	.11	.18	-.21	-

** significant at 0.01

Note. AL = appearance likelihood; AV = appearance value; HL = health likelihood; HV = health value; TSE = task self-efficacy; SSE = scheduling self-efficacy; CSE = coping self-efficacy; IntM = intention to maintain current activity level; IntI = intention to increase current activity level.

Table 6

Prediction of Intention to Maintain Activity Level by Outcome Expectations and Self-efficacy

Model	R^2adjusted	β	*p*
Week 0			
OE + SE I	-.02		*ns*
Week 9			
OE + SE I	.33		.000
AL		.25	*ns*
AV		-.05	*ns*
HL		-.04	*ns*
HV		-.04	*ns*
TSE		.27	.02
SSE		.19	*ns*
CSE		.22	*ns*
Week 36			
OE + SE I	.36		.000
AL		.41	.004
AV		-.03	*ns*
HL		-.13	*ns*
HV		-.22	*ns*
TSE		-.35	.008
SSE		.53	.000
CSE		.22	*ns*

Note. *p* for the model is a reflection of the overall *F* test, while *p* for the beta weights is based on *t* tests. OE reflects the outcome expectations measured (AL - appearance likelihood; AV - appearance value; HL - health likelihood; HV - health value). SE is self-efficacy (TSE – task; SSE – scheduling; CSE – coping). I is the intention for future exercise behaviour.

Table 7

Prediction of Intention to Increase Activity Level by Outcome Expectations and Self-efficacy

Model	R^2adjusted	β	*p*
Week 0			
OE + SE I	.01		*ns*
Week 9			
OE + SE I	.07		.*ns*
Week 36			
OE + SE I	.13		.020
AL		-.30	*ns*
AV		.13	*ns*
HL		.03	*ns*
HV		.35	.020
TSE		.16	*ns*
SSE		-.12	*ns*
CSE		.26	*ns*

Note. *p* for the model is a reflection of the overall *F* test, while *p* for the beta weights is based on *t* tests. OE reflects the outcome expectations measured (AL - appearance likelihood; AV - appearance value; HL - health likelihood; HV - health value). SE is self-efficacy (TSE – task; SSE – scheduling; CSE – coping). I is the intention for future exercise behaviour.

Figure 7. Schedule of Assessments

Assessment	**Week 0**	**Week 9**	**Week 36**
Demographic Questionnaire	**X**		
Multi-dimensional Self-Efficacy for Exercise Scale	**X**	**X**	**X**
Outcome Expectation Questionnaire	**X**	**X**	**X**
Exercise Intentions	**X**	**X**	**X**
Anthropometrics (height/weight/BMI)	**X**	**X**	**X**

SUMMARY, IMPLICATIONS, AND FUTURE DIRECTIONS

The purpose of this dissertation was to explore the relationship among and within cognitive variables associated with exercise initiation and maintenance in a sample of female exercise initiates. Given the contention that being regularly active can lead to an abundance of physical and psychological health benefits (Penedo & Dahn, 2005), Manuscript 1 aimed to examine the influence of an exercise imagery intervention on exerciser's identity while engaged in an 8 week structured exercise program. Manuscript 2 explored the changes to participant's self-efficacy and outcome expectations over an exercise program, and the contribution of both variables to intentions to maintain or increase exercise behaviour.

More specifically, the purpose of Manuscript 1 was to determine if utilizing imagery scripts targeting components of exercise identity (i.e., role identity and exercise beliefs) could influence the participant's perception of herself and lead to greater fitness and self-reported exercise behaviour. Previous research has noted the ability of imagery scripts to influence targeted cognitive variables such as self-efficacy and motivation (e.g., Cumming & Stanley, 2009; Duncan, Hall, Wilson, & Rodgers, 2012; Duncan, Rodgers, Hall, & Wilson, 2011). The results of the present research further supported the notion that exercise imagery can be utilized to influence exercise cognitions. Females in the exercise imagery condition reported greater role identity at week 9 in the exercise program than control participants. However, imagery did not have a significant influence on fitness or self-reported exercise behaviour. Given the strength of endorsement of a particular identity is linked to engagement in behaviour that agrees with that identity (i.e., identity-consistent behaviour; Anderson, Cychosz, & Franke, 2001; Ryan & Deci, 2003), female initiates in the exercise imagery condition were provided with identity affirmation through the use of the imagery scripts. However, it appears that the amount and perhaps frequency of imagery must be increased if its influence on identity is to be extended to positively impact fitness and exercise behaviour.

Further exploration of cognitive variables among the same sample of female exercise initiates occurred in Manuscript 2, where the use of outcome expectancy (likelihood and value) and self-efficacy (task, scheduling, and coping) in predicting intention for exercise over time was investigated. Previous research has noted that outcome expectations and self-efficacy may influence exercise behaviour at different time points of an exercise program (Gao, Xiang, Lee, & Harrison, 2008; Rodgers & Brawley, 1996). The present results support this suggestion as each variable was expressed at different time points of the intervention. Specifically, task self-efficacy was the only significant predictor of intention to maintain behaviour at week 9, while scheduling self-efficacy was the strongest predictor of intention to maintain behaviour at week 36, with additional contributions from appearance likelihood and task self-efficacy. Interestingly, only health value (i.e., outcome expectation) was found to be a significant predictor of intention to increase activity and only at the final assessment point (week 36). It appears that self-efficacy provides a strong contribution to an exerciser's intention to maintain activity, such that if one has a high level of confidence in their ability to complete the task and schedule it, they are more likely to continue engaging in the behaviour. Moreover, it appears that a female exerciser's intention to increase her exercise behaviour is strongly linked to the value she places on her health, not necessarily the likelihood that engaging in exercise will result in improved health. The findings of Manuscript 2 support the suggestion of Rodgers and Brawley (1996) that self-efficacy and outcome expectations have independent influence on intentions, as well highlights that these variables can quickly change as a result of involvement in a short exercise program.

Despite the contributions of the current research, some limitations are evident and should be highlighted to help guide future research. Of course, directions for future research also need to be noted. Although a longitudinal design was employed in assessing the cognitive variables associated with exercise engagement, the application of imagery scripts was removed at the end of the structured exercise program. Given the lack of interaction effects observed after the 9 week assessment, it appears that the females in the exercise imagery condition may have benefitted from additional imagery scripts or booster sessions. It would be helpful to replicate the present intervention with the addition of individualized scripts to be used once participants have completed the structured exercise program to determine if additional effects are reported while they exercise on their own.

With respect to assessing outcome expectations and self-efficacy, more micro-level observations in the changes of these two variables could have been achieved with additional assessment points. More specifically, use of measurement tools within the 8 week structured program (i.e., every two weeks) may have shed light on the incremental changes to allow improved interpretation on predictive behaviour. For example, given the change in significance at week 0 to week 9 on both outcome expectations and self-efficacy, more frequent measurement of these variables may highlight patterns of change. Moreover, the lack of diversity on outcome expectations may have contributed to a non-significant finding at baseline for intention to increase activity. As previously noted, women tend to report appearance/weight management and fitness/health management as the primary incentives for undertaking exercise behaviour (e.g., Cash, Now, & Grant, 1994; O'Dougherty, Kurzer, & Schmitz, 2010; Rodgers & Gauvin, 1998). However evidence further alludes to the diversity of outcome expectations associated with exercise engagement among sedentary females (O'Dougherty et al., 2010), and the possible differences in the temporality of said outcomes (Evans, Cooke, Murray, & Wilson, 2014). As such, future research should include more varied outcome expectations (e.g., physical, social, emotional; distal/proximal) to identify contributors which are more salient on intention at the initiation of an exercise program and over time. Finally, the current research utilized participants who self-selected into the exercise program who may have already held expectations or previous experience with exercise engagement. Thus, the results are restricted to populations who were previously inactive but held a desire to begin regular activity.

A recent systematic review supported the positive relationship between long-term physical activity and the reduction in selected diseases, including obesity, coronary heart disease, and type 2 diabetes mellitus (Reiner, Niermann, Jekauc, & Woll, 2013). As such, the findings from the present research further contributes to our understanding of variables that influence female initiates continuing exercise participation, and highlight the beneficial application of using imagery in support of this endeavor.

References

Anderson, D. F., Cychosz, C. M., & Franke, W. D. (2001). Preliminary exercise identity scale (EIS) norms for three adult samples. *Journal of Sport Behaviour*, *24*, 1431-1439.

Brawley, L. R., & Latimer, A. E. (2007). Physical activity guides for Canadians: Messaging strategies, realistic expectations for change, and evaluation. *Canadian Journal of Public Health*, *98*(Suppl. 2), S170-184.

Cash, T. F., Now, P. L., & Grant, J. R. (1994). Why do women exercise? Factor analysis and further validation of the Reasons for Exercise Inventory. *Perceptual and Motor Skills*, *78*(2), 539-544. doi: http://dx.doi.org/10.2466/pms.1994.78.2.539

Cumming, J., & Stanley, D. M. (2009). Are images of exercising related to feeling states? *Journal of Imagery Research in Sport and Physical Activity*, *4*(1), 1-23.doi: http://dx.doi.org/10.2202/1932-0191.1033

Duncan, L. R., Hall, C. R., Wilson, P. M., & Rodgers, W. M. (2012).The use of a mental imagery intervention to enhance integrated regulation for exercise among women commencing an exercise program. *Motivation and Emotion*, *36*(4), 452-464. doi: http://dx.doi.org/10.1007/s11031-011-9271-4

Duncan, L. R., Rodgers, W. M., Hall, C. R., & Wilson, P. M. (2011).Using imagery to enhance three types of exercise self-efficacy among sedentary women. *Applied Psychology: Health and Well-Being*, *3*(1), 107-126.

Evans, M. B., Cooke, L. M., Murray, R. A., & Wilson, A. E. (2014).The sooner, the better: Temporally proximal exercise outcomes promote intrinsic motivation. *Applied Psychology: Health and Well-Being*, *6*(3), 347-361.doi:10.1111/aphw.12032

Gao, Z., Xiang, P., Lee, A. M., & Harrison, L., Jr. (2008). Self-efficacy and outcome expectancy in beginning weight training class: Their relations to students' behavioral intention and actual behavior. *Research Quarterly for Exercise and Sport*, *79*(1), 92-100.doi: http://dx.doi.org/10.5641/193250308X13086753543059

Hall, C. R. (2001). Imagery in sport and exercise. In R. N. Singer, H. A. Hausenblas, & C. M. Janelle (Eds.), *Handbook of sport psychology* (2nd ed., pp.529-549). New York, NY: John Wiley & Sons.

Hall, P. A., & Fong, G. T. (2007). Temporal self-regulation theory: A model for individual health behavior. *Health Psychology Review, 1*, 6-52. doi: http://dx.doi.org/10.1080/17437190701492437

O'Dougherty, M., Kurzer, M. S., & Schmitz, K. H. (2010).Shifting motivations: Young women’s reflections on physical activity over time and across contexts. *Health Education & , 37*(4), 547-567. doi: http://dx.doi.org/10.1177/1090198110361316

Penedo, F. J., & Dahn, J. R. (2005). Exercise and well-being: a review of mental and physical health benefits associated with physical activity. *Current Opinion in Psychiatry*, *18*(2), 189-193. doi: http://dx.doi.org/10.1097/00001504-200503000-00013

Reiner, M., Niermann, C., Jekauc, D., & Woll, A. (2013). Long-term health benefits of physical activity: A systematic review of longitudinal studies. *BMC Public Health*, *13*(1), 813-822. doi: http://dx.doi.org/10.1186/1471-2458-13-813

Rodgers, W. M., & Brawley, L. R. (1996).The influence of outcome expectancy and self-efficacy on the behavioral intentions of novice exercisers. *Journal of Applied Social Psychology*, *26*(7), 618-634. doi: http://dx.doi.org/10.1111/j.1559-1816.1996.tb02734.x

Rodgers, W. M., & Gauvin, L. (1998).Heterogeneity of incentives for physical activity and self-efficacy in highly active and moderately active women exercisers. *Journal of Applied Social Psychology, 28*, 1016-1029. doi: http://dx.doi.org/10.1111/j.1559-1816.1998.tb01665.x

Ryan, R. M., & Deci, E. L. (2003). On assimilating identities to the self: A self-determination theory perspective on internalization and integrity within cultures. In M. R. Leary & J. P. Tangney (Eds.), *Handbook of self and identity* (pp. 253-272). New York, NY: Guilford Press.

Appendices

APPENDIX A: Questionnaires – Manuscripts 1 and 2

Demographic Questionnaire– Manuscript 1 and 2

Age: ________

Weight: _______ (kg)

Height: _______ (cm) Body Mass Index (BMI): ______________

Race: _________________________

Please state your combined family income over the past 12 months:

□ less than $5,000	□ $5,000 – 11,999	□ $12,000 – 15,999
□ $16,000 – 24,999	□ $25,000 – 34,999	□ $35,000 – 49,999
□ $50,000 – 74,999	□ $75,000 – 99,999	□ $100,000+
□ Don't know	□ No response	

Education:

□ High school diploma	□ College diploma	□ Bachelor's degree
□ Master's degree	□ Doctorate degree	□ Professional (MD, LLB etc)
□ Other: _____________________________		□ None of the above

Occupation: _____________________________________

Marital Status:

□ Single	□ Separated	□ Married	□ Common Law
□ Divorced	□ Widowed	□ No response	

Do you have children? □ No □ Yes➔Please indicate ages (separated by comma)

____

Exercise Identity Scale (Anderson & Cychosz, 1994) – Manuscript 1

Please indicate on the scale provided the degree to which you strongly disagree (1) or strongly agree (7) with each statement as it applies to you.

	Strongly Disagree						**Strongly Agree**
I consider myself an exerciser	**1**	**2**	**3**	**4**	**5**	**6**	**7**
When I describe myself to others, I usually include my involvement in exercise	**1**	**2**	**3**	**4**	**5**	**6**	**7**
I have numerous goals related to exercising	**1**	**2**	**3**	**4**	**5**	**6**	**7**
Physical exercise is a central factor to my self-concept	**1**	**2**	**3**	**4**	**5**	**6**	**7**
I need to exercise to feel good about myself	**1**	**2**	**3**	**4**	**5**	**6**	**7**
Others see me as someone who exercises regularly	**1**	**2**	**3**	**4**	**5**	**6**	**7**
For me, being an exerciser means more than just exercising	**1**	**2**	**3**	**4**	**5**	**6**	**7**
I would feel a real loss if I were forced to give up exercising	**1**	**2**	**3**	**4**	**5**	**6**	**7**
Exercising is something I think about often	**1**	**2**	**3**	**4**	**5**	**6**	**7**

Exercise Prescription Sample – Manuscript 1 and 2

Each exercise session should be preceded by at least 2-5 min of an active warm-up (i.e. self-paced exercise near the target HR zone) followed by light stretching.

The end of each exercise session should include an active cool-down (i.e. self paced exercise) until HR nears pre-exercise values.

It is more important to try to stay within the HR ranges than to exercise at one particular HR. That means that within each exercise bout it is OK to exercise at various intensities as long as your HR is within the range specified.

If a particular HR zone is too intense, work at a lower intensity for a longer period of time.

Weeks 1-2

Target HR zone: 50 - 60% of HRR (__________ bpm - __________ bpm)

Weeks 3-4

Target HR zone: 55 – 65% of HRR (__________ bpm - __________ bpm)

Weeks 5-8

Target HR zone: 60 – 70% of HRR (__________ bpm - __________ bpm)

Exercise Motivation Study Activity Log Book – Manuscript 1

Please complete the chart **EVERY time** you come into the lab for your workout

Participant #	Date	Time IN	Time On: Treadmill	Time On: Rower	Time On: Bike	Time On: Stepper

Godin Leisure-Time Exercise Questionnaire (Godin & Shepard, 1986) – Manuscript 1

During a typical 7-Day period (a week), how many times, *on average*, do you do the following kinds of exercise for *more than 15 minutes* during your *free time*? Only count those exercise sessions that *are not* associated with the required practices, competitions, or training for your sport (if applicable). Count the number of exercise sessions during your week that are *at least 15 minutes in duration*, and write that number on the line provided.

Times Per Week

a) **STRENUOUS EXERCISE** (heart beats rapidly)

(e.g., running, jogging, hockey, football, soccer, squash, basketball, cross country skiing, judo, roller skating, vigorous swimming, vigorous long distance bicycling). ____________

b) **MODERATE EXERCISE** (not exhausting)

(e.g., fast walking, baseball, tennis, easy bicycling, volleyball, badminton, easy swimming, alpine skiing, popular, and/or folk dancing). ____________

c) **MILD EXERCISE** (minimal effort)

(e.g., yoga, archery, fishing from river bank, bowling, horseshoes, golf, snowmobiling, easy walking). ____________

2. During a typical 7-Day period (a week), in your leisure time, how often do you engage in any regular activity long enough to work up a sweat (heart beats rapidly)?

1. Often _______ 2. Sometimes _______ 3. Rarely/Never _______

Multidimensional Self-Efficacy for Exercise Scale (Rodgers et al., 2008) – Manuscript 2

The following questions are about YOUR confidence for exercising regularly. Examples of such exercise include jogging, biking, swimming, and weight training. Please rate **HOW CONFIDENT YOU ARE THAT YOU CAN PERFORM** each of the exercise related tasks below.

Rate each item on the following scale:

0	**10**	**20**	**30**	**40**	**50**	**60**	**70**	**80**	**90**	**100**
No										**Completely**

How confident are you that you can . . .

1. Exercise when you feel discomfort. ______
2. Complete your exercise using proper technique. ______
3. Include exercise in your daily routine. ______
4. Exercise when you lack energy. ______
5. Follow directions to complete exercise. ______
6. Consistently exercise 3 times per week. ______
7. Exercise when you don't feel well. ______
8. Perform all of the required movements. ______
9. Arrange your schedule to include regular exercise. ______

Exercise Outcome Expectations Questionnaire – Manuscript 2

Please respond to each statement by circling the number that is most appropriate for you.

1. If I exercise, I expect my physical health to improve

1 2 3 4 5 6 7 8 9

Definitely do NOT expect this to happen — Definitely expect this to happen

---

2. For me, improving in my physical health is…

1 2 3 4 5 6 7 8 9

Undesirable — Desirable

---

3. If I exercise, I expect my appearance to improve

1 2 3 4 5 6 7 8 9

Definitely do NOT expect this to happen — Definitely expect this to happen

---

4. For me, improving my appearance is…

1 2 3 4 5 6 7 8 9

Undesirable — Desirable

Exercise Intention (Baseline) – Manuscript 2

Please respond to the following items by circling the most appropriate number.

1. I intend to maintain my current activity level during the next four weeks

   1 2 3 4 5 6 7
   Strongly Disagree Strongly Agree

2. I intend to increase my current activity level during the next four weeks

   1 2 3 4 5 6 7
   Strongly Disagree Strongly Agree

Exercise Intention (Week 9) – Manuscript 2

Please respond to the following items by circling the most appropriate number.

1. I intend to maintain my current activity level during the next nine weeks

1	2	3	4	5	6	7
Strongly Disagree						Strongly Agree

2. I intend to increase my current activity level during the next nine weeks

1	2	3	4	5	6	7
Strongly Disagree						Strongly Agree

Exercise Intention (Week 36) – Manuscript 2

Please respond to the following items by circling the most appropriate number.

1.I intend to maintain my current activity level during the next six months (36 weeks)

1 2 3 4 5 6 7

Strongly Disagree Strongly Agree

2. I intend to increase my current activity level during the next six months (36 weeks)

1 2 3 4 5 6 7

Strongly Disagree Strongly Agree

3. The Canadian Physical Activity Guidelines suggest adults should accumulate at least 150 minutes of moderate- to vigorous-intensity aerobic physical activity per week, in bouts of 10 minutes or more. Moderate to vigorous activities include activities such as brisk walking, bike riding, jogging, or cross-country skiing.

I intend to meet the recommended activity levels set by the Canadian Physical Activity Guidelines during the next six months (36 weeks)

1 2 3 4 5 6 7

Strongly Disagree Strongly Agree

APPENDIX B: Imagery Scripts – Manuscript 1

Week 1

Close your eyes and relax. Imagine that you are walking into the Exercise and Health Psychology Lab for your first workout. The lab is tidy and brightly lit. You hear upbeat music playing over the stereo. You see a few other exercisers in the room. Their faces are friendly. You get the feeling that this is an inviting atmosphere.

Imagine yourself getting prepared for your workout. Imagine hanging up your jacket and placing your bag aside and signing in for the day. You may be feeling nervous about starting up an exercise program. You may be wondering what you are getting yourself into! You may be feeling butterflies in your stomach but that's ok. Think about the reasons you signed up for this study. Exercise is important to you. Think about your goals for this exercise program. Think about the plan you have just made for the week. This week you will be a regular exerciser!

Imagine that you are ready to begin your workout. You are dressed in your workout clothes and you are wearing comfortable running shoes. Imagine the feeling of the heart rate monitor around your rib cage and the watch around your wrist. Imagine feeling excited to get started! Imagine feeling your heart start to beat a bit faster because you are excited.

Now that you are ready to exercise, choose a machine to begin your workout. Maybe you want to start on the treadmill. Maybe you would prefer the bike or the stepper. Imagine yourself getting onto the equipment and beginning to move your body. You are starting at an easy pace, just to get your muscles warmed up. Notice how nice it feels to get your body moving. As your muscles start to loosen up, notice that your movements become more comfortable. Imagine yourself turning up the intensity on the machine. Maybe you increase the grade on the treadmill or the speed of the stepper. If you are on the rower you start to pull harder. Notice the change in your body. Imagine that your heart rate starts to increase and your muscles and skin start to feel really warm; it feels good. Imagine how good it feels to know that you are doing something good for your body.

Imagine that you have completed thirty minutes in your target heart rate zone. You have made it to the end of your workout. You might feel a bit tired. Maybe the last few minutes were a bit tough. Imagine adjusting the settings on your machine to turn down the intensity. As you begin to slow down and take off some of the intensity, you feel your muscles start to relax. Notice that you feel satisfied from this workout. You feel like you are in control. Imagine that your body feels calm but your mind feels invigorated. Imagine feeling proud that you have completed your workout. Take a moment to notice that having finished your first workout in the lab you feel even more comfortable here.

Once your heart rate has come down and your breathing has slowed down, imagine yourself getting off the equipment. It feels a bit strange to be standing on solid ground. Imagine finishing off your workout with a light stretch. As you do this, think about the benefits you have given to your body. Before signing up for this study, you decided that exercise was important to you. Now that you have finished your first workout you feel proud that you are taking action to achieve your goals!

Week 2

Close your eyes, take a deep breath….exhale. You are feeling relaxed and calm. Imagine yourself entering the lab, this is your second week exercising so you are becoming familiar with the routine. As you walk in, you feel comfortable with the surroundings, you put your outdoor clothes in the closet, and complete the sign-in form. Imagine the equipment you will use today, you are getting familiar with the machines. The space feels inviting as you see familiar faces. As you walk down the hall to pick up your heart rate monitor you are confident walking around the lab and feel relaxed as you know where to go.

Before you start your exercise, you notice how comfortable you feel in your workout clothes. You are comfortable with the feeling of the heart rate monitor around your rib cage. You are excited to start another week of exercise. Remind yourself that you are an exerciser and you belong here. Imagine the exercise plan you have made for the week. You can see yourself working hard to reach your goals. Feel the energy you have for your workout and your heart rate increase as you get ready to start.

Now, imagine getting onto your equipment and starting to move your legs and arms. As you begin, you notice a similar feeling. You are aware of the movements your body needs to make and you become comfortable in your warm up. You have done this before. You notice your heart rate and breath begin to pick up, and your muscles start to feel warm. You feel relaxed in the lab and on the equipment. Now that you have been exercising for a week, you notice your body appreciates the chance to move.

As your body gets warmer, you start to increase your intensity. You notice that this time, increasing your intensity feels more natural. You start to settle into a target heart rate which feels comfortable and possible to maintain. You reflect on your exercise plan for the week and work hard to achieve these goals. As you become more settled into a comfortable rhythm, you notice that your mind begins wander. Coming to the exercise lab gives you a chance to take time for yourself. It gives you a time to reflect on your own thoughts and take a break from the tasks you have to do for work or school. Imagine how content you feel, knowing that you are doing something good for your body and your mind. Picture how great you will feel after your workout, and how proud you will feel when you finish.

Now, picture yourself coming to the end of your workout. As you start to slow down your intensity, you start to focus on controlling your breathing. You feel your breaths become slower and relaxed. As you cool down you notice your muscles feel stronger. You have worked hard. You feel satisfied with your progress. You feel comfortable with your ability. As you finish your routine, you remind yourself about your exercise plan. You start thinking about your plan for the next week. Think about when you are coming back to the lab. Imagine the exercises you want to do. You feel confident you have made it to the second week and are excited for the next session. You are gaining confidence in your ability to complete exercises on your own. Think how you are in control of your body. Remind yourself how great you feel, how strong you are, and how far you have come. You are confident you can push ahead to the next visit to the lab.

Week 3

Close your eyes and relax. Think about what you have accomplished as an exerciser so far. When you signed up for this study, you made the decision that exercise is important to you. For two weeks, you have been working toward your exercise goals. Think about the changes that you have made so far. Imagine how good it feels to finish a workout and to know that you have achieved something you wanted to do. Imagine the way you felt when you came to the exercise for the first time. Now, imagine how it felt to come to the lab near the end of week 2. This place feels more comfortable now. When you see other exercisers you feel like you are one of them. You feel like you belong here.

One of the goals of the exercise program is for you to feel confident exercising outside the lab. This week you will do half of your workouts outside the lab. Imagine yourself in one of the places (outside the lab) that you have planned to exercise this week. Imagine the things you like about this exercise environment. Giving yourself the chance to choose where you exercise helps you to be confident that you will enjoy your workout. Recognize how nice it feels to have choices about your exercise. Imagine feeling free and in control of how you can make exercise fit into your day.

Now imagine yourself starting to exercise in the location you chose. Just like you have been doing for the past two weeks, you start with a light warm-up. Imagine the way it feels as you start to move your body through the exercise you have chosen. Imagine your heart starting to beat faster, your muscles starting to feel warmer and your breathing getting a bit heavier. The way that your body feels is comfortable and familiar. It feels good to be exercising.

Now that you are warmed up, imagine starting to exercise more vigorously. As you start to work harder imagine feeling your heart beating faster. Notice that you are beginning to sweat. These feelings help to reassure you that you are working at the proper intensity. Imagine looking at the heart rate monitor and noticing that you are in your target heart rate range. As you exercise at this intensity you are accomplishing your exercise goals. Imagine feeling satisfied knowing that your body and your mind will benefit from this workout.

When you planned your exercise for this week, you decided how long this workout would last. Imagine that as you come to the end of the workout, you still feel good. You are working hard but your body is getting used to the exercise.

Imagine that your workout is complete and you begin to cool down. Imagine the way your body feels as you begin to slow down your movements. Even though your muscles are starting to relax, they feel strong. You notice that your lungs feel flexible, you take a slow, deep breath and it feels refreshing and easy. Imagine feeling your body relax. Imagine that your posture feels confident and tall. This makes you feel like being an exerciser is becoming a part of who you are.

Week 4

Close your eyes, take a deep breath….exhale. You are feeling relaxed. Imagine yourself coming to the exercise lab for your first workout of week four. Picture the lab setting – the equipment, the sounds, the people, and you. See how confident you are walking into the lab. You know what to do and where to go. You have been exercising for three weeks now, and are proud at your accomplishments. Take a moment to reflect on how far you have come and the goals you have met. You feel strong. You feel ready for the next step.

Imagine yourself going through your pre-workout routine. You feel at ease with exercise plans, you know what you can accomplish. Picture yourself signing in, setting up your heart rate monitor, and deciding which machine you will use today. Now, imagine yourself getting onto the equipment and starting your workout. Everything feels so comfortable and familiar. Think about how your body responds when you begin to exercise. Your heart rate starts to climb, your breathing gets heavier and faster, you feel yourself start to sweat. Imagine all of these things feel good. You know you are in control of your body and are excited to push yourself to a new intensity. After three weeks of regular exercise, you know how your body feels when it is in your target heart rate range without even having to look at the watch. This makes you feel like a regular exerciser.

As you continue to exercise you allow your mind to wander. You notice that you are thinking about future exercise sessions. For the past week you, have been choosing where two of your exercise sessions will take place. You enjoy the freedom of making choices about your exercise. You are excited to choose where to workout and what types of exercise you will do. You are confident about your exercise plans – you are comfortable coming into the lab or working out on your own.

As you continue to exercise in the lab, bring your mind back to the way you feel doing your workout. Feel your body move easily and naturally through the movements. You feel strong and in control. You are working hard, but it feels comfortable to be doing it**.** Think about how your exercise makes you feel during the day. Maybe you felt a bit tired during your first few weeks of exercise, now you notice that exercise is helping you to feel energized! Maybe you notice that your core feels strong, your posture is improving, and you feel taller. Maybe you notice you feel more flexible; it is easier for you to do simple day to day activities, reach for something or bend to pick something up. Maybe you notice you feel stronger and more agile as it is easier for you to carry groceries, or do your housework. See how exercising regularly is carrying over into your day to day life.You notice that you don't just feel like an exerciser when you are at the lab, you feel like an exerciser all the time.

As you finish your workout, notice the consistent improvements you have made in your fitness. Today, you feel better after your workout than you did last week. These improvements will continue. Imagine yourself a few weeks from now, exercise will energize you!

As you leave the lab, feeling proud about today's workout, think ahead to your other workouts this week. You are able to imagine your exercise plan for whole week with ease and confidence. You are excited to try exercising in a new setting. You are confident you have to ability to stick to your plan.

Week 5

Close your eyes and relax. Imagine yourself coming into the exercise lab. By now, the lab is a familiar, comfortable place for you. Hear the radio playing upbeat music and the gentle hum of the exercise equipment in the background. Notice that it is a bright, clean, and inviting place. You have been exercising for more than a month now. Think about the changes you have made and the successes you have had since you started coming here.

Imagine yourself making your way around the lab, preparing for your workout. Imagine that you set your personal belongings aside. Maybe you hand up a coat or a bag in the closet, you sign into the book, and you grab a heart rate monitor and put it on. Imagine feeling very comfortable here. Take a moment to notice that after a month, being an exerciser in this lab is a part of who you are. To others, you look like you belong here. You look like a confident exerciser.

Imagine making your way over to your favourite exercise machine. Imagine yourself getting onto the equipment, and starting your warm-up, just like you always do. As you warm up, notice that you feel particularly good today. Your body feels strong and your mind feels alert. Imagine yourself really enjoying the way that exercise makes you feel. You feel really confident doing this exercise.

Now imagine that you have finished your warm-up and you are increasing the intensity of your workout. Imagine yourself increasing the resistance on your machine and working your body harder. Feel your heart rate start to beat harder in your chest. As you increase the intensity you notice that your body feels more comfortable than it used to working at this intensity. Your actions are smooth and strong. The way that your body feels make you feel really good. Now, imagine yourself feeling so confident that you decide to increase the intensity a bit more. You don't make a huge change, just enough to feel a bit more tension in your muscles. Notice that it feels good to be working a bit harder. Imagine feeling confident that your body can handle a little extra work today!

At the end of your workout, you adjust the settings on the machine to bring the intensity back down. Your muscles feel a bit different than they always do since they worked a little bit harder today. Imagine the way that your muscles feel both strong and relaxed once you have finished a workout. Take a moment to acknowledge that you have satisfied your body. Imagine how great it feels to accomplish your exercise goals. Now, take your attention to your thoughts. Notice that you feel psyched up and mentally alert. You are excited that you successfully pushed your limits! You feel motivated for the rest of your workouts this week!

Week 6

Close your eyes, take a deep breath…exhale. See yourself relaxed.

Imagine yourself coming into the exercise lab. The surroundings and people are very familiar to you at this point. You have been exercising for more than a month now. You are extremely comfortable in the setting and are confident you can complete your exercise plan. You can hear the radio playing up beat music and the gentle hum of the exercise equipment in the background. Notice that the lab is a bright, clean, and inviting place. As you get ready for another workout, you think about the changes you've made and the success that you've had since you started coming here. You are filled with feelings of pride.

As you imagine yourself making your way around the exercise area, you feel like you fit in. You look like a confident exerciser and realize that being an exerciser is part of who you are. Other people in the lab see you as an exerciser too. You are really comfortable here. You are ready to start your workout and choose a machine with ease. As you make your way to your favourite exercise machine, imagine yourself getting onto the equipment and starting your warm-up just like you always do. As you warm up notice that you feel particularly good today. Your body feels strong and your mind feels alert. Imagine yourself really enjoying the way that exercise makes you feel. You feel really confident doing this exercise.

As you exercise you imagine how far you have come. You are now able to exercise on your own a lot more since you started and you are confident with your exercise plans. You decide where, when, and how you want to exercise. You are in complete control of your routine. You can be flexible with your schedule and workout how you want. Imagine how great you feel about doing the exercises you like.

As you focus back on your current workout in the lab, imagine you've finished your warm up and you're increasing the intensity of the workout. Maybe you're increasing the speed- moving your body faster, or maybe you're increasing the resistance. As you increase the intensity to your usual level you notice that your body feels more comfortable than it used to. Your actions are smooth and strong. You notice that your heart isn't beating quite as fast as it did when you first started exercising- this makes you feel really good.

Now imagine yourself feeling so confident that you decide to increase the intensity a little bit more. You don't make a huge change, just enough to feel your muscles work a bit harder. Notice that it feels good to be working a little bit harder. You know that your body can handle it, you're sure that your body can manage more work today.

Picture that you have come to the end of your workout. Picture yourself adjusting the settings on your machine to bring the intensity back down. Your muscles feel a bit different than they always do since they worked a little bit harder today but that's okay. Take a minute to acknowledge that you satisfied your body. You are strong and in control. You feel great with your accomplishment today.

Now take your attention to your thoughts. Notice that you feel psyched up and mentally alert. You're excited that you successfully pushed your limits- You feel motivated for the rest of your workouts this week. You are excited to chose your exercises this week and are confident you can complete them. You see yourself working hard and making your exercise routine a part of your day. You are in control.

Week 7

Close your eyes and relax you body. When you began the study, it was important to you to become more active. Now, you are more active. You have been a regular exerciser for six weeks. Exercise is a part of your life. It is a part of your weekly routine and it is a part of who you are.

Imagine yourself coming to the exercise lab for your first workout of week 7. You feel very comfortable here. Picture the equipment and the sound of the music in the background. Picture the other exercisers. When they see you in the lab, ready for a workout they think of you as an exerciser. Notice that in here you feel like a confident exerciser.

Now imagine the plan you have made for your workouts this week and what you have planned to do in the lab today. Picture yourself going through your pre-workout routine. Imagine yourself signing in, setting up your heart rate monitor, and heading toward the machine you will exercise on today.

Now imagine yourself getting onto the equipment and starting your workout. Think about the way your body responds as you begin to exercise. Your heart rate start to pick up, your breathing gets heavier and faster, and you feel yourself start to sweat. All of these things feel good. You feel like you're in control of your body. You can feel when your body gets to your target heart rate range without even having to looking at the watch. You feel in touch with your body, just like a regular exerciser does.

As you exercise your mind starts to wander. You notice that you're thinking about future exercise sessions. The rest of your workouts this week will happen outside the lab. You've made a plan about where and when you'll exercise. You know what type of exercise you will do. Imagine yourself doing this exercise. Imagine how nice it is doing the exercise that you like best.

As you continue to exercise bring your mind back to the way that you feel doing your workout in the lab. Feel your body move easily through the movements. You're working hard but it feels comfortable. Notice that you feel agile and strong. Think about the impact that regular exercise has had on your day-to-day life. Imagine the way that exercise helps you to feel energized. Notice that exercising regularly has made your mind feel sharp and alert throughout the day. Think about the strength that exercise has given you. It is easier for you to walk up a flight of stairs or carry a heavy object around your house. Imagine yourself feeling like exercise is a part of who you are even when you're not working out.

Once you're finished the main part of your workout, you turn down the intensity and begin to cool down. As your body begins to relax, notice that you've made some improvements in your fitness. Today you feel better after your workout than you did last week. These improvements have been building from week to week. You feel much more fit than you did when you first began the study. Imagine yourself a month from now as you continue to make improvements.

One of the goals of this study is for you to continue exercising after the eight week program is complete. Imagine having the confidence to carry on a regular exercise routine once the weekly visits to the lab have stopped. Imagine yourself continuing to make a weekly exercise plan. Picture yourself following that plan and exercising in a place that makes you feel good.

Week 8

Close your eyes, take a deep breath….exhale and relax. Imagine yourself in your favorite place to exercise. This place is comfortable…it makes you feel in control and confident. You are excited to begin a new exercise session. You look forward to the feeling of satisfaction you have when you complete your workout. Your exercise environment is inviting, maybe you see familiar faces or you find it motivating.

Picture yourself in your exercise clothes. Notice how great you feel wearing them. You are so comfortable wearing your exercise gear. You are looking forward to your workout and realize how much you belong in the lab. You are an exerciser.

As you begin your warm up feel yourself move freely and comfortably. As your heart rate starts to increase, your breathing gets deeper, and your muscles warm up. Notice that doing this exercise feels right. Your body feels relaxed. You are familiar with your body movements and start to flow into your workout routine.

Now imagine yourself increasing the intensity of your workout. Notice that exercising in this setting helps to make your workout feel particularly enjoyable. When you do your exercise in this place, it doesn't feel like a chore, or something that you have to do. It feels nice to exercise in an environment that is comfortable and pleasant for you. Notice that you enjoy the flexibility of choosing your exercise setting. Being in control of your exercise environment helps you to make a connection between exercise and your personal values and goals.

Take your attention to how you feel when you're doing your workout. Notice that your heart beat is strong. You feel your muscles. They feel firm and toned. Your mind is alert and you're aware of your surroundings.

Recognize that in this environment you look like a regular exerciser, you feel like a regular exerciser, you are a regular exerciser.

Feel yourself pushing your body through the main part of your workout. After 7 weeks of exercise you feel powerful and strong. Imagine the way that your body feels when you exercise. Your body is used to your exercise routine now. Think about the improvements you've made since you began the exercise program. Right now you're working harder than you could at the beginning of the program. You feel strong in your legs and in your core. You feel tall and flexible. Notice that when your body is working, your heart and your lungs respond quickly. You're experiencing the benefits of regular exercise.

Notice that the changes in your fitness were gradual but when you look back at where you started, the difference is substantial. Feel the confidence that goes along with knowing you can achieve your exercise goals.

Now imagine yourself starting your cool down. You've just completed another workout. You've been exercising regularly for almost 2 months. Notice that you feel proud and confident.

Imagine the satisfaction of finishing a workout. Imagine the satisfaction of finishing 4 workouts in one week. Imagine feeling confident that you can plan your weekly workouts and carry them through. Imagine feeling satisfied that you've transformed yourself into a regular exerciser.

APPENDIX C: Control Scripts – Manuscript 1

Week 1 – Overview of Physical Activity and Health Outcomes

Physical activity is defined as “any bodily movement produced by skeletal muscles that require energy expenditure.” At least 30 minutes of moderate intensity physical activity on most days has been found to produce many health benefits.

Over the past 15 years, cardiovascular exercise has received a lot of attention as the centerpiece of physical fitness, weight management, and cardiorespiratory health. The terms cardiovascular exercise, cardiorespiratory fitness, and aerobic exercise all mean pretty much the same thing. This kind of exercise requires large muscle movement over a sustained period of time and elevating your heart rate to at least 50% of your maximum level. Examples of this type of exercise are walking, jogging, biking, swimming, and any other repetitious activity. This is the type of exercise you will be doing in this study.

Physical inactivity (or a lack of physical activity) is a risk factor for chronic diseases. Overall, physical inactivity is estimated to cause 1.9 million deaths per year worldwide. Regular physical activity reduces the risk of cardiovascular disease and stroke. Physical activity also plays a role in the prevention of type II diabetes, colon cancer and breast cancer. Engaging in regular physical activity can help to keep your bones strong and to prevent osteoporosis.

Physical activity is a key determinant of energy expenditure, and thus is an important part of energy balance. This means that physical activity plays a role in weight control. In order to control weight, an individual may need to engage in more activity than the recommended 30 minutes of regular, moderate-intensity physical activity on most days.

The list of benefits of physical activity goes on… being physically active has some positive consequences for your mental health too. Physical activity can help to reduce feelings of depression and anxiety. Physical activity can also help to reduce general stress levels. Taking time on a daily basis to engage in physical activity can provide people with a chance to have a mental break, a distraction from their busy life. Physical activity can also have positive effects on your mood, body image, and self-esteem.

Finally, there are social benefits to engaging in regular physical activity as well. Physical activity often provides opportunities for social interactions; allowing participants to meet new people or work with others towards a common goal.

Cardiovascular exercise is the foundation for the activities of daily living, sports, and other outdoor activities. Your ability to engage in activities such as tennis, golf, skiing, dancing, basketball, volleyball, boxing, hiking, and strength training programs are all influenced by your cardiovascular fitness. Cardiovascular fitness allows you to enjoy your day-to-day activities even more because you will have more stamina, less fatigue and less risk of injury.

Week 2 – Physical Activity and Stress

Physical activity — whether it's a relaxing walk, bicycle ride or meditative tai chi — all contribute to relieving stress. We've heard many times that exercise is great for your health. But did you also know that virtually any form of exercise can also help to reduce stress? Stress can be simply defined as "what we experience when we face challenges in our lives." Stress can be caused by a growing number of sources including biological sources (such as improper nutrition) psychological sources (such as perfectionism, anxiety, or depression) interpersonal sources (such as shyness, or loneliness) and physical sources (such illness, disease, or disability). When we are faced with stressors or challenges we experience a shift in the balance of our chemical or hormonal bodily composition. In order to relieve the stress, we must find a way to regain balance. Exercise can be used to decrease the production of stress hormones and counteract your body's natural stress response. It's true! - The same regular exercise routine that helps prevent disease and builds muscle can also help you better manage stress. In fact, research has found that individuals who have higher levels of cardiovascular fitness are more able to handle stress than individuals with lower levels of fitness.

So, how does exercise reduce stress? Exercise increases your overall health and your sense of well-being, which puts more pep in your steps every day. But exercise also has some direct stress-busting benefits.

First, exercise pumps up your endorphins. Endorphins are your brain's feel-good neurotransmitters. Although this function is often referred to as a runner's high, a rousing game of tennis or a nature hike also can contribute to this same feeling.

Exercise can also be thought of as “meditation in movement”. After a fast-paced game of racquetball or several laps in the pool, you'll often find that you've forgotten the day's dilemmas and irritations and concentrated only on your body's movements. As you begin to regularly shed your daily tensions through movement and physical activity, you may find that this focus on a single task, and the resulting energy and optimism, can help you remain calm and clear in everything that you do.

Finally, exercise improves your mood which can go a long way to help relieve stress. Regular exercise can increase self-confidence and lower the symptoms associated with mild depression and anxiety. This can ease your stress levels and give you a sense of command over your body and your life.

Whatever you do, don't think of exercise as just one more thing on your to-do list. Find an activity you enjoy. Since all forms of physical activity can be equally stress relieving, it doesn’t matter what you do, what matters is that you do it! Whether it's an active tennis match or a relaxing walk through a local park, make it part of your regular routine. Any form of physical activity can help you unwind and become an important part of your approach to easing stress.

Week 3 - Physical Activity and the Prevention of Osteoporosis

Osteoporosis is a thinning of the bones that occurs over time for most people. Osteoporosis is a disease of the bones that affects both men and women. Women who are beyond menopause are at particular risk of developing osteoporosis because their body begins to make less estrogen, a hormone that helps to protect bone. With osteoporosis, the bones become brittle and weak and have a greater risk of fracture. Osteoporosis is associated with 1.2 million bone fractures each year.

There are certain characteristics that increase the chances of developing osteoporosis. Among them,; a diet that is low in calcium and vitamin D and a lack of weight bearing exercise are the easiest factors to change.

Weight bearing exercise helps to keep the bones strong. Weight bearing exercise is any activity you do while on your feet and legs, that works your muscles and bones against gravity. During weight bearing exercise, bone adapts to the impact of weight and the pull of muscle by building more bone cells. Consequently, bone becomes stronger and more dense.

All exercise helps improve your general fitness however, weight-bearing exercise is best for strengthening bones. Some examples of weight bearing exercises are; running and jogging, gymnastics, aerobics classes such as step aerobics and dance. This is the type of exercise we do in this study. Weight lifting is also a weight bearing exercise. For this type of exercise you can use dumbbells, barbells, weight machines, or even your own body weight. Team sports involving running and throwing can also help to maintain bone mass. This type of sport includes; basketball, football, baseball, volleyball, and many more.

Individual sports that involve running (such as racket sports) can also be good for helping to maintain bone mass.

Exercise helps to prevent falls and fractures too. Although strong bones may help you prevent fractures if you fall, the best way to protect from fractures is not to fall in the first place! Balance and strength are the keys to fall protection. Doing the right kinds of exercise as we age -- such as weight training -- not only helps keep bones healthy, it protects against falls and fractures by improving balance and strength.

Week 4 - Exercise and Cardiovascular Health

There are many types of heart disease, including diseases of the heart valves, the arteries, and the muscle itself. The most common disease is coronary heart disease, which is a narrowing of the arteries that supply the heart with blood. This restriction is usually caused by a build-up of fatty “plaques” that are loaded with cholesterol. As the obstruction to blood flow becomes more severe, the heart becomes starved for oxygen and severe chest pain can result. A heart attack occurs when a clot forms over the plaque or when the fatty tissue peels off the artery wall, obstructing most or all of the blood flow.

Regular aerobic physical activity increases your fitness level and stamina for exercise. It also contributes to the prevention of cardiovascular disease. A lack of physical activity is a major risk factor for heart disease and stroke. If your physical health becomes too poor it can lead to cardiovascular mortality.

Regular physical activity can help reduce your risk of developing cardiovascular disease because it can help to control blood lipid or ‘fatty’ abnormalities. So engaging in regular activities such as riding a bike or walking briskly around your neighbour can help defend your cardiovascular health. More specifically, physical activity helps reduce triglyceride levels -triglycerides are the chemical form in which most fat exists in food and the body. Some people with lots of triglycerides exhibit a greater risk for developing coronary artery disease.

There are two types of cholesterol or triglycerides: High Density Lipoproteins also known as HDLs are sometimes referred to as “good cholesterol” and Low Density Lipoproteins, or LDLs referred to as the “bad cholesterol” in our bodies. People want to have high amounts of HDLs (the good cholesterol) as low levels of "good cholesterol” have been linked to a higher risk of coronary artery disease. Recent studies show that regular physical activity can significantly increase HDL cholesterol levels and thus reduce your risk.

So, how much exercise is necessary to reduce your cardiac risk? The fact is, the more exercise you do, the more you are reducing your cardiovascular risk. More than 40 research studies highlight that cardiac risk can be reduced by 30 - 50% due to involvement in regular, moderate exercise – just an hour per day is all it takes. Researchers followed more than 73,000 women for several years and found that those who reported walking at least 2.5 hours a week (roughly 20 minutes a day) reduced their cardiovascular risk by 30%. Women, who exercised more than this amount, reduced their risk even more! The point is, 20 minutes a day was enough to gain a substantial improvement in cardiac risk.

What kind of exercise should you do? Almost any activity will be beneficial, as long as you increase your heart rate for more than 12 minutes. Studies show that the highest cardiovascular benefit occurs when exercising between 60 to 80% of your maximum heart rate. Furthermore, putting variety into your exercise keeps it more interesting. When you exercise to reduce your cardiovascular risk you can select from a wide variety of activities, including walking, jogging, cycling, weight lifting, or using exercise machines such as stair climbers and cross trainers. Find an activity you can do in your community and get active!

Week 5 - Exercise and the prevention of Type II Diabetes

Within our bodies, our cells depend on a single simple sugar called glucose in order to work properly. Our bodies have complex systems in place to make sure that glucose levels in the bloodstream don't go too low or soar too high. We use insulin to control the balance of glucose in our bodies. Diabetes occurs when the body can't make enough insulin or can't properly use the insulin it makes.

Type II Diabetes (which was once called adult-onset diabetes) is striking an ever-growing number of adults. In the year 2000, more than 171 million adults worldwide were living with Type II diabetes.

The problems behind the numbers are even more alarming. Diabetes is the leading cause of blindness and kidney failure among adults. It causes mild to severe nerve damage that, coupled with diabetes-related circulation problems, often leads to the loss of a leg or foot. Furthermore, diabetes significantly increases the risk of heart disease.

The good news is that type 2 diabetes is largely preventable. About 9 cases out of 10 could be avoided by making simple lifestyle changes including: not smoking, keeping weight under control, eating a healthy diet, and exercising more.

A high level of body fat (in particular abdominal body fat) decreases the body's sensitivity to insulin. This decreased sensitivity to insulin is one of the major causes of type 2 diabetes.

Exercise increases the body's sensitivity to insulin, which helps you prevent the onset of diabetes. Muscle cells help keep the levels of blood sugar in your body in check. They do this by using insulin to help pull the sugar out of your bloodstream. The better trained your muscles are, the better they are at doing this job. This is one reason that people who do not exercise their muscles are at high risk for developing diabetes.

Working your muscles more often and making them work harder improves their ability to use insulin and to absorb glucose. This puts less stress on your insulin-making cells.

The good news is that you do not have to do really long bouts of hot, sweaty exercise in order to reap this benefit. Walking briskly for a half hour every day has been found to reduce the risk of developing type 2 diabetes by 30 percent. This amount of exercise has a variety of other benefits as well.

Both cardiovascular and strength training exercise are important in the prevention of Type II diabetes, but for different reasons. Both types of exercise help the body to burn fat. Cardiovascular exercise helps to burn the fat directly. With strength training, the increased muscle mass that you gain helps to burn fat, since muscles need energy. You don’t need huge body builder type muscles to get this effect- Even a slight increase in muscle mass helps a lot.

Finally, an exercise program helps you keep a high ratio of good to bad cholesterol which helps to prevent diabetes, as well as many other diseases.

Week 6 - Exercise and the Relief of Depression and Anxiety

Exercise has long been touted as a way to maintain physical fitness and help prevent high blood pressure, diabetes and other diseases. A growing volume of research shows that exercise can also help improve symptoms of certain mental health conditions, including depression and anxiety. Exercise may also help prevent a relapse after treatment for depression or anxiety.

Research suggests that it may take at least 30 minutes of exercise a day for at least three to five days a week to significantly improve depression symptoms. But smaller amounts of activity — as little as 10 to 15 minutes at a time — can improve mood in the short term.

How exercise reduces symptoms of depression and anxiety has yet to be fully understood. Exercise has some physiological benefits which can improve feelings that are associated with depression and anxiety such as sadness, irritability, stress, fatigue, anger, self-doubt, and hopelessness. Some evidence suggests that exercise raises the levels of certain mood-enhancing hormones in the brain. Exercise may also boost endorphins, the 'feel-good' chemicals in your brain which may reduce the sensation of pain by your brain. Researchers also suggest exercise may lead to increased levels of "brain-derived neurotrophic factor" (BDNF) and decreased amounts of cortisol. BDNF is thought to improve mood while cortisol, the "stress hormone" is linked to your body's response to stress and anxiety. Reducing cortisol levels in the body can influence relaxation which can help to relieve feelings of depression and anxiety. Exercise can also decrease muscle tension which helps you feel more relaxed throughout the day and sleep better at night.

Exercise also has many psychological and emotional benefits which can play a role in helping to relieve feelings of depression or anxiety. First, exercise can help to increase your confidence. Being physically active can give you a sense of accomplishment. Meeting goals or challenges, no matter how small, can boost self-confidence at times when you need it most. Exercise can also make you feel better about your appearance and self-worth. Exercise can also be a great way to give you a mental break or distraction. When you experience feelings of depression or anxiety, it's easy to dwell on how badly you feel. But dwelling interferes with your ability to problem solve and cope in a healthy way. Dwelling can also make feelings of depression more severe and longer lasting. Exercise can shift the focus away from unpleasant thoughts to something more pleasant, such as your surroundings or the music you enjoy listening to while you workout. Finally, exercise can also provide an important opportunity for social interactions. Feeling depressed or anxious can lead to isolation. That, in turn, can lead to cyclic effects of the condition. Exercise may give you the chance to meet or socialize with others, even if it's just exchanging a friendly smile or greeting as you walk around your neighborhood.

Any type of exercise can help to reduce feelings of depression and anxiety, so pick an activity that you already like to do. Your body and mind can benefit from relaxing, low intensity exercises such as tai chi and yoga, more vigorous activities such as jogging, resistance training or playing sports and all types of exercise in between! Regardless of the activity you chose, make sure to have fun while you exercise as it can help to maximize the relieving effects on depression and anxiety.

Week 7 - Exercise and Cancer Prevention

Two in five Canadians face a cancer diagnosis in their lifetime. Cancer is the leading cause of premature death in Canada. An estimated 159,000 new cases of cancer and 72,700 deaths from cancer occur in Canada each year. The burden of cancer in Canada is enormous, affecting the economic and social well-being of individual Canadians, their families and the country.

There are many known risk factors for cancer. Some risk factors are unavoidable (for example, age, gender, and genetic predisposition) however some risk factors can be changed. These factors include smoking, poor diet, exposure to sunlight, and physical activity.

Colon cancer and breast cancer are among the most commonly diagnosed cancers. Physical activity has been found to play a role in the prevention of both of these types of cancer. Your risk of developing colon cancer can be reduced by simply leading an active lifestyle. In general, people don't have to go to the gym three-to-five times a week for an hour in order to reduce their risk of developing colorectal cancer. People can reduce their risk by increasing physical activity in their daily lives. This can be accomplished by choosing a distant parking space, taking the stairs, shopping, cleaning, going for walks, playing with children or pets, and a multitude of other activities. Your large intestine is kind of like a sewage plant. It recycles the stuff your body can use and stores the waste for disposal. The longer waste sits in the colon, the longer toxic materials have to leach be absorbed back into your tissues. Exercise gets your body moving, which in turn gets the waste in your body moving. Research indicates that exercising can decrease colon cancer risk by up to 40%. Exercise also tends to reduce the incidence of other risk factors for colon cancer, like obesity and diabetes.

In the case of breast cancer, prevention it seems that exercise intensity does play a role. Research has found that women who said they did six or more hours per week of strenuous exercise can reduced their risk of invasive breast cancer by 23 per cent compared to women who do not exercise.

High levels of estrogen have been linked to a higher risk of developing breast cancer. Women who exercise heavily tend to be older at the time of their first period and produce estrogen for a shorter time, lowering their exposure to the hormone over their lifetime. It has also been suggested that exercise helps by preventing weight gain, regulating insulin sensitivity, and enhancing the function of your immune system.

It has been found that exercise offers protection against breast cancer regardless of a woman's stage in life. This means that when breast cancer prevention is concerned, it is never too late to begin exercising!

Week 8 - Other Benefits of Exercise

A major part of physical activity that is often forgotten is the social benefit of participating. It can be an opportunity to make new friends or even strengthen existing relationships with friends or family members. There are many ways you can use physical activity to help develop or enhance social relationships. One example is joining a sports team or group fitness class. To be able to engage in activities you like while sharing similar interests and goals with others highlights the benefits of exercise. Even engaging in a walk on a Sunday afternoon is an ideal opportunity to catch up with friends and family members. Walking around your neighbourhood also provides a great opportunity for you to interact with your neighbours and to feel connected to your community. If you are looking to use physical activity to meet new people, you may try joining an exercise class such as dance class or a running group. Many communities also provide opportunities to sign up for a charity event such as a 5 Km walk or run where you can meet new people, keep active, and support a good cause!

Physical activity has also been found to have social benefits that go beyond interpersonal interactions. In fact, physical activity is positively linked to work productivity. Research has found that workers who are physically active have reduced absenteeism and are more productive on the days they are at work. In addition, companies who have more physically active employees have lower turnover compared to companies with fewer active employees. Research has found that workers who are more physically active are more productive, happier, and less stressed on days when they exercise before work or during their lunch break. In addition, workers who are regularly active report that they feel calmer on exercise days compared to non-exercise days.

Engaging in regular physical activity can also contribute to feelings of satisfaction and confidence. Being able to enhance your athletic skills such as hand-eye coordination or balance can lead to beneficial changes in your day to day life. Exercise helps develop stronger muscles and bones which contribute to your ability to complete demanding tasks around the house, be confident walking on an icy sidewalk or even attempt new physical activities you never thought of before.

Research has also found that getting outside during the day can have some great mood-enhancing effects! Physical activity can be a great reason to get outside! Exercise on its own can help people to maintain a positive mood however when added to an enjoyable environment, the effects are even greater. Sometimes in our climate it is tough to imagine going outside to be active in the winter but as long as you dress appropriately for the weather, there are lots of active opportunities to enjoy! Skating, tobogganing, skiing or snowshoeing are great ways to be active in the outdoors. Even going for a neighbourhood walk in the wintertime can be a beautiful activity! In the summer, getting outside seems even easier to do. Walking, biking, hiking, rollerblading, and playing sports are among many activities that can get you outside to enjoy nature, your community, and the benefits of physical activity! Find out what you can get involved in around your community – and stay active!

APPENDIX D: Letter of Information and Consent – Manuscripts 1 and 2

Letter of Information

The Use of a Cognitive Intervention to Influence Motivation and Exercise Participation among Overweight Female Exercise Initiates

You are invited to participate in a study being conducted by Dr. Craig Hall, Lisa Cooke, and Lindsay Duncan, from the Faculty of Health Sciences at The University of Western Ontario.The primary purpose of this research is to examine how motivation to exercise and actual exercise behaviour can be influenced by a cognitive intervention during an 8-week exercise program. In order to participate in the study you must be a healthy female between the ages of 22 and 50 years. You must exercise less than once per week but want to begin exercising more regularly. You must have a Body Mass Index (BMI) score greater than 25 indicating that you are overweight. You must not possess any health condition that would be contraindicated for exercise.

Procedures - If you agree to participate, you will complete the following:

Introductory meeting:
To help you determine if the study and the exercise facility is right for you, you will attend an introductory meeting at which the details of the study will be explained and you will be oriented to the study facility.

Baseline Assessment:
Once you are aware of the details of the study and have provided informed consent to participate you will visit the lab for a baseline assessment in which you will complete a package of questionnaires and undergo a sub-maximal fitness test.

Questionnaires:
You will be asked to complete questionnaires that ask you about your intentions to exercise, your motivation to exercise, and your exercise-related identity. Completion of the questionnaires should take approximately 15 minutes.

Sub-maximal fitness test:
You will be required to undergo a fitness test conducted in the Exercise and Health Psychology Lab located in the Arthur and Sonia Labatt Health Sciences Building. You will begin the test by standing still on a treadmill until a resting heart rate can be obtained (approximately 2 minutes). Once a resting heart rate has been established you will begin walking on the treadmill. The speed and the incline of the treadmill will be increased every two minutes and your heart rate will be monitored throughout the test. The test will take approximately 15 minutes to complete. A certified, trained kinesiologist will determine if the test should be terminated earlier if you fail to conform to the exercise test protocol, or experience any signs of excessive discomfort. The fitness test will be repeated after 8 weeks and at each 8 week follow-up session (total 48 week study).

Exercise Program:

You will be given an 8-week cardiovascular program to follow. The program will involve exercising 4 times a week at a moderate to high intensity. In weeks 1 and 2, three exercise sessions will take place in the Exercise and Health Psychology Lab (EHPL) in the Arthur and Sonia Labatt Health Sciences Building (Room 408) and one exercise session in a preferred exercise location (e.g., at home, at your local community centre or fitness facility). In weeks 3 and 4 you will exercise in a preferred exercise location (e.g., at home, at your local community centre or fitness facility) for two of your exercise sessions (you will be required to exercise at the EHPL twice per week). In weeks 5 - 8 you will exercise in your preferred location for three of your exercise sessions (you will be required to exercise at the EHPL once per week).

Compliance with the program will be monitored by attendance sheets located inside the lab. In addition, you will wear a heart rate monitor while you are exercising. The heart rate monitor will record the duration and intensity of your exercise session. You will be given a heart rate monitor during the study period to wear during your time in the EHPL and during your at-home workouts. When you come to the lab for your weekly visit, the data from your heart rate monitor will be downloaded onto the study computer and deleted from the heart rate monitor.

Experimental Intervention

You will be randomly placed into one of the experimental study groups (either a cognitive behavioural intervention group or a health education intervention group). Each participant, regardless of group, will meet with the researcher before their first exercise session each week. During these meetings you will be presented with information delivered by voice recording. These meetings will take place in the EHPL and will be approximately 15 minutes in length.

Implementation Intentions:

During your first visit to the EHPL each week you will complete an implementation intentions worksheet. An implementation intention is a worksheet where you will be asked to specifically outline when, where, how long, and what type of exercise activities you plan to do for each of your four workouts in the upcoming week. You will also indicate what type of exercise you plan to do. You will receive a copy of this worksheet each week.

Mid-point assessment:

After 4 weeks in the exercise program, a mid-point assessment will be conducted in which you will complete questionnaires assessing your intentions to exercise, your exercise motivation, and your exercise-related identity.

End-of-program assessment:

After the 8-week exercise program is complete you will visit the lab for an end-of-program assessment at which you will complete a package of questionnaires and a sub-maximal fitness test (same protocol described above).

Follow-ups:
Every 8 weeks (for a total of 5 follow-up session) after the completion of the exercise program, you will complete a follow-up assessments involving a package of questionnaires, a measure of your exercise behaviour, and a sub-maximal fitness test (same protocol outlined above). You will need to visit the lab a week before your follow-up session to pick up a heart monitor. Once the week is complete, you will return the heart rate monitor to the lab during your scheduled follow-up session and we will download the workout data (frequency, intensity, and duration).

Feedback from the study
You may request the general findings of this research after the study is complete. If you have any concerns, please feel free to contact the researchers below. This letter is for you to keep.

Potential Risks and Discomforts
You should be aware that physical exercise is associated with certain risks including muscle soreness, muscle or joint injury, heat exhaustion/ stroke, increased heart rate, and in very rare instances heart attack. Every effort will be made to minimize these risks. If at any time you experience pain or difficulty breathing or do not feel well while exercising you should immediately notify the staff in attendance at the exercise or testing facility.

First Aid Protocol
If you receive any minor injury while exercising, you will be responsible for reporting this to the exercise supervisor, and will receive medical treatment on-site as necessary. A first aid kit and ice packs are available to treat minor injuries.

Our exercise program is designed to minimize muscle soreness, but if it occurs our exercise supervisors will be trained to administer the appropriate first aid which can relieve pain, limit swelling and protect the injured tissue, all of which help to speed healing.

The exercise supervisors are trained in first aid and will be available to provide immediate assistance in the case of a major medical emergency. The Student Emergency Response Team (SERT) and Dr. Lisa Fischer from the Fowler-Kennedy Sport Medicine Clinic will be contacted immediately for their assistance. SERT and Dr Fischer will assist until the 911 emergency services arrive. Participants who have a medical emergency will be removed from further participation in the study.

Potential Benefits
There may be no direct benefit to you associated with your participation in this study. You may experience some of the benefits associated with increased physical exercise including increased energy, cardiovascular benefits, increased strength, better circulation, increased flexibility and weight loss. You may also experience increases in some psychological variables (e.g., increased motivation to exercise).

Voluntary Participation
Participation in this study is voluntary. You may refuse to participate, refuse to answer any questions or withdraw from the study at any time with no effect on your academic status. You do not waive any legal rights by signing the consent form.

Compensation
You will be allowed to use the facilities in the Exercise and Exercise Psychology Lab free of charge for the duration of the study. Parking at the Arthur and Sonia Labatt Health Sciences Building will also be free.

Confidentiality
Your participation in this study is completely confidential. The information from the fitness test and questionnaires will only be for the use of the researchers listed. The completed questionnaires will be stored in a locked cabinet, inside a locked office. After 5 years, all of the questionnaires will be shredded. By participating in this research, you agree that your results may be used for scientific purposes, including publication in scientific and exercise & health specific journals. A master list will be maintained linking your name as a participant to an identifying number. Upon completion of the study, this list will be destroyed. The results of the study will be reported without identifying you personally thus maintaining your confidentiality. Representatives of The University of Western Ontario Health Sciences Research Ethics Board may contact you or require access to your study-related records to monitor the conduct of the research.

Rights of Subjects
If you have any questions about the conduct of this study or your rights as a research participant you may contact: Office of Research Ethics
The University of Western Ontario

Lab Hours:
Currently there are several exercise studies being conducted in the EHPL. In order to avoid bottle-necks in the fitness facility, each study has been assigned specific hours in which the lab will be open for exercise. Please respect the hours that have been assigned to your study.

Monday: 8am-9am, 11:30am-12:30pm, 4pm- 6pm
Tuesday: 7am- 9am, 11:30am- 1:30pm, 4pm- 8pm
Wednesday: 8am-9am, 11:30am- 12:30pm, 4pm- 6pm
Thursday: 8am- 9am, 11:30am- 12:30pm, 4pm- 6pm
Friday: 7am- 9am, 11:30- 1:30pm, 4pm- 7pm
Saturday: 10am- 12pm
Sunday: CLOSED

Informed Consent

I, ______________________________have read the Letter of Information, have had the nature of the study explained to me and I agree to participate. All questions have been answered to my satisfaction.

Signature: ____ Date: __________________

Name of Person Responsible for Obtaining Informed Consent:_________________________________

Signature: ____ Date: ________________

Curriculum Vitae

Name:	Lisa Cooke
Post-secondary Education and Degrees:	Queen's University Kingston, Ontario, Canada 2004-2008 B.PhEd and B.Sc
	University of Windsor Windsor, Ontario, Canada 2008-2010 M.H.K
	The University of Western Ontario London, Ontario, Canada 2010-2015 Ph.D.
Honours and Awards:	*Ontario Graduate Scholarship* University of Western Ontario, 2012-2013; 2013-2014
	Graduate Thesis Research Scholarship University of Western Ontario, 2012; 2013
	Graduate Student Society Award University of Windsor, 2010
	Degree of Distinction Queen's University, 2008
Research Service:	**Research Coordinator**, Sept 2012 – 2013 CIHR Grant: You can't always get what you want: A self-determination based examination of the difference between implicit and explicit outcome expectations and their influence on exercise adherence. Drs. W. Rodgers, T. Berry, C. Hall, & C. Blanchard Project site: University of Western Ontario
	Physical Activity Coordinator - CO.21, Oct 2011 – Aug 2013 (NCIC Clinical Trials Group) Dr. K. S. Courneya University of Alberta Project site: University of Western Ontario

Other Scholarly Service:	**Hellmuth Prize for Achievement in Research Selection Committee**, January 2013 – March 2013 **Society of Graduate Students**, Councilor for Kinesiology (October 2012 – June 2013); University of Western Ontario, London, ON. **Eastern Canadian Sport and Exercise Psychology Symposium Organizing Committee** (January 2011 – March 2012); University of Western Ontario, London, ON. **Graduate Student Teaching Award Committee** (November 2010-March 2011); Society of Graduate Students, University of Western Ontario, London, ON.
Teaching Service:	**Instructor,** *Psychological Interventions in Exercise, Sport, and Injury Rehabilitation*(*Distance Studies*), May – July 2013 University of Western Ontario **Instructor**, *Programming for Diverse Populations*, September – December 2012, Fanshawe College **Instructor**, *Psychological Interventions in Exercise, Sport, and Injury Rehabilitation* (*Distance Studies*), May – July 2012 **Co-Instructor,** *Psychological Interventions in Exercise, Sport, and Injury Rehabilitation*, January – April 2012

Publications:

Paradis, K. F., **Cooke, L. M.**, Martin, L. J., & Hall, C. R. (in press).Just need some satisfaction: Examining the relationship between passion for exercise and the basic psychological needs. *The Health & Fitness Journal of Canada.*

Cooke, L. & Munroe-Chandler, K. (2014).Examination of the relationship between imagery use, efficacy beliefs, and body image in females. *Women in Sport and Physical Activity Journal*, *22*, 47-53.doi: http://dx.doi.org/10.1123/wspaj.2014-0012

Evans, M. B., **Cooke, L. M.**, Murray, R. A., & Wilson, A. E. (2014). The sooner, the better: Temporally proximal exercise outcomes promote intrinsic motivation. *Applied Psychology: Health and Well-Being, 6*(3), 347-361.doi:10.1111/aphw.12032

Cooke, L.M., Fitzgeorge, L., Prapavessis, H., & Hall, C.R. (2014). Imagine that: Examining the influence of exercise imagery on cigarette cravings and withdrawal symptoms. *Journal of Smoking Cessation*. Advanced online publication.doi: http://dx.doi.org/10.1017/jsc.2014.13

Cooke, L. M., Munroe-Chandler, K. J., Hall, C. R., Tobin, D., & Guerrero, M. D. (2014).Development of the Children's Active Play Imagery Questionnaire. *Journal of Sport Sciences*, *32*(9), 860-869.doi: http://dx.doi.org/10.1080/02640414.2013.865250

Paradis, K.F., **Cooke, L.M.**, Martin, L.J., & Hall, C.R. (2013).Too much of a good thing? Examining the relationship between passion for exercise and exercise dependence. *Psychology of Sport & Exercise. 14*(4), 493-500. doi:http://dx.doi.org/10.1016/j.psychsport.2013.02.003.