The effects of physical activity messages tailored to social setting on extraverts' and introverts' exercise-related social cognitions.

by

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Abstract

This thesis explored the effects of tailoring exercise messages to social setting based on the personality domain of extraversion on participants' exercise-related social cognitions. Messages were tailored to either *exercising alone* (introverted social context) or *exercising with others* (extraverted social context). To select participants, an extraversion domain test was conducted on a pool of 2,029 psychology students. One hundred twelve of the most extraverted and eighty-three of the most introverted students were selected to participate in the main study. The study had participants read an exercise message that was either matched or mismatched to social setting based on their level of extraversion. After reading the message, participants filled out questionnaires that assessed exercise-related social cognitions, demographics, physical activity behaviour, and personality. Eight 2 (extraverted social context message, introverted social context message) x 2 (extraverted, introverted) Analyses of Variance (ANOVA) or Analyses of Covariance (ANCOVA) were performed, with the dependent variables being intention, affective attitude, instrumental attitude, two injunctive norm and one descriptive norm variables, and two perceived behavioural control variables. Results of the main study demonstrated that there was a main effect on extraversion level for intention, affective attitude, instrumental attitude, injunctive and descriptive norms, and for self-efficacy. No main effect on extraversion level was found for controllability. For message type, there was a near significant main effect for one of the two injunctive norm variables, $p = 0.05$. There were no other main effects for message type. There were no significant interactions between factors. From this study, it can be seen that a difference exists between the exercise-related cognitions of introverts and extraverts, especially affective attitude, self-efficacy, and descriptive norm. It is recommended that research continue to explore these differences between introverts and extraverts in an effort to increase physical activity levels in people who are introverted in nature.

Preface

This thesis is an original work by Kirsten A. Scheliga. The research project, of which this thesis is a part, received research ethics approval from the University of Alberta Research Ethics Board, Project Name “Exercise messages tailored to Extraversion and their influence on Theory of Planned Behaviour variables in students who are more extraverted or more introverted than their fellow classmates.”, No. Pro00038989, Date July 7, 2013.

Dedication

To those who wander… and wonder.

As,

All that is gold does not glitter,

Not all those who wander are lost;

The old that is strong does not wither,

Deep roots are not reached by the frost.

~ J. R. R. Tolkien

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I would like to thank my parents, Astrid and Peter Scheliga, for always being there to support me during the good times and the difficult times of pursuing this wild idea of mine to earn a Master's degree, knowing all you know about me. I couldn't ask for better parental support.

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Introduction

Physical inactivity and poor diet have been irrefutably linked to most modern chronic diseases such as cardiovascular diseases, Type 2 diabetes, metabolic syndrome, and various cancers (Roberts & Bernard, 2005). These diseases are the leading cause of mortality in westernized society, and are also becoming apparent in developing nations (Roberts & Bernard, 2005). According to Colley, Garriguet, Janssen, Craig, Clarke and Tremblay (2011), 85% of Canadian adults are not active enough to meet Canada's physical activity guidelines, demonstrating that achieving sufficient daily physical activity is something many adults struggle with. Only 35% of Canadian adults obtain a recommended target of 10,000 steps-per-day (Colley et al, 2011). The Canadian Society for Exercise Physiology (2013) recommends that adults between the ages of 18-64 engage in 150 minutes of moderate to vigorous physical activity a week to gain the health benefits associated with physical activity behaviour.

Behavioural interventions can increase physical activity levels and thus reduce mortality rates in a population (Penedo & Dahn, 2005, Roberts & Barnard, 2005). Behavioural interventions that target personality factors, such as extraversion, may result in more successful behaviour change (Rhodes & Smith, 2006). Message tailoring is a type of behavioural intervention. In the physical activity domain, messages that are tailored towards stage of change are favoured over generic messages (Latimer, Brawley & Bassett, 2010). Shepard (2004, p. 178) states, "It is naive to anticipate that [...] a single precise pattern of physical activity […] can be marketed to the general public". Rather, he argued, the pattern will be "highly individual". The general population varies in its goals, objectives, resources, psychosocial constraints, personality, and initial fitness level (Shepard, 2004).

Research has shown that people who are introverted tend to be less physically active than those who are extraverted (Rhodes & Smith, 2006). While extraversion is the tendency to be sociable, assertive, energetic, seek excitement, and experience positive affect (Rhodes & Smith, 2006), most literature only indirectly defines introversion as being the absence of extraversion (McCrae & Costa, 2003; Rhodes & Smith, 2006). However, Freyd (1924, p. 74) provides an explicit definition of an introvert as "an individual in whom exists an exaggeration of the thought processes in relation to directly observable social behaviour, with an accompanying tendency to withdraw from social contacts". Current commercial exercise settings may not appeal to introverts, as these environments tend to be interactive and social in nature.

Around 48% (female) and 54% (male) of U.S. Americans identify themselves as introverted (CAPT, 1996, 2003). Using message tailoring as a behavioural intervention towards this part of the population could improve physical activity behaviour, as the messages could be created to be more appealing to introverted individuals. The idea of tailoring behavioural interventions to introversion has not yet been explored, as indicated by the literature.

In this introversion tailoring intervention study, two groups were artificially established based on their level of extraversion through the use of the 12-item extraversion scale (McCrae & Costa, 2010). The extraverted group consisted of those that scored the highest on this scale, and the introverted group consisted of those that scored the lowest on this scale. Then, the extraverted group was randomly assigned to one of two message groups, and the introverted group was randomly assigned to one of two message groups. This resulted in four experimental groups in a 2x2 factorial design. One of the more extraverted groups and one of the more introverted groups were given an exercise message about exercising with other people; the other more extraverted group and the other introverted group were given an exercise message about exercising by themselves. Once the message was read, all groups were assessed on exercise-related social

cognitions, demographic information, physical activity behaviour and personality. The purpose of this study was to examine if having introverts and extraverts read an exercise message that was matched or mismatched to the social setting preferences of more extraverted or more introverted people would influence group exercise-related social cognitions scores. As well, examining the differences between the physical activity levels and exercise-related social cognitions between introverted participants and extraverted participants was also explored.

Personality Theories

Personality traits are consistent patterns of thoughts, feelings, and actions (McCrae & Costa, 2003). Personality is considered to be quite stable over time and context (Edmonds, Goldberg, Hampson & Barckley, 2013; Kern, Reynolds & Friedman, 2010). Various models that attempt to describe and capture the essence of personality have been created throughout the years, the most popular being the Five Factor Model (FFM), and Eysenck's three-factor model (Eysenck & Eysenck, 1975). These two models are considered the most parsimonious of the personality models (Funder, 2001). The FFM is composed of the following higher-order factors, which are also called domains (Funder, 2001, Rhodes & Smith, 2006):

– E: extraversion (degree of preference for external social stimulation);

– A: agreeableness (degree of kindness and generosity);

– C: conscientiousness (degree of organization and thoroughness);

– N: neuroticism/emotional stability (degree of anxiety and tenseness);

– O: openness to experience/intellect/culture (degree of imaginativeness and curiosity).

Eysenck's three-factor model is composed of the following personality domains (Eysenck & Eysenck, 1975, Rhodes & Smith, 2006):

– E: extraversion (degree of preference for external social stimulation);

– N: neuroticism (degree of negative affect such as depression and anxiety);

– P: psychoticism (degree of aggression and likelihood of breaking with reality).

These higher-order trait taxonomies are further divided in to lower-order traits (also called facets). Though both these models are the most used in personality and physical activity research (Rhodes & Smith, 2006), the current study used the Five Factor Model, as it is more prevalent of the two in physical activity research specifically. See Table 1 for the five domains and their respective six facets in the FFM.

Table 1

Five Factor Model Personality Domains and Their Facets

Domain	Neuroticism	Extraversion	Openness	Agreeableness	Conscientiousness
Facet	Anxiety	Warmth	Fantasy	Trust	Competence
	Anger Hostility	Gregariousness	Aesthetics	Straightforwardness	Order
	Depression	Assertiveness	Feelings	Altruism	Dutifulness
	Self-Consciousness	Activity	Actions	Compliance	Achievement Striving
	Impulsiveness	Excitement-Seeking	Ideas	Modesty	Self-Discipline
	Vulnerability	Positive Emotions	Values	Tender-Mindedness	Deliberation

Note. From McCrae and Costa (2010).

Extraversion and Society

In this thesis, the personality domain of extraversion was explored. Adjectives used to describe individuals who are highly extraverted include active, assertive, energetic, enthusiastic, outgoing, and talkative (McCrae & John, 1992). Individuals who score high on the personality trait of extraversion are considered more extraverted; those who score low on the personality trait of extraversion are considered to be more introverted. Introverted people have a tendency to avoid excessive social situations (Eysenck & Eysenck, 1975). They may find some social situations excessive in terms of both size of the social situations and in terms of number of total

social situations. Introverted people prefer to work alone, enjoy one-on-one interactions where topics can be delved into deeply, and require 'downtime' to process previous events.

Americans and Canadians are among the most extraverted nations in the world (Allik & McCrae, 2004, McCrae & Terracciano, 2005). The promotion of the self is encouraged and supported by society; North American society prefers the extraverted personality. American society evolved from a 'Culture of Character' to a 'Culture of Personality', states Susman (1984) where it does not matter so much the type and values of a person, but rather the type of temperament and personality that one has to advance towards the American dream. North American culture values individualism, with the United States being perhaps the most individualist culture in the world (Heine, 2001). Canadian culture, though not considered as individualistic as the United States, partly due to the idea of the American 'melting pot' (immigrants assimilating to U.S. culture is the American ideal) and Canada's 'cultural mosaic' (multicultural being the Canadian ideal), is argued by Heine (2001) to most closely resemble the United States compared to other countries, both culturally and psychologically. The Extraverted Person is the ideal, even though one third to one half of people in the United States consider themselves introverted (CAPT 1996, 2003; Bayne, 1995). Many introverted people may find they must act extraverted to advance themselves in this extraverted world (Little, 2008). People can take on patterns of behaviour that may not fit with their personality but are necessary, or considered 'worth it' in the long run to pursue their dreams.

Introversion and Physical Activity

People who are extraverted are shown to be more physically active than people who are more introverted (Rhodes & Smith, 2006, Courneya & Hellsten, 1998). Extraverts are more active than introverts perhaps because people are thought to seek situations in which their personalities thrive (Eysenck & Eysenck, 1975). Introverted people may have to act outside their

comfort zone to engage in physical activity, as some physical activity environments tend to be over-stimulating, while extraverts more naturally enjoy these environments.

Environments that could be over-stimulating for introverted people would be those that happen in busy or changing settings, those that occur with many participants that interact with one another, or those that contain elements of both. For instance, de Bruijn, Kremers, van Mechelen, and Brug (2005) found that extraversion was positively associated with sport-related physical activity (e.g. jogging, swimming, gymnastics, tennis, martial arts, canoeing, field sports, and skating) and not routine physical activity (e.g. walking, cycling, using the stairs, gardening, and household labour). The sports-related physical activities would be more mentally and socially stimulating. Extraverts seek stimulating and exciting situations that can lead them to activities such as sport and exercise (Courneya & Hellsten, 1998), while introverts would be less likely to seek such activities. Extraverts and introverts differ in levels of arousal, with arousal being the physiological and psychological state of being awake or reactive to stimuli (Eysenck, 1991). It is thought that introverts possess higher base levels of arousal than extraverts. Introverts' personalities guide them towards activities that are less stimulating and exciting, since introverts have higher base levels of arousal so need less stimulation to be content (Eysenck, 1991). In the current research, it was speculated that certain kinds of physical activity environments are perhaps over-stimulating to introverts. Over-stimulation in the physical activity setting may be a result of the social interactive environments in which some physical activities take place. As introverted people prefer to spend time alone, these social and interactive environments may add an excess of external stimulation that makes physical activity unpleasant for the introverted person. Increasing stimulation to any activity that is already quite arousing for an introvert would cause a need for the introvert to increase their stimulation threshold, or bear with the overload. The over-stimulation could make a pleasant activity into a stressful activity.

For example, in a game of softball, adding socialization with others (communicating with team members, coaches, fans), to a busy and loud environment (the baseball diamond, sun, wind, dogs barking, fans cheering) could quickly become stressful to an introverted person, who is not accustomed to this type of interaction. This may result in the desire to avoid these over-stimulating activities. Introverted people may find certain activities over-stimulating and energy depleting while extraverts may find the same activities energizing. The research by Eysenck (1991) continues by stating that, with their higher base levels of arousal, introverts withdraw from stimulating environments, while extraverts intentionally seek them out.

In 1998, Courneya and Hellsten found that people who were more extraverted preferred to exercise in a group or with a few other people rather than exercise alone. De Bruijn, de Groot, van den Putte, and Rhodes (2009) found that extraversion was positively associated with moderate physical activity; however, this association did not apply to vigorous physical activity. De Bruijn et al. (2009, p. 737) discuss that it appears that "the active and outgoing nature" of highly extraverted people seems to better apply towards "everyday activities than for vigorous activities". Contrarily, there is evidence that the quiet nature of the introvert is more relevant to everyday activities such as gardening and home improvement than is the more sociable nature of the extravert (De Bruijn, et al. 2009). This may be because moderate physical activities tend to provide opportunities for socialization and camaraderie, while vigorous activities do not provide as many opportunities. Vigorous activities require greater concentration that focuses the individual inwardly, and the additional exertion causes an increased breathing rate that makes verbal communication more difficult. There is less of an opportunity to converse, to play and to assert oneself verbally during vigorous activities, which are elements of physical activity that important to extraverts (McCrae & John, 1992). De Bruijn et al. (2005) found that more extraverted adolescents spent more time in sports-related physical activity (jogging, swimming,

gymnastics, tennis, martial arts, canoeing, field sports, and skating) which tend to be more social in nature than routine physical activity walking, cycling, using the stairs, gardening, and household labour which tend to be more solitary. The extraverted adolescents spent more time in active, group activities, and the introverted in more solitary, quiet activities. Sports-related physical activities are activities in which people decided to participate in (e.g., for health, enjoyment, to make friends) and can be social, while routine physical activity are activities are a part of everyday life (e.g. biking to school, chores) and can be more individual. People may choose activities based on the social interaction the activities may involve, with most sports conducted in group settings. Thus, more extraverted people may be drawn to the group settings of sport, while more introverted people may prefer to avoid groups and subsequently avoid sport activities.

Message Tailoring

Creating tailored messages in the physical activity domain has shown promise towards motivating individuals to increase their physical activity behaviour. Latimer, Brawley and Bassett (2010) reviewed the effectiveness of three approaches for constructing physical activity messages, namely message tailoring, message framing, and self-efficacy change targeting. Latimer, et al. (2010) recommends that these three approaches for constructing physical activity messages "should be a focus of future research" (p.15). The approach focused on in this study is message tailoring. Message tailoring is concerned with creating messages that suit individual characteristics (Latimer, et al., 2010).

Regarding physical activity, tailored messages improve physical activity behaviour and related cognitions better than generic messages (Latimer et al., 2010). For example, Yap, Davis, Gates, Hemmings, and Pan (2009) found that tailoring e-mail messages within the Transtheoretical Model (TTM) of behaviour change advanced participants towards the desired

outcome of greater physical activity behaviour better than not tailoring e-mail messages. The review by Latimer, et al (2010) concluded that tailoring exercise messages work somewhat well outside the laboratory setting. Though the systematic review by Latimer et al. (2010) could only review the utility of messages tailored to the stages of change model, the current study explores the possibility of tailoring physical activity messages to personality characteristics. Latimer et al. (2010, p. 17) suggest this branching out to personality characteristics.

Studies that tailor messages to motivational orientation, like cognitive processing style, have found some success. Latimer, Rivers, Rench, Katulak, Hisck, Hodorowski, et al. (2008) found that messages tailored to the cognitive processing styles, i.e. regulatory focus, of their participants led to greater physical activity participation and more positive feelings than messages that did not fit with the participants' regulatory focus. This finding was particularly strong in the promotion-focus condition. In contrast to the previous research by Latimer et al. (2008), Martinez, Duncan, Rivers, Latimer, and Salovey (2013) found that though exercise promotion messages did result in greater exercise intentions than those who received prevention messages, it did not matter what the participants' regulatory focus was (i.e. either health promotion focus or health prevention focus). The idea that message tailoring can be used to tailor to individual characteristics is useful in the current study. Engaging more people to be physically active by tailoring exercise messages to their preferred social situation would personalize the exercise environment. It is possible that participants' intentions to exercise would increase, as improving perceptions of the exercise environment may increase exercise intentions and positive feelings.

In this study, messages were tailored to the social setting in which exercise can take place, i.e. *exercising alone* (introverted social context) or *exercising with others* (extraverted social context). This is an attempt to tailor exercise messages towards the personality dimension of extraversion. Since previous literature has shown that more introverted individuals are less

physically active than more extraverted people, and that more introverted people tend to enjoy exercising alone as opposed to with others, messages tailored to the social context preferred by more introverted people and more extraverted people were created for this research. In order to understand how tailoring messages to level of extraversion may work, it was decided to choose the aspect of social setting, because of its ease of modification in a tailored message. In this thesis, social setting is defined as proximity to other individuals. Whether the social setting was interactive or not was not distinguished.

The messages were created on the basis of previous message tailoring (Berry & Carson, 2010, Latimer et al., 2010), and research by Courneya and Hellsten (1998). Tailoring the message to social setting reflects the exercise social setting preferences of participants through their responses on the exercise-related social cognitions questionnaire. As such, this would expose whether social setting could be related to the different physical activity levels between extraverted people and introverted people.

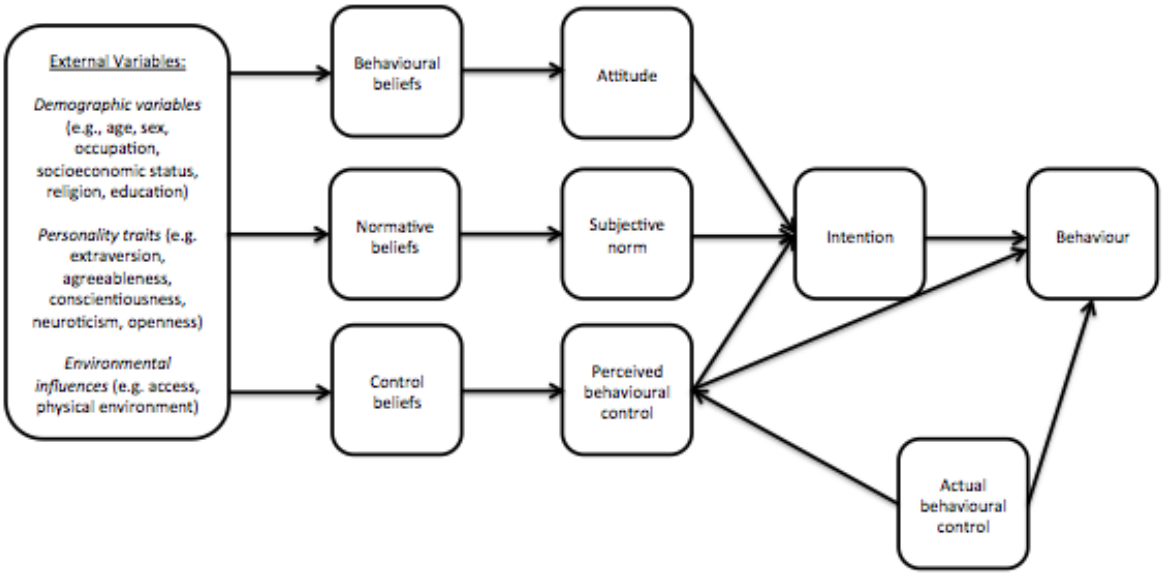
Theory of Planned Behaviour

Health behaviour change models such as the Theory of Planned Behaviour (TPB; Ajzen, 1991), Social Cognitive Theory (SCT; Bandura, 1986), and Protection/Motivation Theory (PMT; Rogers, 1983) have had success in predicting intention towards behaviour (Ajzen, 1991; Conner & Norman, 2005). The theory of planned behaviour is one of the most successful health behaviour change models used in the physical activity domain, and is one of the preferred theories used in health psychology and behavioural medicine research (Ajzen, 1991; Conner & Sparks, 2005; Ajzen, 2011). The theory of planned behaviour, and it's predecessor the Theory of Reasoned Action (TRA), are considered "deliberative processing models that imply that people's attitude are formed after careful consideration of available information," (Conner & Sparks, 2005, p. 171). The theory of planned behaviour predicts behaviour through the salient beliefs

towards the behaviour in question after accounting for variables considered external to the model (Ajzen, 1991). The external variables are composed of demographic variables (e.g. age, sex, occupation, socioeconomic status, religion, education), personality traits (e.g. extraversion, agreeableness, conscientiousness, neuroticism, openness to experience), and environmental influences (e.g. access, physical environment) (Conner & Sparks, 2005). Beliefs about a certain behaviour are subdivided into behavioural beliefs, normative beliefs and control beliefs. Behavioural beliefs are assumed to influence attitude towards behaviour, normative beliefs are the underlying framework from which subjective norms spring, and control beliefs are the basis for perceived behavioural control (PBC). Attitude, subjective norm and perceived behavioural control are related to the intention to act out a behaviour. Intention and perceived behavioural control predict behaviour. See Figure 1 for a model of the theory of planned behaviour.

In order for the theory of planned behaviour determinants of intention and perceived behavioural control to predict behaviour, they must meet three conditions: 1) intention and perceived behavioural control must correspond to, or be compatible with, the behaviour that is to be predicted; 2) intention and perceived behavioural control must remain stable in the interval between their assessment and observation of the behaviour; 3) perceived behavioural control must be accurate (Ajzen, 1991).

Figure 1. Theory of planned behaviour, adapted from Conner and Norman (2005).



Attitudes, social norms and perceived behavioural control can be considered holistically, or in their components. Attitudes are composed of affective attitudes and instrumental attitudes. It is considered to be more theoretically sound to analyze attitudes towards a certain behaviour through the affective attitudes they involve, and through the instrumental attitudes they involve than to analyze them together (Breckler & Wiggins, 1989; Crites, Fabrigar & Petty, 1994; Trafimow & Sheeran, 1998). The distinction between affective and instrumental attitudes is well distinguished.

Injunctive norm, called subjective norm in the theory of planned behaviour, addresses the normative influences of the culture people live in (Ajzen, 2002). Injunctive norm measures the concept of an individual's beliefs about whether those they associate with, e.g. friends, family, and co-workers, approve of a particular behaviour (Ajzen, 2002). Typically, injunctive norms do not usually vary a lot, as an individual's social network usually support the health-positive

behaviour in question. Thus, descriptive norm was added by Ajzen (2002) to increase the variability of the injunctive norm measure. Descriptive norms capture whether significant others perform the behaviour in question (Ajzen, 2002). Important others usually support health-promoting behaviours (measured by injunctive norm), so scores on this item are mostly positive. Adding whether the significant others participate in the behaviour themselves adds variability to the injunctive norm score (Ajzen, 2002), and improves the predictability of injunctive norm (Rhodes & Courneya, 2003).

Perceived behavioural control is a variable that can predict both intention towards behaviour and behaviour directly (Ajzen, 1991). Following in line with the theory of planned behaviour which is the theory chosen to guide this current study, perceived behavioural control may be measured by items that "capture the respondents' sense of self-efficacy with respect to preforming the behaviour [in question] (p.7)", and with items that "address people's beliefs that they have control over the behaviour, that its performance is or is not up to them (p.7)" (Ajzen, 2002). The first set of items measure the construct of self-efficacy, and the second set of items measure the construct of controllability (Ajzen, 2002). It has been seen by Ajzen (2002), Trafimow, Sheeran, Conner and Finlay (2002), and Rhodes and Courneya (2003) that these two components of perceived behavioural control are distinct from one another, and that self-efficacy is a better predictor of most behavioural intentions and behaviours than is controllability. Bandura's (1986) seminal publication of the Social Cognitive Theory highlighted the importance of the role of self-efficacy. Self-efficacy, to function as a predictor of behaviour, is context specific, and if this theoretical guideline is ignored, self-efficacy will not optimally predict behaviour.

Rogers, Conner and Murray (2008) found that self-efficacy is superior to perceived control and perceived difficulty, particularly in predicting the behaviours of reading and exercise

behaviour. Rogers et al. (2008) state that self-efficacy may be the most useful variable if only one of the three is to be used in a study. Rhodes and Courneya (2003) studied the predictability of self-efficacy and controllability on both an undergraduate sample and a cancer survivor sample in the exercise domain, and found that self-efficacy alone was a predictor of intention. Even so, according to Ajzen (2002), for improved predictability of perceived behavioural control in the theory of planned behaviour, both the construct of self-efficacy, and the construct of controllability should be utilized when measuring perceived behavioural control in the theory of planned behaviour. Ajzen (2002) advises that perceived behavioural control could be considered either generally, or in its two components of self-efficacy and controllability depending on the purpose of the study.

Though the theory of planned behaviour is predictive of behaviour, exercise behaviour has also been found to be associated with personality types, including extraversion, in both a cross-sectional study using self-reported exercise behaviour and a prospective study using objective attendance records (Courneya et al., 1999). These two studies by Courneya et al. (1999) found that the theory of planned behaviour mediated the relationship between neuroticism and conscientiousness and exercise behaviour, but not extraversion and exercise behaviour (Courneya et al., 1999). This challenges the idea that the theory of planned behaviour and other social-cognitive theories fully mediate the relationship between personality and a specific behaviour (Ajzen, 1991; Courneya et al., 1999). Integrating the five-factor model of personality into the theory of planned behaviour more closely when attempting to predict exercise behaviour may have merit, as Courneya et al. (1999) point out. Factors that were thought to be external to the theory of planned behaviour may actually have a more direct role in people's choices to engage in physical activity. People's extraversion level may either help or hinder their attempts to be active. Ajzen (2011, p.1124) explains that there may be "stable individual difference that

influence the relative weights of the different predictors in the TPB".

In the groups of individuals who received the social setting messages that match their extraversion level, it was expected that they would have different levels of exercise-related intention, attitude, subjective norm, and perceived behavioural control scores towards exercise than the groups of individuals who receive the social setting messages that do not match their extraversion levels. It was thought that matching exercise messages to extraversion level would result in different social cognition outcomes than messages that are mismatched to extraversion level.

Purpose

The purpose of this research was to examine if differences exist in exercise-related social cognitions between introverts and extraverts after reading exercise messages that addressed the social setting preferences of more extraverted and more introverted people, as well as identify which, if any, differences exist between introverts' and extraverts' physical activity behaviour and exercise-related social cognitions. The tailored messages were based on the tendency of introverted people preferring to spend time alone, and the tendency of extraverted people to enjoy spending time with other people (Courneya & Hellsten, 1998). Therefore, the exercise messages were tailored to the social setting in which exercise can take place.

Hypotheses

Based on previous research, it was hypothesized that:

H1 – Introverted participants who received the exercise message tailored to exercising alone would have higher scores in exercise-related social cognitions than introverts who received an exercise message tailored to exercising in a group setting.

H2 – Extraverted participants who received the exercise message tailored to exercising alone would have lower scores in exercise-related social cognitions than extraverts who received an

exercise message tailored to exercising in a group setting.

H3 – Introverts who received the exercise messages tailored to exercising in a group would have lower scores in exercise related social cognitions than introverts who received an exercise message tailored to exercising alone.

H4 – Extraverts who received the exercise message tailored to exercising in a group would score higher in exercise-related social cognitions than extraverts who received an exercise message tailored to exercising alone.

H5 – Extraverts would be more active than introverts (Rhodes and Smith, 2006).

Method

Pre-screening Study

This research, including both the pre-screening and main study, was approved by the University of Alberta Human Research Ethics Board 2 (see Appendix C). It was also approved through the Department of Psychology internal review board. For the pre-screening study, participants were recruited through the mass testing of undergraduate psychology students conducted by the psychology department at the beginning of the 2013 fall semester. Students were asked to fill out a series of questionnaires online for various researchers throughout the University of Alberta to use in conducting their respective studies and experiments, and in return gain research participation credit. Of these students, two thousand thirty-five (2,035) students completed the two questionnaires that were part of the mass testing that were necessary to be considered in the current study: a generic demographics questionnaire, and a measure of extraversion. The extraversion questionnaire was used to select highly extraverted and highly introverted participants to participate in the main study, similar to the extreme groups approach (Preacher, Rucker, MacCallum & Nicewander, 2005). Though Preacher et al. (2005) were critical

of the extreme groups approach, they state that when there is a need for cost-efficiency and the power to detect effects, its application is acceptable.

Measures. The participants completed a demographics questionnaire, and a 12-item extraversion domain questionnaire (extraversion sub-scale of NEO Five Factor Inventory 3; Costa & McCrae, 1992, 2010).

Demographics. The generic mass testing demographics questionnaire included questions regarding gender, age, education, and ethnicity, among others. Gender, age, education, and ethnicity were the demographics that were useful in this pre-screening study. For a complete list of demographic information requested during the mass testing, see Appendix A.

Extraversion. Extraversion was measured using the extraversion scale within the NEO-FFI (NEO Five Factor Inventory 3; Costa & McCrae, 1992, 2010). The NEO-FFI is designed to measure the Five Factor Model of personality. The NEO-FFI was used to measure personality in much of the literature that guided this study (e.g. Rhodes et al., 2002). The 12 items from the NEO-FFI assessing extraversion were used in the pre-screening study. These items are rated on a 5-point scale, ranging from *strongly disagree* (4) to *strongly agree* (0); an example item is, '*I like to have a lot of people around me: strongly disagree [4,3,2,1,0] strongly agree,'*. The NEO-PI-R, the expanded version of this questionnaire, has been found to be reliable and valid across a variety of different populations (Allik & McCrae, 2004). See Appendix B for the full questionnaire.

Data analysis. Descriptive statistics were performed on gender, age, BMI, extraversion and ethnicity. Participants who failed to answer two or more questions on the extraversion scale, or who did not correctly input their student number were not included in the recruitment procedure for the main study. Out-of-range and inconsistent data were identified through the use of frequency distribution graphs on SPSS, version 21. The frequency, percentages, means and

ranges of the variables were calculated using SPSS, version 21. The internal reliability of the extraversion sub-scale of the NEO-FFI was calculated using Cronbach's using the 12 items of this scale. This measure was found to be reliable, returning a score of 0.82. A score between 0.7 – 0.9 is considered to have good internal consistency.

Extraversion. In this study, the extreme groups approach (Preacher et al., 2005) was used such that the participants who scored in the extreme ends of the extraversion domain scale during the mass testing procedure were invited to participate in this study. The majority of participants identified as Euro-American (33%), East Asian (25.4%) and European (17.9%), and as female (63.1%). A table comparing the mass testing participants to those who were selected to participate in the main study can be seen in Table 2. The identification process was as follows: The mass testing participants were ranked on their level of extraversion scores from most extraverted to most introverted and divided into twelve groups of approximately the same size (n = 169). From this preliminary categorization, it was determined that participants with scores greater than or equal to 3.33 (indicating high extraversion) and participants with scores lower than or equal to 1.50 (indicating low extraversion) would be invited to the main study. Of the two thousand twenty-nine participants who answered the NEO extraversion sub-scale, 351 participants fit the criteria for the main study. One hundred seventy-six participants had scores between 3.33 and 4.00 and were classified as extraverted. One hundred seventy-five participants had scores between 0.42 and 1.50 and were classified as introverted. Of the 175 more introverted participants, three had student IDs that were incorrect and not compatible with the online recruiting system, so therefore, 172 of the more introverted participants were invited to partake in the main study. These cut-off scores were appropriate as they encompass either ends of the extraversion continuum, but still allowed for enough people to volunteer to participate in the

study. These two groups were invited to participate in the main study through the sign up system implemented through the Department of Psychology. Two hundred sign-up slots were available.

Table 2

Comparison between Mass Testing Participants and Participants Invited to Main Study

	Mass Testing Participants		Invited to Main Study			
Personality			Introvert		Extravert	
Gender	Male	Female	Male	Female	Male	Female
n =	738	1,262	64	104	52	122
n (%)	36.40	63.10	38.10	61.90	29.89	70.11
Age (Mean)	19.09	18.92	18.28	19.78	18.9	18.78
Age (SD)	2.24	2.4	1.89	4.45	2	1.97
BMI (Mean)	23.5	22.09	23.87	22.53	23.79	22.11
BMI (SD)	4.4	3.99	6.88	3.53	2.99	3.37
Extraversion (Mean)	2.38	2.46	1.22	1.21	3.49	3.55
Extraversion (SD)	0.6	0.64	0.28	0.25	0.14	0.18
Mode ethnicity per group	Euro-American (35%)	Euro-American (32%)	Euro-American (41%)	East Asian (26%)	Euro-American (52%)	Euro-American (43%)

Main Study

Participants. Referring to Cohen (1992), it was determined that for a medium effect size for $a = 0.05$, using a p value of 0.05 and power of 0.80, a sample size of approximately 45

participants per condition was necessary for the main study. The number of participants within each of the four conditions is demonstrated in Table 3.

Table 3

Participants per Condition

Message type		Extraversion level	
With others	Alone	High	Low
n = 99 (50.76%)	n = 96 (49.23%)	n = 112 (57.44%)	n = 83 (44.10%)
Experimental condition			
EME	EMI	IME	IMI
n = 55 (28.20%)	n = 44 (22.56%)	n = 57 (29.23%)	n = 39 (20%)

Note. EME = extraverted message to extraverted person; EMI = extraverted message to introverted person; IME =introverted message to extraverted person; IMI = introverted message to introverted person.

Measures.

Social cognitions. In this study, the social cognitions come from the theory of planned behaviour. The theory of planned behaviour constructs, (i.e. intention, attitude, injunctive and descriptive norm, perceived behavioural control) were measured following the guidelines set out by Ajzen (2002) and by Conner and Sparks (2005). Ajzen (2002) recommends defining the behaviour of interest, and defining the population. The population is defined above. In this study, the behaviour was defined as '*exercise for 30 minutes or more three times a week in the next month*'. The Canadian Society for Exercise Physiology (2013) recommends that adults between the ages of 18-64 engage in 150 minutes of moderate to vigorous physical activity a week. The

reason for the difference that exists between this study's definition of exercise and CSEP's established guidelines is due to the fact that much of the Canadian population does not engage in enough physical activity for health benefits, and that the current sample would be no exception. If CSEP's definition of exercise was used in the questionnaire, many participants would see this level of exercise as unachievable, and their answers on the theory of planned behaviour questions would likely be quite low. With many people reporting very low levels on the theory of planned behaviour variables, it would not be possible to see whether or not the tailored messages worked. A more moderate exercise definition of 30 minutes three times a week in the next month was used in the hopes that it would more evenly distribute the participants over the theory of planned behaviour constructs. See Appendix D for all social cognition measures.

Intention. This measure contained three items. It had possible scores on a Likert-like scale ranging from 1 – 7. An example of this item is: *I intend to exercise for 30 minutes three times a week in the next month: definitely true [1, 2, 3, 4, 5, 6, 7] definitely false*. The second of the three items was reversed scored. The mean score was calculated from these three items.

Affective attitude. Affective attitude was measure by four items. The possible scores on these items ranged from 1 – 7. An example item is as follows: *For me to exercise for 30 minutes three times a week in the next month will be: pleasant [1, 2, 3, 4, 5, 6, 7] unpleasant.* A mean score was calculated from these items.

Instrumental attitude. This measure contained four items and had possible scores ranging from 1-7. An example of this item is: *For me to exercise for 30 minutes three times a week in the next month will be: healthy [1, 2, 3, 4, 5, 6, 7] unhealthy*. The 1st and 4th were reverse scored and a mean score was calculated.

Injunctive norm. The injunctive norm, also know as subjective norm in the theory of planned behaviour, measure contained two items. The possible scores ranged from 1 – 7 on a

Likert-like scale. An example of one of the injunctive norms is: *People who are important to me want me to exercise for 30 minutes three times a week in the next month: strongly disagree [1, 2, 3, 4, 5, 6, 7] strongly agree*.

Descriptive norm. Descriptive norm measure contained one item. This item was worded as follows: *Most people like me will exercise for 30 minutes three times a week in the next month: unlikely [1, 2, 3, 4, 5, 6, 7] likely.*

Perceived behavioural control. Possible scores ranged from 1 – 7 on the Likert-like scale. Self-efficacy was measured by: *I am confident that I can exercise for 30 minutes three times a week in the next month: false [1, 2, 3, 4, 5, 6, 7] true*. Controllability was measured by: *My exercising for 30 minutes three times a week in the next month is up to me: strongly disagree [1, 2, 3, 4, 5, 6, 7] strongly agree.*

Past behaviour. Past behaviour was measured with one true/false item: *In the past month, I exercised for 30 minutes three times a week: true/false*.

Demographics. The following demographic variables were collected, based on self-report: age, sex, height, weight, ethnic background, level of education, hometown, and home province/territory. For ethnic background, participant responses were coded, and collapsed down to the most condense but meaningful categories. Alphabetically, these categories are: Aboriginal and/or Métis and/or French-Canadian and/or Canadian, African, Canadian, Chinese, Eastern European, Euro-Canadian, European/Caucasian (general), European (originated from one country), Middle Eastern, Other, South American and Caribbean, South Asian (other than Chinese), Southeast Asian and Pacific Islander, and Undeclared. See Appendix E for the demographics questionnaire in full.

Physical activity behaviour. Physical activity behaviour was assessed using the Godin Leisure-Time Exercise Questionnaire (Godin & Shepard, 1997). This measure includes four

items. The first three items are open ended, requesting the participant to state how many times they have exercised for more than 15 minutes during an average 7-day period at the following intensities: strenuous (heart beat rapidly, sweating, e.g. running), moderate (not exhausting, light perspiration, e.g. alpine skiing), mild (minimal effort, no perspiration, e.g. yoga). These items were scored by multiplying strenuous activity by nine, moderate activity by five, and mild activity by three. In this way, the Metabolic Equivalent of Task (MET) score was obtained. Godin (2011) recommends that only the strenuous and moderate activity scores be considered when seeking health benefits for exercise. Therefore, a moderate and vigorous physical activity (MVPA) score was calculated. Participants with an MVPA score of 24 or higher were considered active, those who scored 14 – 23 were considered somewhat active, and those who scored lower than 14 were considered inactive, according to the scale by Godin (2011). The fourth item requests the participant to circle either the response *often*, *sometimes*, or *never/rarely* to the question of how often during a 7-day period the participant engages in any leisure time activity long enough to work up a sweat. This questionnaire has been found to be valid and reliable and has been utilized in numerous studies (Godin, 2011). Please refer to Appendix F.

Personality. As described in the pre-screening methods section, the NEO-FFI (NEO Five Factor Inventory 3; Costa & McCrae, 1992, 2010) is designed to measure the Five Factor Model of personality. In the main study, all five factors were measured: neuroticism, extraversion, openness to experience, agreeableness, and conscientiousness. The NEO-FFI scale has 60 items. These items are rated on a 5-point Likert like scale, range from *strongly disagree* (4) to *strongly agree* (0), ex. Neuroticism, item 1: *I am not a worrier. strongly disagree [4,3,2,1,0] strongly agree.* The maximum one can score on this scale is 240, and the minimum is 0. However, multiple selection of the same response to different items consecutively should cause the test to be interpreted with caution, as *acquiescence*, *nay saying* and/or *random responding* could have

taken place (Costa and McCrae, 2010). As well, if more than 10 answers are left blank, Costa and McCrae (2010) advise that the test be considered invalid, and not scored. When nine or fewer items have been left blank, the blank items should be considered as a *neutral (2)* response. If any domain has more than four blank items, the domain should be interpreted with caution. As stated in the pre-screening methods section, the NEO-PI-R, the expanded version of this questionnaire, has been found to be reliable and valid across a variety of different populations (Allik & McCrae, 2004). Please see Appendix G for more information.

Manipulation.

Tailored messages. There were two social context-tailored exercise messages: one message tailored to exercising alone, and the other to exercising with others. Each message contains reference to an authority on exercise, benefits to engaging in exercise, a rationale as to why one might want to engage in exercise alone or with others, and a recommendation of exercise dose. The messages were created following the research by Courneya and Hellsten (1998) among others, the examples in Berry and Carson (2010), and the guidelines by Latimer, et al (2010). See Appendix H and Appendix I for both versions of the tailored messages.

Procedure and design.

When participants signed up for the study, they were first stratified by personality group, and then within these stratified groups, they were randomly assigned to one of the two message groups. On the participants' chosen dates and times, they reported to the study room. Data was collected with one to eighteen participants per data collection session, depending on the number who signed up per day. A short welcome and explanation of the study preceded the introduction to the study and the filling out of the consent form (see Appendix J). Then the messages and questionnaire sets were distributed. The participants read the tailored message assigned to their group before responding to the questionnaire set. The participants responded to the

questionnaires in the following order: social cognitions, demographics, physical activity behaviour, and then the personality questionnaire, including the extraversion sub-scale given to them in the mass testing. The entire study took about 20-25 minutes to complete. The questionnaires were completed in person in the designated study room with pen and paper. In return for their participation, participants earned credit towards their psychology class. An alternate assignment was available to complete for credit for those who did not want to complete the study. At the end of the study, participants were thanked for their time, and debriefed about the study.

Data analysis.

Descriptive statistics of main study participants. Data were inspected and cleaned of outliers (>3.29 standard deviations from the mean), and of missing data, and to determine if the data were normally distributed. Normal distributions were found for neuroticism, extraversion, openness to experience, agreeableness, and conscientiousness. See Table 4 for a description of participants in their experimental groups. Ethnicity of participants per experimental group can be found in Table 5.

Table 4

Comparison of Participants in Experimental Groups

	Message Type							
	Alone				With others			
Personality	Introvert		Extravert		Introvert		Extravert	
Gender	Male	Female	Male	Female	Male	Female	Male	Female
n =	13	26	15	42	17	27	13	42
n %	6.66	13.33	7.69	21.54	8.71	13.85	6.66	21.54
Age (Mean)	19.77	19.54	19.4	19.17	19.94	18.89	19.23	18.79
Age (SD)	2.42	3.33	2.97	2.81	2.01	1.19	2.13	1.62
BMI (Mean)	23.94	22.83	24.46	21.4	24.03	22.82	23.75	21.84
BMI (SD)	5.98	3.65	3.04	3.63	5.66	3.21	2.65	2.73
METs (Mean)	64.77	38.35	55.87	50.69	38.94	40.81	59.23	61.29
METs (SD)	47.97	38.9	22.55	23.91	29.44	23.59	33.09	35.87
MVPA (Mean)	49.54	22.65	45.67	37.55	31.18	27.04	50.69	45.79
MVPA (SD)	35.35	25.38	20	20.75	25.94	20.63	28.81	29.7
Extraversion (Mean)	1.79	1.51	3.34	3.28	1.64	1.36	3.18	3.3
Extraversion (SD)	0.43	0.35	0.31	0.37	0.46	0.43	0.28	0.37

Table 5

Ethnicity of Main Study Participants

	Condition			
	EME (n=55)	EMI (n=44)	IME (n=57)	IMI (n=39)
Ethnicity	% (n)			
Aboriginal and/or Métis and/or French-Canadian and/or Canadian	1.8% (1)	4.5% (2)	3.5% (2)	2.6% (1)
African	3.6% (2)	4.5% (2)	3.5% (2)	2.6% (1)
Canadian	9.1% (5)	15.9% (7)	19.3 (11)	15.4% (6)
Chinese, Hong Kong, South Korean	10.9% (6)	18.2% (8)	5.3% (3)	15.4% (6)
Eastern European	1.8% (1)	2.3% (1)	3.5% (2)	15.4% (6)
Euro-Canadian	18.2% (10)	6.8% (3)	15.8% (9)	2.6% (1)
European, from one country	9.1% (5)	6.8% (3)	12.3% (7)	7.7% (3)
European/Caucasian	20.0% (11)	6.8% (3)	12.3% (7)	12.8% (5)
Middle Eastern	3.6% (2)	2.3% (1)	3.5% (2)	5.1% (2)
Other	3.6% (2)	4.5% (2)	1.8% (1)	5.1% (2)
South American and Caribbean	7.3% (4)	4.5% (2)	3.5% (2)	2.6% (1)
Southeast Asia and Pacific Islands	1.8% (1)	18.2% (8)	7.0% (4)	10.3% (4)
Southern Asian	9.1% (5)	4.5% (2)	8.8% (5)	0% (0)
Undeclared	0% (0)	0% (0)	0% (0)	2.6% (1)

Note. EME = extraverted message to extraverted person; EMI = extraverted message to introverted person; IME = introverted message to extraverted person; IMI = introverted message to introverted person. Ethnicity based on self-reported ancestry.

Data Preparation. Cronbach's alpha test determines the internal consistency between items in a measurement scale. The intention, affective attitude, and instrumental attitude scales obtained acceptable and thus meaningful reliability scores of $\alpha = 0.712$, $\alpha = 0.801$ and $\alpha = 0.766$ respectively, indicating acceptable levels of internal consistency. The injunctive norm and descriptive norm scale, and the perceived behavioural control scale had Cronbach's alphas of $\alpha = 0.483$ and $\alpha = 0.244$, respectively – scores that demonstrate unacceptable levels of internal consistency. Therefore, items in these scales were treated individually in the analysis. The internal consistency of the 5 personality factors ranged from good to excellent (N (neuroticism): $\alpha = 0.889$; E (extraversion): $\alpha = 0.938$; O (openness to experience): $\alpha = 0.779$; A (agreeableness): $\alpha = 0.785$; C (conscientiousness): $\alpha = 0.849$).

Correlations between dependent variables were examined to identify any possible covariates for the final eight ANOVAs/ANCOVAs on the dependent variables. Previous research suggests that higher levels of extraversion and conscientiousness, and low levels of neuroticism are associated with increased physical activity levels (Rhodes & Smith, 2006). Based on the strength of the correlations with the dependent variables, conscientiousness and MVPA were considered to be potential covariates in the main analysis. Though considered, neuroticism was not used as a covariate as it did not correlate strongly with the dependent variables. As well, it tended to correlate with the other more strongly correlated covariates, and so having neuroticism as a covariate would have been redundant. On some dependent variables, ANCOVAs were chosen over ANOVAs to increase the sensitivity of the test of main effects and interactions by reducing the error term and to adjust the dependent variable means if all participants had scored equally on the related covariate (Tabachnick & Fidell, 2001). It is important to remember that when using ANCOVAs, the means are adjusted and do not occur as such in the real world (Tabachnick & Fidell, 2001). Any conclusions drawn should reflect this. Therefore, in the current

study ANCOVAs were only used when conscientiousness and/or MVPA correlated strongly with the dependent variables. See Table 6 for correlations that were used to identify covariates. Through the use of the correlation matrix, MVPA was identified as a covariate for the dependent variables of intention, perceived behavioural control–self-efficacy, and perceived behavioural control–controllability. Conscientiousness was identified as a covariate for the dependent variable of affective attitude. No covariates were found for instrumental attitude, injunctive norm 1, injunctive norm 2, and descriptive norm.

As the analysis performed on the dependent variables differ based on whether the dependent variables correlated strongly with conscientiousness and/or moderate/vigorous physical activity, three different approaches were used to examine the relationship between the independent variables and the dependent variables. Eight analyses were performed in total. ANOVAs and ANCOVAs were chosen over MANOVAs and MANCOVAs, as there were too many dependent variables that were moderately correlated with one another (Tabachnick & Fidell, 2001). MANOVAs are substantially more complicated than ANOVAs, often less powerful than ANOVAs, and leave some ambiguity in the interpretation of the effects of independent variable on any single dependent variable (Tabachnick & Fidell, 2001).

Four 2 (level of extraversion) x 2 (message type) Analysis of Variance (ANOVA) on the dependent variables of instrumental attitude, injunctive norm 1, injunctive norm 2, and descriptive norm were performed. Three 2 (level of extraversion) x 2 (message type) Analysis of Co-variance (ANCOVA; covariate: moderate/vigorous physical activity) on the dependent variables of intention, perceived behavioural control–self-efficacy, and perceived behavioural control–controllability were performed. One 2 (level of extraversion) x 2 (message type) Analysis of Co-variance (ANCOVA; covariate: conscientiousness) on the dependent variable of affective attitude was performed.

Table 6

Correlations between TPB, Personality, Moderate/Vigorous Physical Activity Level, and BMI Measures

Measure	Intent.	Aff. Att.	Instr. Att.	Inj. Norm 1	Inj. Norm 2	Descrip. Norm	Self-eff.	Control.	Neurot.	Extra.	Open. to Exper.	Agree.	Consci.	M./V. P.A.	BMI
Intention	1														
Affective attitudes	0.533**	1													
Instrumental attitudes	0.401**	0.561**	1												
Injunctive norm 1	0.076	0.149*	0.123	1											
Injunctive norm 2	0.302**	0.097	0.119	0.383**	1										
Descriptive norm	0.511**	0.496**	0.381**	0.150*	0.306*	1									
Self-efficacy	0.683**	0.570**	0.418**	0.135	0.224*	0.549**	1								
Controllability	0.126	0.075	0.127	0.024	0.023	0.003	0.167*	1							
Neuroticism	-0.168*	-0.406**	-0.175*	-0.092	0.009	-0.328**	-0.292**	0.053	1						
Extraversion	0.352**	0.462**	0.291**	0.218**	0.165*	0.436**	0.433**	0.003	-0.556**	1					
Openness to Experience	0.087	0.114	0.196**	-0.044	0.024	0.085	0.179*	0.007	0.013	0.099	1				
Agreeableness	-0.022	0.199**	0.145*	0.034	-0.069	0.078	0.076	0.053	-0.210**	0.215**	0.275*	1			
Conscientiousness	0.177*	0.342**	0.212**	0.056	0.032	0.232**	0.255**	0.134	-0.339**	0.422**	0.112	0.176*	1		
Moderate/Vigorous Physical Activity	0.534**	.419**	0.275**	0.059	0.176*	0.443**	0.542**	0.168*	-0.277**	0.294**	0.086	0.062	0.203**	1	
Body Mass Index	0	-0.178*	0.022	-0.061	0.075	-0.088	-0.054	0.052	0.096	-0.148*	-0.074	-0.089	-0.186**	-0.88	1

Note. * Correlation significant at the $p < 0.05$. ** Correlation significant at the $p < 0.01$. N = 195.

Results

Determination of the Final Sample

There was no missing data. Out-of-range and inconsistent data were identified through the use of frequency distribution graphs on SPSS, version 21. In one questionnaire pack, due to a photocopy error, one sheet of paper was omitted that included the measurement of the following variables: injunctive and descriptive norm scale, perceived behavioural control scale, past behaviour, weight, and height. One participant was affected by this error. Two outliers with extreme BMI scores were found. Therefore, the final sample included one hundred ninety-five (195) participants, for approximately 48 participants/group, which met the power requirements for a medium effect size and $a = 0.05$ using an ANOVA with 4 groups (Cohen, 1992). More participants in the 'more extraverted' group volunteered for this study then participants in the 'more introverted' group, with the final sample being composed of 57.44 % extraverts and 42.56% introverts. One hundred seventy-six of the most extraverted participants were invited to the study. One hundred twelve volunteered to participate. One hundred seventy-two of the most introverted participants were invited to the study. Eighty-three volunteered to participate. Therefore, 64% of the extraverts that were invited to participate in the study participated, while 48% of the introverts that were invited to participate in the study participated. The breakdown by extraversion level, message type and condition can be found in Table 3 and Table 4 above.

Preliminary Analysis

Univariate analysis and cross-tabs analysis (Chi-square analysis) were performed on the data to ensure both normality of the data and randomization of participants to experimental groups. The four conditions did not differ in terms of age, $F(3,191) = 0.73$, $p = 0.54$; nor gender, $\chi^2 (3, N = 193) = 3.20$, $p = 0.36$. There were also no differences in ethnicity, $\chi^2 (13, N = 195)$ 25.52, $p = 0.02$, BMI category, $\chi^2 (3, N = 195)$ 3.26, $p = 0.353$ based on level of extraversion, nor

on hometown location, χ^2 (3, N = 195) 5.41, p = 0.144.

The introverted groups and the extraverted groups were hypothesized to differ on physical activity level. The four groups (2 introverted, 2 extraverted) did in fact differ in terms of MET scores, F (3, 191) = 3.61, p = 0.014 and MVPA scores, F (3, 191) = 4.90, p = 0.003. There were no differences in METs, F (1, 81) = 0.84, p = 0.363, or MVPA, F (1, 81) = 0.25, p = 0.618 between the introverts who received the matched message compared to those who received the mismatched message. As well, there were no differences in METs, F (1, 110) = 2.43, p = 0.122; and MVPA, F (1, 110) = 2.31, p = 0.13 between the extraverts who received the matched message compared to those who received the mismatched message. Mean extraversion scores of participants invited to participate in the main study and participants who volunteered to participate in the main study can be found in Table 7.

Table 7

Mean Extraversion Scores of Invited Participants and Main Study Participants

Participants	
Invited	Main study
n = 348	n = 195
Extraverted	
M = 3.53	M = 3.28
SD = 0.172	SD = 0.355
Introverted	
M = 1.21	M = 1.52
SD = 0.271	SD = 0.425

Main Analysis

The results of the eight 2 (level of extraversion) x 2 (message type) Analysis of Variance ANOVA/ANCOVAs showed some main effects, and no interactions. The means, standard deviations, sample sizes and results of the ANOVAs/ANCOVAs are shown in Table 8 and Table 9.

Main effects for level of extraversion were presented in the dependent variables. There were significant differences between extraverts and introverts on intention, affective attitude, instrumental attitude, injunctive norm 1, injunctive norm 2, descriptive norm, and self-efficacy. There was no significant difference on controllability.

For type of message, no main effects were found on any of the dependent variables. However, there was a near significant finding on injunctive norm 2 (*My exercising for 30 minutes three times a week in the next month is up to me - strongly disagree-strongly agree*), $F(1, 194) = 3.874$, $p = 0.05$, $\eta^2 = 0.020$.

There were no significant interactions between extraversion level and message type. However, the message type by extraversion level interactions can be seen in Table 10.

Table 8

Means, Standard Deviations and ANOVA/ANCOVA Results of the Dependent Variables for Level of Extraversion

Dependent variable	Extraverted (*M, SD*)	Introverted (*M, SD*)	F	*p*-value	η^2
Intention**	5.531 (0.127)	4.856 (0.148)	11.668	**0.001**	0.058
Affective attitude ***	6.033 (0.102)	5.084 (0.121)	33.329	**<.001**	0.149
Instrumental attitude*	6.611 (0.079)	6.175 (0.92)	12.851	**<.001**	0.063
Injunctive norm, 1*	6.759 (0.079)	6.309 (0.091)	13.981	**<.001**	0.068
Injunctive norm, 2*	5.772 (0.141)	5.240 (0.164)	6.069	**0.015**	0.031
Descriptive norm*	5.387 (0.156)	3.899 (0.182)	38.634	**<.001**	0.168
Self-efficacy**	5.906 (0.143)	4.870 (0.167)	21.43	**<.001**	0.101
Controllability**	6.558 (0.084)	6.633 (0.098)	0.335	0.564	0.002

Note. * ANOVA ** ANCOVA covariate moderate/vigorous physical activity *** ANCOVA covariate conscientiousness

Table 9

Means, Standard Deviations and ANOVA/ANCOVA Results of the Dependent Variables for Message Type

Dependent variable	Extraversion (*M, SD*)	Introversion (*M, SD*)	F	*p*-value	η^2
Intention**	5.268 (0.134)	5.101 (0.138)	0.928	0.337	0.005
Affective attitude ***	5.595 (0.106)	5.522 (0.106)	0.238	0.259	0.001
Instrumental attitude*	6.385 (0.085)	6.401 (0.087)	0.018	0.893	0.00
Injunctive norm, 1*	6.575 (0.084)	6.493 (0.086)	0.468	0.495	0.002
Injunctive norm, 2*	5.718 (0.150)	5.294 (0.155)	3.874	**0.05**	0.02
Descriptive norm*	4.659 (0.167)	4.627 (0.172)	0.018	0.893	0.00
Self-efficacy**	5.340 (0.151)	5.436 (0.156)	0.194	0.66	0.001
Controllability**	6.622 (0.088)	6.569 (0.091)	0.172	0.679	0.001

Note. * ANOVA ** ANCOVA covariate moderate/vigorous physical activity *** ANCOVA covariate conscientiousness

Table 10

Means, Standard Deviations, F-statistic, and Significance of Message Type by Extraversion Level Interactions

Dependent variable	EME	IME	EMI	IMI	F	Significance
Intention**	5.82 (1.38)	5.57 (1.41)	4.76 (1.69)	4.52 (1.64)	0.51	0.476
Affective attitude***	6.19 (0.89)	6.03 (0.94)	4.96 (1.25)	5.01 (1.21)	0.278	0.599
Instrumental attitude*	6.19 (0.54)	6.53 (1.00)	6.07 (0.98)	6.28 (0.76)	2.324	0.129
Injunctive norm, item 1*	6.76 (0.64)	6.75 (0.91)	6.39 (0.87)	6.23 (0.90)	0.369	0.544
Injunctive norm, item 2*	5.98 (1.21)	5.56 (1.52)	5.45 (1.53)	5.03 (1.72)	0.00	0.984
Descriptive norm, item 3*	5.55 (1.60)	5.23 (1.50)	3.77 (1.93)	4.03 (1.60)	1.42	0.235
Self-efficacy**	6.24 (1.48)	5.95 (1.33)	4.45 (2.16)	4.79 (1.96)	0.456	0.50
Controllability**	6.65 (0.80)	6.53 (1.12)	6.59 (0.69)	6.59 (0.79)	0.073	0.788

Note. EME = extraverted message to extraverted person; EMI = extraverted message to introverted person; IME = introverted message to extraverted person; IMI = introverted message to introverted person.
* ANOVA ** ANCOVA covariate moderate/vigorous physical activity *** ANCOVA covariate conscientiousness

Discussion

This research examined if reading an *exercising alone*-tailored (introverted social context) message or an *exercising with others*-tailored (extraverted social context) message had an effect on people who were highly extraverted or highly introverted. This was explored through a comparison between groups on scores of exercise-related intention, attitude, injunctive and descriptive norm, and perceived behavioural control towards exercise. It was hypothesized that 1) the more introverted people who receive the introversion tailored message would have higher scores on theory of planned behaviour constructs than the more introverted people who receive the more extraverted message; 2) the more extraverted participants who receive the introversion tailored message will have lower scores on the theory of planned behaviour constructs than the

more extraverted participants who receive the extraversion message; 3) the more introverted people who receive the more extraverted message will have lower scores on the theory of planned behaviour constructs than the more introverted people who receive the introverted message; 4) the more extraverted people who receive the extraversion message will score higher on the theory of planned behaviour constructs than the more extraverted people who receive the introversion message; and 5) the more extraverted people will be more active than the more introverted people. Hypotheses one through four were not supported, though hypothesis five was.

Main findings

Hypotheses one through four applied to the interaction effect of message type with extraversion level. There were no interaction effects on any of the social cognition variables measured in this study. There were no significant differences between the extraverted participants and introverted participants in their matched message groups and the extraverted participants and introverted participants in their mismatched message groups. Neither matched exercise message group scored higher nor lower than their mismatched exercise message group. However, main effects across extraversion level and message type were detected.

There were main effects for extraversion across all dependent variables except for controllability (*My exercising for 30 minutes three times a week in the next month is up to me - strongly disagree-strongly agree*). Intention, affective attitudes, instrumental attitudes, injunctive norm 1, injunctive norm 2, and self-efficacy were all higher in the extraverted group than in the introverted group.

For the message type factor, none of the dependent variables yielded significant main effects except for injunctive norm 2 (*My exercising for 30 minutes three times a week in the next month is up to me - strongly disagree-strongly agree*). Though injunctive norm 1 (*People who are important to me disapprove/approve of me exercising*) and descriptive norm (*Most people*

like me will exercise for 30 minutes three times a week in the next month, unlikely/likely) and injunctive norm 2 are all items measuring the same overarching construct, injunctive norm 2 was the only variable to demonstrate a borderline significant main effect for message type.

In the preliminary analysis, it was found that the extraverted participants differed from the introverted participants on moderate to vigorous physical activity. The two more introverted groups had no statistically significant differences between their activity levels, and the two more extraverted groups also had no differences. The more extraverted participants were more active than the more introverted participants. In the main analysis, the exercise-related social cognitions of the extraverted participants were significantly higher than the exercise-related social cognitions of the introverts. The more introverted participants had lower social cognitions towards exercise across all dependent variables except on controllability. This supports the fifth hypothesis.

Extraversion, social cognitions and exercise

This study supports previous research that extraverted people are more active than introverted people (Courneya & Hellsten, 1998; Kern et al., 2010; Rhodes et al., 2003). The participants who had higher exercise-related social cognitions were more active, and extraverted participants had higher levels of physical activity than the introverted participants. A difference between the social cognitions of introverts and extraverts was found. The greatest differences in social cognitions scores between these two groups were on affective attitude, self-efficacy, and descriptive norm. Though attitude, injunctive and descriptive norms, and perceived behavioural control all contribute to the prediction of intention and are lower in the introverted group than in the extraverted group, the much lower social cognitions seen on the specific components of these items, namely affective attitude, self-efficacy, and descriptive norm in the introverted group are especially intriguing. There is potential to increase these low scores through various

interventions. Increasing the exercise-related social cognitions of introverts would improve their physical activity behaviour, according to the theory of planned behaviour (Ajzen, 1991). It is important to remember, however, that any self-efficacy improvement, as well as affective attitudes and descriptive norm, are context specific (Bandura, 1986). The closer the physical activity intervention is to the desired outcome physical activity behaviour, the more applicable the self-efficacy learned will be translatable to that outcome physical activity behaviour.

The results of this study show that there are distinct exercise-related social cognitive differences between extraverts and introverts. To the knowledge of the researchers, this study is original in its findings. Previous research has confirmed a relationship between physical activity behaviour and extraversion (Courneya & Hellsten, 1998; Kern et al., 2010), but do not explicitly report any differences in exercise-related social cognitions based on extraversion level, even though social cognitions precede behaviour in social cognition theories. As the greatest divisions between introverts and extraverts occurred on the dependent variables of affective attitude, self-efficacy, and descriptive norm, these variables specifically will be discussed, along with possible rationales to explain the findings.

It was theorized, based on previous literature (de Bruijn et al., 2009), that the social setting of exercise may play a role in people's attitudes towards exercise. Both instrumental attitude and affective attitude are predictors of intention according to Ajzen (1991), and seemingly of exercise behaviour itself (Hausenblas et al., 1997). Kraft, Rise, Sutton and Røysamb (2005) and Lowe, Eves and Carroll (2002) found that affective attitude seems to be a better predictor of exercise behaviour than instrumental attitude. People tend to avoid behaviours that they do not enjoy, and that relate to negative emotions. Introverts experience less positive affect than extraverts (Lucas, Diener, Grob, Suh, & Shao, 2000; Rhodes & Smith, 2006). Even so, it is important to remember that, "Although [introverts] are not given to the exuberant high spirits of

extraverts, introverts are not unhappy or pessimistic," (McCrae & Costa, 2010, p. 19). With the introverted participants having much lower affective attitudes towards exercise, and somewhat lower instrumental attitudes towards exercise than the extraverts, along with a lower affective predisposition, the fact that introverts are less active than extraverts is not surprising, considering the significance of attitudes in physical activity behaviour prediction. Specifically improving introverts' affective attitudes is desirable in order to increase physical activity levels, as positive affective attitudes towards physical activity are much more critical in their prediction of physical activity behaviour than are instrumental attitudes (French, et al., 2005; Lowe et al., 2002). Future research could explore why introverts are more resistant to exercise than extraverts are as a step toward changing attitudes. It may be that social setting is related to this but that the messages in the current research were not enough to change attitude. Furthermore, there may be other aspects of exercise that introverts, in particular, dislike.

Self-efficacy is considered to be a much stronger predictor of intention than is controllability when it comes to the perceived behavioural control predictor of behaviour in the theory of planned behaviour (Rhodes & Courneya, 2003). The fact that self-efficacy scores were so much lower in the introverted participants than in the extraverted participants is therefore cause for concern. The confidence levels introverted participants had towards exercise behaviour is much lower than the confidence levels of the extraverted participants. Self-efficacy was measured in this study by one item, and this item was quite broad (*I am confident that I can exercise for 30 minutes three times a week in the next month: false/true*). Therefore, there could be many possible rationales as to why introverts have lower self-efficacy levels than extraverts, as the item measured self-efficacy in general. One rational for the lack of confidence expressed by introverts to be physically active may be linked to their higher levels base levels of arousal (Eysenck, 1991). Introverts may become over-stimulated from other parts of their lives and thus

do not have enough energy to participate in regular physical activity. They may not have enough belief in their ability to be physically active. Or, introverted individuals may find participation in the act of exercise itself to be over-stimulating. The idea of exercise itself may require them to give more energy than they have available. Courneya and Hellsten (1998) speculated that lack of energy, a barrier to physical activity participation, would be more of a barrier for introverted people.

Additionally, another reason to why introverted people may have lower exercise related-self-efficacy could be because they have less previous exercise-related experience. Rhodes et al. (2002) concluded that the activity facet of extraversion might be responsible for the effect of extraversion found in other research. Individuals scoring high on the activity facet of extraversion are individuals who naturally tend to seek activity, and so therefore, exercise is a natural outlet for their energy (Rhodes et al., 2002). Introverted people therefore might not have this natural affinity towards physical activity, which would limit their exposure to the exercise setting. Not knowing how to use equipment, or what is expected of them in a gym would be barriers towards exercise participation. More extraverted people seem to have an affinity towards physical activity and thus are more likely to participate in physical activity settings, and so would be more likely to have a greater field of experience to draw upon when confronted with an exercise setting. Introverted participants could have lower levels of physical activity than extraverts because they are less likely to seek activity, as it is not in their disposition to do so (Rhodes et al., 2002). These individuals would then have less experience in the physical activity setting, which would lower their exercise-related self-efficacy when confronted with such situations.

Descriptive norm was the last exercise-related social cognition that introverts scored exceptionally low on in the current study. Individuals are believed to be responsible for their own health and disease risk (Crawford, 1980, p. 364). However, it has been shown (Colley et al.,

2011; Roberts & Bernard, 2005) that people are not engaging in sufficient levels of physical activity for health benefits in North America. The knowledge that other people are not active enough may further disincline certain individuals from participating in physical activity, as low levels of physical activity are the norm. These certain individuals may be introverted people. The results of the current study indicate that extraverted people seem to identify themselves as exercisers more readily than introverted people do, perhaps due to their natural affinity towards activity as discussed above. When norms about exercise change, such as through exercise messages that portray physical activity as something enjoyable that can appeal to all sorts of personalities and through positive physical activity experiences, it is possible that exercise-related descriptive norms will change for these certain individuals who do not visualize people like themselves to be exercisers. If more introverted people can identify themselves as exercisers, levels of physical activity would increase, in accordance with the theory of planned behaviour.

Endeavouring to improve introverts' low exercise-related social cognitions would be the desired objective from a message tailoring intervention such as the one attempted in the current study. The basis of behaviour change according the theory of planned behaviour is the notion of increasing attitude, injunctive and descriptive norms, and perceived behaviour control towards the desired behaviour in question (Ajzen, 1991). Affective attitudes and self-efficacy have been found to be strong predictors of health-related behaviours (Godin & Kok, 1996; Haggar et al., 2002), though were the lowest of the exercise behaviour predictors measured in the current study. Therefore, strategies targeted at raising affective attitudes and self-efficacy would improve health-related intentions, and possibly behaviour, the greatest. With descriptive norm, attempting to improve introverts' normative beliefs could result in higher health-related intentions and exercise behavioural, but as subjective norm is the weakest predictor of health-related intention, the impact of improved descriptive norms could also be minimal (Godin & Kok, 1996). The best

route to improving intention in introverts would be to target predictors based on amount of influence they have over the behaviour in question (Ajzen, 2004). To improve exercise-related intention levels in this study, improving affective attitude and self-efficacy would be the best social cognitions to target.

Introverted people find social situations more stimulating that extraverted people do (Eysenck & Eysenck, 1975). For some, the physical activity environment may be over-stimulating, and thus be considered unpleasant. This lowering of affective attitudes due to physical activity's perceived unpleasantness would lower intention to be physically active according to the theory of planned behaviour (Ajzen, 1991). This perception of exercise as being unpleasant is in addition to the lower dispositional positive affect introverts have over extraverts (Lucas, Diener, Grob, Suh, & Shao, 2000; Rhodes & Smith, 2006). In sum, introverts would be less likely to desire to be physically active. An introvert witnessing another introvert choosing activities other than physical activity because of their perception of physical activity being unpleasant would decrease their descriptive norms towards physical activity. This would further lower intention towards exercise. If introverted participants do not find physical activity environments enjoyable, and perceive that people like themselves avoid these situations, the opportunities they avail themselves to be physically active might be decreased. This would lower exercise-related self-efficacy, which decreases intention, which in turn results in low physical activity behaviour seen in introverted individuals as opposed to extraverted individuals. The researchers would argue that developing strategies that would have physical activity appeal to introverted people would be a critical step to improving population-wide physical activity levels, as one third to one half of the general population consider themselves to be introverted (CAPT, 2003; Bayne, 1995). These are all interesting questions that could be addressed in future research.

Social setting tailored messages

When one-on-one message sharing is not feasible, health professionals can rely on message tailoring to improve message retention in their targeted audience. Gaining insight into how tailored exercise messages best work is therefore beneficial. In the current thesis, tailoring exercise messages to social context was attempted with limited success. There were no interaction effects detected. This was likely due to the fact that the tailored messages were not strong enough. Future research could improve upon the strength of messages tailored to exercise-related social cognitions of introverts.

With the finding of a borderline main effect for message type on injunctive norm 2, there perhaps is some potential to increase injunctive norm scores through participants reading an extraverted social setting tailored exercise message. However, the improper methods that were used in this study could be responsible for this finding (i.e. a lack of power in the introverted groups, injunctive norm 2 measure was not constructed properly, poor message construction). The finding of injunctive norm 2 was just on the threshold for consideration for being significant, in addition to having a small effect size. Many ANOVAs/ANCOVAs were preformed in this study. As such, it is possible that this finding of significance on injunctive norm 2 is due to the increased chance of having one of the 8 tests preformed in this study result in a significant finding (Type l error). When many tests are preformed in a study, the chance of obtaining a false negative result increases. It is probable that there really is no difference between message type groups on injunctive norm 2. The partial eta squared result of 0.02 indicates that 2% of the variance is due to injunctive norm 2. With a small effect size, if this difference does exist, it is negligible.

The current research attempted to tailor messages based on social context to raise social cognitions towards exercise with limited success. It was hypothesized that increasing exercise-

related social cognitions could be achieved through creating exercise messages that matched extraversion level. However, the introverted participants scored lower on social cognitions towards exercise despite the introverted and extraverted matched and mismatched messages. This attempt to improve introverts physical activity levels was made in response to Courneya & Hellsten's (1998, p. 631) recommendation: "It may be fruitful, therefore, for future research to focus on the contextual characteristics of an activity that may be related to personality rather than the activity itself,". The researchers of the current study interpreted the previous statement by Courneya and Hellsten (1998) to apply to social context of exercise. There are other interpretations of what contextual characteristics may mean, such as the stance taken by Graziano, Feldesman, and Rahe (1985), which defined contextual characteristics of activity as being *cooperative* versus *competitive*. Graziano et al. (1985) found that introverts and extraverts differ in their interpretation of social encounters, with introverts more likely to find competitive orientated encounters, teammates and opponents less friendly, less enjoyable, and less positive than cooperative encounters, with extraverts responding better to competitive-oriented encounters, teammates and opponents than cooperative encounters. The perceptions introverts have of a social context may be more important that the physical number of people in a social context.

Young people, including the participants in the current study, have grown up around strong positive messages about exercise (Crawford, 1980). They have grown up in a culture of *healthism*, which is *"*the preoccupation with personal health as a primary focus for the definition and achievement of well-being; a goal which is to be attained primarily through the modification of lifestyles", (Crawford, 1980, p. 368). It is widely accepted (Crawford, 1980) that an individual is responsible for their health – which would be the construct of perceived behavioural control in the theory of planned behaviour – and that exercise is regarded as a good and healthy behaviour

to engage in – which would be the construct of instrumental attitude under the theory of planned behaviour framework. A select group of people finds exercise to be fun and enjoyable (affective attitude), in addition to finding it to be a healthy behaviour. If the responsibility for maintaining health remains with the individual, developing health interventions, such as personality-tailored message interventions, that are specific enough to the individual to effect change, yet are broad enough to be cost-effective is desirable.

One way in which to improve applicability of tailored health messages to individuals, and thus tailored message interventions, is to tailor exercise messages to an expert-determined topic rather than to a participant-selected topic (Quintiliani, Campbell, Bowling et al., 2010). Quintiliani, et al. (2010) found that physical activity tailored messages worked better when both experts and participants choose physical activity to be the behaviour to improve. Quintiliani et al. (2010) impart the importance of synchrony between participant-selected topics and expert recommendations regarding physical activity messages. Forbes, Plotnikoff, Courneya, and Boulé (2010) lend further support to this idea by recommending that health professionals and researchers tailor interventions and physical activity programs to the preferences of individuals for greater physical activity participation and maintenance. Additionally, creating messages more closely following attitude change theory, such as the Elaboration Likelihood Model (Petty & Cacioppo, 1986), could improve the quality and applicability of the tailored message.

Conscientiousness, extraversion and exercise

Though it was not the aim of this thesis to examine the role of the personality domain of conscientiousness on physical activity and exercise, it would be remiss not to address the topic. The role of conscientiousness is of high interest in personality and health-related behaviour research (Bogg & Roberts, 2004; Kern, Reynolds and Friedman, 2010). Additionally, conscientiousness was a covariate in the ANCOVA of affective attitude. Work by Conner,

Rodgers, and Murray (2007) demonstrated the role conscientiousness could play in the exercise domain, with conscientious people being able to sustain their exercise behaviour when the context is changed from a normal routine to an interrupted routine. Conscientious people were more successful in sustaining their levels of physical activity during interruptions from routine life, such as vacation. Conscientiousness was found only to moderate the intention – behaviour relationship during the interrupted routine and not during the normal routine.

Those individuals who are both highly extraverted and highly conscientious may possess the best personality characteristics to engage in exercise behaviour. Individuals who are lower on one of these two domains may benefit from interventions or techniques to establish and maintain an active lifestyle. Tailoring interventions to a few personality facets may give rise to better outcomes than tailoring interventions to entire personality domains. In regards to physical activity and exercise, the facets most likely to affect a change in exercise behaviour would be the activity facet of extraversion which may account for higher activity levels found in extraverted people (Rhodes et al., 2002) and the industrious and/or ambition facets of conscientiousness which are most closely linked to planning regarding conscientiousness (Conner et al., 2007).

Other findings

Though not part of the initial hypotheses, BMI and ethnicity are worth discussing. Regarding BMI, no difference was found between the extraverted group and the introverted group. Both groups equally spanned the body mass index underweight, normal weight, overweight, and obese categories. In the pre-screening study, participants from western nations, having mainly Canadian and European identities, tended to be more extraverted, with participants from Asian countries, including China and South Korea, tending to be more introverted. This is consistent with research by Heine (2001), McCrae and Terracciano (2005), and Schmitt, Allik,

McCrae and Benet-Martinez (2007), which finds western cultures to be more extraverted, and eastern ones more introverted.

The finding in the pre-screening study of the mass testing results showed that the majority of participants were Euro-American (33%). However, when participants for the mass testing study were screened by extraversion/introversion level and gender, it was found that East Asian female students represented the most introverted ethnicity and gender. In the main study, there were no differences on ethnicity based on extraversion level. Previous research has found that people from European and American cultures appear to be more outgoing, while Asian (East, South and Southeast Asia), and African cultures are more introverted (Allik & McCrae, 2004; Schmitt, Allik, McCrae, Benet-Martinez et al., 2007)**.**

Limitations

This research is based on theory and used a randomized experimental design to ensure internal validity. Several meta-analyses have shown that the theory of planned behaviour is a good predictor of exercise behaviour (Blue, 1995; Godin & Kok, 1996; Hagger, Chatzisarantis, & Biddle, 2002; Hausenblas, Carron & Mack, 1997). There are some limitations present in the current study to be considered when interpreting this research, including limitations regarding participants, measurement, and study design.

Participants. There were a few limitations to the study in regards to participant selection. The participants volunteered to get course credit in return. Volunteer bias could have occurred. The participants who decided to partake in the study may be somewhat less introverted than their peers, as those who volunteer may be more willing to participate than others. Furthermore, other populations would have improved the external validity of the results. It is therefore important to remember that the results are only to be generalized to other samples that contain the same

characteristics as in the current study (undergraduate students at a Canadian university), and not to the population as a whole.

The more introverted participants in the study ranged from very introverted to more neutral on the extraversion factor. The more extraverted participants did not have such a range of scores, scoring as extraverted. This may suggest that not as many very introverted participants decided to participate in the current study, or that there are not as many introverted students as there are extraverted students in the first year psychology class. It has been noted that extraverted behaviour can improve college transition and that proactive social behaviours are advantageous in the university setting (Wang, Cullen, Yao, & Li, 2013). Perhaps students are pushing themselves to be more outgoing because it will increase their success in the university setting, or that they are avoiding the university setting as a whole. Whatever the reason, the range of introverts in the study did not equally balance the range of extraverts.

Measurement. Utilizing the NEO-PI-R instead of the NEO-FFI could have lead to a more precise measurement of extraversion and the other four personality domains, as well as being able to measure the specific facets of each domain. Further, all measurements were self-reported. There were no external measurements of physical activity levels, or personality, such as utilizing pedometers, and multiple observers to assess personality and cross check the findings.

The injunctive and descriptive norm scale and perceived behavioural control scale were not internally consistent. It is possible that the dependent variables measured in this study were inappropriately operationalized, and that they had poor construct validity. This would mean that the items were not measuring the constructs that they were supposed to be measuring. The repercussions of this would be the failure to measure the effect exercise messages might have had on the dependent variables.

Study Design. Another possible limitation of the study is that tailored messages were not strong enough to elicit a response. There was no manipulation check to see if participants actually read and retained the content of the exercise messages. Additionally, there was a lack of specificity for exercise context in the introversion message, while the extraversion message listed physical activities that were more context-specific. Acute exposure to the message may not have been as influential as prolonged exposure or repetitious exposure to the messages could have been. Increased exposure to the message may have yielded stronger effects. Piloting the tailored messages before the main study would help ensure that the messages were indeed distinct. It is not known how persuasive the messages were, and obtaining the messages' persuasiveness is recommended in the future.

The results of the mass testing extraversion results and the main study extraversion results were similar, but not the same. There were more extreme scores in the mass testing evaluation than in the main study evaluation, despite the fact that the main study evaluation dealt with the more extreme scores in the mass testing. The differences seen between them could be due to the much larger sample size of the participants in the mass testing in the main study, as well as due to the two different testing conditions in which the participants answered the questionnaires. Additionally, regression towards the mean could have occurred. Regression towards the mean is a phenomenon that occurs when extreme scores are tested, and then when re-tested, results tend to regress closer to the average of scores (Tabachnick & Fidell, 2001).

Future Research

It was speculated that the existing discrepancy between extraverted people and introverted people regarding physical activity behaviour might have something to do with the exercise messages that people are given. Implementing strategies to change perceptions of the exercise environment through tailored messages could change exercise-related social cognitions. Drawing

from the results from this study, the exercise messages did not alter any exercise-related social cognitions measured. Assessing the potential of message tailoring to injunctive norms could be better explored in future research, as the finding of significant for this item in the current study is weak. Future research should continue to look into the ability of messages tailored to social context to change injunctive norms towards exercise.

Future research could explore the utility of tailoring interventions to the activity facet of extraversion and the industrious and/or ambition facets of conscientiousness. As these three personality facets have been identified as being the most closely linked to exercise behaviour, creating interventions that attempt to increase these levels in participants who do not have these characteristics would be potentially beneficial.

Exercise-related social cognitions levels are generally higher in the extraverted participants than in the introverted participants. Thus, finding ways to increase exercise-related social cognition levels in introverts is necessary if increasing physical activity levels remains a healthcare priority. More research needs to be done to determine how to encourage introverted people to be more active. In the future, it would be beneficial to conduct qualitative research to obtain a deeper understanding of how introverted people experience physical activity environments.

Future research could examine the utility of multiple exposers to messages matched to extraversion level. Reading an exercise message once is unlikely to undo years of conditioning, despite measurement occurring directly after exposure. However, if a new message is repeatedly consumed, over time it could become internalized and recondition individuals to think about exercise in a way that better suits their personality types.

Finding the most introverted and the most extraverted participants from the pool of psychology students was attempted in the current study. However, in future research, a more

precise measurement of extraversion could be beneficial, especially considering the previous research on the activity facet of extraversion. Utilizing the longer, more robust NEO-PI-R extraversion scale (McCrae & Costa, 2010) as opposed to the shorter NEO-FFI extraversion scale (McCrae & Costa, 2010) used in the current study might have more specifically identified the most extreme extraversion levels. As well, it would then be possible to measure the extraversion facet levels of participants, including the facet of activity.

Implications

This research demonstrates that introverted people had significantly lower levels on most exercise-related social cognitions, including intention, instrumental attitudes, and injunctive norm towards exercise than extraverts. The exercise-related social cognitions with the lowest levels among introverts were affective attitude, self-efficacy and descriptive norm. As introverted people report lower levels of physical activity, raising these exercise-related social cognitions would increase physical activity levels. Increasing physical activity in this part of the population could have meaningful repercussions as one third to one half of the American population considers themselves introverted (CAPT 1996, 2003; Bayne, 1995). In practice, it would be helpful to broaden introverts sense of self to include identifying as an exerciser, to have exercise be seen as enjoyable, and to improve introverts sense of confidence towards exercise. For instance, increasing self-efficacy in introverted individuals could be achieved through evidence-back self-efficacy raising interventions. William and French (2011) found through their meta-analysis that interventions that included an action-planning phase, that reinforced effort or progress towards the physical activity behaviour, and that provided instruction had greatly improved self-efficacy.

Conclusion

It makes physical, economic, and social sense to improve the physical activity levels of most people everywhere (U.S. Department of Health and Human Services, 2008, p.5) and to reach as many people as possible with improved exercise messages. Therefore, the idea of tailoring messages to improve physical activity levels is a valuable one. This thesis validated previous work – extraverts are more physically active than introverts – and found that introverts have higher exercise-related social cognitions than extraverts, as well as provided some insight into the role of tailored messages, extraversion, and the theory of planned behaviour.

Following the advice of Latimer et al.'s 2010 review, and this study, research should continue to test the impact of messages that are tailored to characteristics other than message recipients' stages of change (e.g., using different theoretical foundations and determinants of physical activity). The current study attempted to tailor messages to social context to manipulate theory of planned behaviour outcome variables.

Level of extraversion was significant across all outcome variables except for controllability. Message type was not significant across most outcome variables, with a near significant finding for injunctive norm 2. Improving affective attitudes, self-efficacy, and descriptive norms of introverted individuals is recommended for increased physical activity levels. With refinement, such as tailoring messages to the activity facet of extraversion, or tailoring message to increase affective attitudes in introverted individuals, tailoring messages to personality type may aid in improving physical activity levels in the population.

Individuals have only so many good decisions in them in a day (Baumeister, Bartlavsky, Muraven, & Tice, 1998; Hagger, et al., 2010), and are constantly confronted with various health messages (Crawford, 1980). Individuals would be more likely to succeed in achieving an active lifestyle if the exercise messages they receive would be congruent with their personality types, as

choosing to be active would be more intuitive. This is supported through the findings relating to the theory of planned behaviour, i.e. affective attitudes, self-efficacy, and descriptive norm. For increased physical activity adherence, individuals and societies would benefit from understanding the diversity in human personality as it related to the exercise domain. This study attempted to explore this idea.

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Appendix A:

Mass testing demographics questionnaire

Demographic and Background Information

What is your Gender? ○ Male ○ Female

What is your age? [ ]

What is your birth date (month/day/year)? [MM/DD/YYYY]

Please indicate your *height* in either inches or centimetres (one or the other, not both) [ ] **inches** [ ] **centimetres**

Please indicate your *weight* in either pounds or kilograms (one or the other, not both) [ ] **pounds** [ ] **kilograms**

How many years of university have you completed?

- ○ 0
- ○ 1
- ○ 2
- ○ 3
- ○ 4
- ○ 5
- ○ 6
- ○ 7
- ○ 8 or more

What is your primary (general) ethnicity?

- ○ Aboriginal/First Nations
- ○ African (including Caribbean of African descent)
- ○ East Asian (e.g., Chinese, Vietnamese, Filipino)
- ○ South Asian (e.g., Pakistani, East Indian, Bangladesh)
- ○ European (e.g., French, German, Italian)
- ○ Hispanic/Latin-American (e.g., Chilean, Brazilian, Mexican)
- ○ Middle Eastern (e.g., Iraqi, Iranian, Egyptian)
- ○ Euro-North American (including Euro-Canadian)
- ○ Pacific Islander
- ○ Other

What is your native (first) language(s)?

- ○ English
- ○ A language(s) other than English (please specify) [ ]
- ○ English and another language(s) other than English (please specify) [ ]

Do you currently speak any other languages fluently that were learned after you learned English? ○ Yes ○ No

Are you colour-blind?

- ○ No
- ○ Yes (red/green)
- ○ Yes (other) [ ]

Do you wear glasses?

- ○ Yes, and I have no contact lenses
- ○ Yes, and I also wear contact lenses
- ○ No

Do you have any mobility impairments that would make it difficult for you to walk around a medium sized room for 30-45 minutes? ○ Yes ○ No

☐ **Click this box to confirm you are ready to submit your responses**

[Continue]

Appendix B:

Extraversion scale, from NEO-FFI

(1) Below is a list of statements that describe people. Please rate the extent to which each of these statements describes you. There are no right or wrong answers, and all that is required is that you provide honest responses. Do not spend too long on any one statement, but rather go with your first impression. Please use the following scale to guide your responses.

	Strongly disagree		Neutral		Strongly agree
(a) I like to have a lot of people around me.	○	○	○	○	○
(b) I laugh easily.	○	○	○	○	○
(c) I shy away from crowds of people.	○	○	○	○	○
(d) I really enjoy talking to people.	○	○	○	○	○
(e) I like to be where the action is.	○	○	○	○	○
(f) I prefer jobs that let me work alone without being bothered by other people.	○	○	○	○	○
(g) I often feel as if I'm bursting with energy.	○	○	○	○	○
(h) I am a cheerful, high-spirited person.	○	○	○	○	○
(i) I don't get much pleasure from chatting with people.	○	○	○	○	○
(j) My life is fast-paced.	○	○	○	○	○
(k) I am a very active person.	○	○	○	○	○
(l) I would rather go my own way than be a leader of others.	○	○	○	○	○

☐ **Click this box to confirm you are ready to submit your responses**

Continue

Appendix C:

Human ethics research board 2 approval

Notification of Approval

Date:	July 8, 2013
Study ID:	Pro00038989
Principal Investigator:	Kirsten Scheliga
Study Supervisor:	Tanya Berry
Study Title:	Exercise messages tailored to Extraversion and their influence on Theory of Planned Behaviour variables in students who are more extraverted or more introverted than their fellow classmates.
Approval Expiry Date:	July 7, 2014

Approved Consent Form:	Approval Date 08/07/2013	Approved Document Revised Info Letter and Consent Form

Thank you for submitting the above study to the Research Ethics Board 2. Your application has been reviewed and approved on behalf of the committee.

A renewal report must be submitted next year prior to the expiry of this approval if your study still requires ethics approval. If you do not renew on or before the renewal expiry date, you will have to re-submit an ethics application.

Approval by the Research Ethics Board does not encompass authorization to access the staff, students, facilities or resources of local institutions for the purposes of the research.

Sincerely,

Dr. Stanley Varnhagen

Chair, Research Ethics Board 2

Note: This correspondence includes an electronic signature (validation and approval via an online system).

Appendix D:

Theory of planned behaviour questionnaire

Please circle the number that best fits your answer to the following statements:

i)

I intend to exercise for 30 minutes three times a week in the next month:

definitely true	**1**	**2**	**3**	**4**	**5**	**6**	**7**	definitely false

I will try to exercise for 30 minutes three times a week in the next month:

strongly disagree	**1**	**2**	**3**	**4**	**5**	**6**	**7**	strongly agree

I plan to exercise for 30 minutes three times a week in the next month:

extremely likely	**1**	**2**	**3**	**4**	**5**	**6**	**7**	extremely unlikely

II)

For me to exercise for 30 minutes three times a week in the next month will be:

harmful	**1**	**2**	**3**	**4**	**5**	**6**	**7**	beneficial
pleasant	**1**	**2**	**3**	**4**	**5**	**6**	**7**	unpleasant
good	**1**	**2**	**3**	**4**	**5**	**6**	**7**	bad
worthless	**1**	**2**	**3**	**4**	**5**	**6**	**7**	valuable
enjoyable	**1**	**2**	**3**	**4**	**5**	**6**	**7**	unenjoyable
healthy	**1**	**2**	**3**	**4**	**5**	**6**	**7**	unhealthy
pleasurable	**1**	**2**	**3**	**4**	**5**	**6**	**7**	painful
important	**1**	**2**	**3**	**4**	**5**	**6**	**7**	unimportant

III)

People who are important to me

disapprove of me exercising	**1**	**2**	**3**	**4**	**5**	**6**	**7**	approve of me exercising

People who are important to me want me to exercise for 30 minutes three times a week in the next month:

strongly disagree	**1**	**2**	**3**	**4**	**5**	**6**	**7**	strongly agree

Most people like me will exercise for 30 minutes three times a week in the next month:

unlikely	**1**	**2**	**3**	**4**	**5**	**6**	**7**	likely

IV)

I am confident that I can exercise for 30 minutes three times a week in the next month:

false	**1**	**2**	**3**	**4**	**5**	**6**	**7**	true

My exercising for 30 minutes three times a week in the next month is up to me:

strongly disagree	**1**	**2**	**3**	**4**	**5**	**6**	**7**	strongly agree

V)

In the past month, I exercised for 30 minutes three times a week:

False	**True**

Appendix E:

Main study demographics questionnaire

Please compete the following questionnaire by writing the answer on the line, or by circling the word(s) that best describes you. The answers will remain anonymous.

i) Age: _____ ii) Sex (Circle.): Male Female

iii) Weight (lbs. or kg): _____ iv) Height (inches or cm): _____

v) Ethnic Background (where your family is from):

_____

i) Highest level of education completed. (Circle.)

high school diploma

some university university degree

some college college diploma

some graduate work university graduate degree/certificate/diploma

college graduate degree/certificate/diploma

vii) Your hometown is? (Circle.) Urban Suburban Rural

Appendix F:

Godin leisure-time exercise questionnaire

Considering a **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** (write on each line the appropriate number)?

	Times Per Week
A. STRENUOUS PHYSICAL ACTIVITY (heart beats rapidly, sweating)	_____
(e.g., running, jogging, hockey, soccer, squash, cross-country skiing, judo, roller skating, vigorous swimming, vigorous long distance bicycling, vigorous aerobic dance classes, heavy weight training)	
ii) MODERATE PHYSICAL ACTIVITY (not exhausting, light perspiration)	_____
(e.g., fast walking, baseball, tennis, easy bicycling, volleyball, badminton, easy swimming, alpine skiing, popular and folk dancing)	
C. MILD PHYSICAL ACTIVITY (minimal effort, no perspiration)	_____
(e.g., easy walking, yoga, archery, fishing, bowling, lawn bowling, shuffleboard, horseshoes, golf, snowmobiling)	

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

Often Sometimes Never/Rarely

Appendix G:

NEO-FFI personality questionnaire

Below is a list of statements that describe people. Please rate the extent to which each of these statements describes you. There are no right or wrong answers and all that is required is that you provide honest responses. Do not spend too long on any one statement but rather go with your first impression. Please use the following scale to guide your responses.

4	3	2	1	0
strongly disagree	disagree	neutral	agree	strongly agree

1	I am not a worrier.	4	3	2	1	0
2	I like to have a lot of people around me.	4	3	2	1	0
3	I enjoy concentrating on a fantasy or daydream and exploring all its possibilities, letting it grow and develop.	4	3	2	1	0
4	I try to be courteous to everyone I meet.	4	3	2	1	0
5	I keep my belongings neat and clean.	4	3	2	1	0

6	At times, I have felt bitter and resentful.	4	3	2	1	0
7	I laugh easily.	4	3	2	1	0
8	I think it's interesting to learn and develop new hobbies.	4	3	2	1	0
9	At times I bully or flatter people into doing what I want them to.	4	3	2	1	0
10	I'm pretty good about pacing myself so as to get things done on time.	4	3	2	1	0

11	When I'm under a great deal of stress, sometimes I feel like I'm going to pieces.	4	3	2	1	0
12	I prefer jobs that let me work alone without being bothered by other people.	4	3	2	1	0
13	I am intrigued by the patterns I find in art and nature.	4	3	2	1	0
14	Some people think I'm selfish and egotistical.	4	3	2	1	0
15	I often come into situations without being fully prepared.	4	3	2	1	0

16	I rarely feel lonely or blue.	4	3	2	1	0
17	I really enjoy talking to people.	4	3	2	1	0
18	I believe letting students hear controversial speakers can only confuse and mislead them.	4	3	2	1	0
19	If someone starts a fight, I'm ready to fight back.	4	3	2	1	0
20	I try to preform all the tasks assigned to me conscientiously.	4	3	2	1	0

4	3	2	1	0

strongly disagree	disagree	neutral	agree	strongly agree

21	I often feel tense and jittery.	4	3	2	1	0
22	I like to be where the action is.	4	3	2	1	0
23	Poetry has little or no effect on me.	4	3	2	1	0
24	I'm better than most people, and I know it.	4	3	2	1	0
25	I have a clear set of goals and work toward them in an orderly fashion.	4	3	2	1	0

26	Sometimes I feel completely worthless.	4	3	2	1	0
27	I shy away from crowds of people.	4	3	2	1	0
28	I would have difficulty just letting my mind wander without control or guidance.	4	3	2	1	0
29	When I've been insulted, I just try to forgive and forget.	4	3	2	1	0
30	I waste a lot of time before settling down to work.	4	3	2	1	0

31	I rarely feel fearful or anxious.	4	3	2	1	0
32	I often feel as if I'm bursting with energy.	4	3	2	1	0
33	I seldom notice the moods or feelings that different environments produce.	4	3	2	1	0
34	I tend to assume the best about people.	4	3	2	1	0
35	I work hard to accomplish my goals.	4	3	2	1	0

36	I often get angry at the way people treat me.	4	3	2	1	0
37	I am a cheerful, high-spirited person.	4	3	2	1	0
38	I experience a wide range of emotions or feelings.	4	3	2	1	0
39	Some people think of me as cold and calculating.	4	3	2	1	0
40	When I make a commitment, I can always be counted on to follow through.	4	3	2	1	0

41	Too often, when things go wrong, I get discouraged and feel like giving up.	4	3	2	1	0
42	I don't get much pleasure from chatting with people.	4	3	2	1	0
43	Sometimes when I am reading poetry or looking at a work of art, I feel a chill or wave of excitement.	4	3	2	1	0
44	I have no sympathy for beggars.	4	3	2	1	0
45	Sometimes I'm not as dependable or reliable as I should be.	4	3	2	1	0

4	3	2	1	0

strongly disagree	disagree	neutral	agree	strongly agree

46	I am seldom sad or depressed.	4	3	2	1	0
47	My life is fast-paced.	4	3	2	1	0
48	I have little interest in speculating on the nature of the universe or the human condition.	4	3	2	1	0
49	I generally try to be thoughtful and considerate.	4	3	2	1	0
50	I am a productive persona who always gets the job done.	4	3	2	1	0

51	I often feel helpless and want someone to solve my problems.	4	3	2	1	0
52	I am a very active person	4	3	2	1	0
53	I have a lot of intellectual curiosity.	4	3	2	1	0
54	If I don't like people, I let them know it.	4	3	2	1	0
55	I never seem to be able to get organized.	4	3	2	1	0

56	At times I have been so ashamed I just wanted to hide.	4	3	2	1	0
57	I would rather go my own way than be a leader of others.	4	3	2	1	0
58	I often enjoy playing with theories or abstract ideas.	4	3	2	1	0
59	If necessary, I am willing to manipulate people to get what I want.	4	3	2	1	0
60	I strive for excellence in everything I do.	4	3	2	1	0

Appendix H:

Tailored message for more introverted participants

Please read and think about the following message. Thank you.

The Canadian Society for Exercise Physiology recognizes the importance of daily exercise, including increasing quality of daily life. Exercise for health and happiness!

Benefits of daily exercise include:

- lung, heart, and muscle strength
- weight control
- increased self-esteem

Reasons to exercise:

- provide you with the opportunity to reflect on the day
- gives you a chance everyday for time alone

How to incorporate daily exercise:

- aim for 10 minutes or more of exercise for a total of 150 minutes (2 ½hrs) per week
- to make the most of exercise, exercise at a moderate or vigorous level. Moderate and vigorous exercise includes activities like walking briskly and running, general and heavy gardening (continuous digging or hoeing), cycling, and swimming laps.
- do activities that you enjoy doing – you will be more likely to stick with them
- make it routine

Enjoy exercise!

Appendix I:

Tailored message for more extraverted participants

Please read and think about the following message. Thank you.

The Canadian Society for Exercise Physiology recognizes the importance of daily exercise, including increasing quality of daily life. Exercise for health and happiness!

Benefits of daily exercise include:

- lung, heart, and muscle strength
- weight control
- increased self-esteem

Reasons to exercise:

- provide you with the opportunity socialize with friends and family
- gives you a chance to reconnect with family and friends or meet new people every day

How to incorporate daily exercise:

- aim for 10 minutes or more of exercise for a total of 150 minutes (2 ½hrs) per week
- to make the most of exercise, exercise at a moderate or vigorous level. Moderate and vigorous exercise includes activities like walking briskly or running with a walking/running club, playing singles or doubles tennis, cycling with friends or family, and joining a sports team (soccer, hockey, swimming).
- do activities that you enjoy doing – you will be more likely to stick with them
- make it routine

Enjoy exercise!

Appendix J:

Information letter and informed consent

Faculty of Physical Education and Recreation

INFORMATION LETTER and COSENT FORM

Study Title: Introversion/Extraversion, Messages and Exercise

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Project reviewed by:
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Background
You are being asked to be in this study because many people do not exercise enough, and we are trying to find out ways to have people exercise more. Our study was made available to you through your participation in the annual mass testing that is associated with classes Psychology 104 and Psychology 105. The other people being asked to participate in this study are from these two classes as well.

Purpose
The purpose of this study is to explore the role messages and personality play in exercise participation. It will benefit society to know more about messaging and personal differences. It will also help to guide future research in this area. The results of this study will be used in my (Kirsten's) Master's thesis.

Study Procedure
The entire research study will take about 20-25 minutes of your time to complete if you decide to participate. You will be asked to read a short message regarding exercise, and then to fill out a booklet of questionnaires regarding your personality and your attitudes and beliefs towards exercise. You are being asked to complete the following questionnaire booklet on campus in this room at this time.

Benefits
If you choose to participate, the benefit to you is that you may learn something about yourself regarding physical activity and personality. We hope that what we find will aid people who design exercise programs to be more successful in helping other people to exercise more. In return for your participation, you will receive one research participation credit after the completion of this study. The cost to you is that it will take up 25 minutes of your time.

Risks
The only potential risk for you is that you might feel uncomfortable answering the questions in the questionnaires.

Faculty of Physical Education and Recreation

Study Title: Introversion/Extraversion, Messages and Exercise

Voluntary Participation

Your participation in this study is completely voluntary. If you come across a question you do not want to answer, you do not have to answer it. You are free to stop at any point without consequences. If you want to stop, just tell the researcher. If you choose not to participate in this study after reading this information letter, you may complete an alternative educational activity for research credit. The time it takes to complete this alternative educational activity is no longer than the time it takes to participate in this study.

Confidentiality & Anonymity

The results will be used only in my Master's thesis. Your answers will be kept confidential. Only Dr. Tanya Berry and Kirsten A. Scheliga will have access the results from the questionnaires. Your name will not be attached to your answers and once you are finished, we will have no way of knowing which answers are yours. Data will be kept for five years after the completion of the study, and then destroyed. The data will be keep in a locked room and on a password protected computer.

Further Information

If you have questions about this project, please feel free to email Kirsten at scheliga@ualberta.ca. The plan for this study has been reviewed for its adherence to ethical guidelines by a Research Ethics Board at the University of Alberta. For questions regarding participant rights and ethical conduct of research, contact the Research Ethics Office at (780) 492-2615. This office has no affiliation with the study investigators. You many also contact the coordinator of the psychology research pool through e-mail (recred@ualberta.ca) or by phone (780-492-5689).

Consent Statement

I have read this form and the research study has been explained to me. I have been given the opportunity to ask questions and my questions have been answered. If I have additional questions, I have been told whom to contact. I agree to participate in the research study described above and will receive a copy of this consent form. I will receive a copy of this consent form after I sign it.

Participant's Name (printed)	Date
Participant's Signature	Date
Name (printed) of Person Obtaining Consent	Date
Signature of Person Obtaining Consent	Date

Appendix K:

Key to dependent variables

Variable	Questionnaire Item
Intention	Appendix D, Section I
Affective attitude	Appendix D, Section II, second, third, fifth and seventh items
Instrumental attitude	Appendix D, Section II, first, forth, sixth and eighth items
Injunctive norm 1,	Appendix D, Section III, first item: 'People who are important to me disapprove/approve of me exercising.'
Injunctive norm 2	Appendix D, Section III, second item: 'People who are important to me want me to exercise for 30 minutes three times a week in the next month strongly disagree/agree.'
Descriptive norm	Appendix D, Section III, third item: 'Most people like me will exercise for 30 minutes three times a week in the next month unlikely/likely.'
Self-efficacy	Appendix D, Section IV, first item: 'I am confident that I can exercise for 30 minutes three times a week in the next month false/true.'
Controllability	Appendix D, Section IV, second item: 'My exercising for 30 minutes three times a week in the next month is up to me strongly disagree/agree.'

Supplemental literature review on extraversion and physical activity

Personality trait psychology has waxed and waned over time, with a re-emergence happening in the last 20 years (Rhodes & Smith, 2006). This re-emergence is a result of better psychometric instrumentation (Funder, 2001) and because personality traits have been found to be consistent patterns of thoughts, feelings, and actions over time (McCrae & Costa, 2003). Various models that attempt to describe and capture the essence of personality have been created throughout the years, the most popular being the Five Factor Model (FFM) and Eysenck's three-factor model. These two models do not admit to containing every possible personality construct, but are considered the most parsimonious of the personality models (Funder, 2001). The FFM is composed of the following higher-order factors: extraversion (E; degree of preference for social and high energy situations), agreeableness (A; degree of kindness and generosity), conscientiousness (C; degree of organization and thoroughness), neuroticism/emotional stability (N; degree of anxiety and tenseness), and openness to experience/intellect/ culture (O; degree of imaginativeness and curiosity) (Funder, 2001; Rhodes & Smith, 2006). Eysenck's three-factor model is composed of: extraversion (E), neuroticism (N), and psychoticism (P), (Funder, 2001; Eysenck & Eysenck, 1975). These higher-order trait taxonomies are further divided in to lower-order traits. These two models are the most used in personality and physical activity research (Rhodes & Smith, 2006).

In this thesis, the higher-order trait of extraversion was explored. Extraversion is the tendency to be sociable, assertive, energetic, seek excitement and experience positive affect (Rhodes & Smith, 2006). Adjectives used to describe individuals who are highly extraverted include active, assertive, energetic, enthusiastic, outgoing, and talkative

(McCrae & John, 1992). Individuals who score high on the personality trait of extraversion are considered more extraverted; those who score low on the personality trait of extraversion are considered to be more introverted. High extraversion, low neuroticism, and high conscientiousness have been shown to be related to higher levels of exercise behaviour and adherence (Courneya & Hellsten, 1998). High extraversion and low neuroticism are independently related to PA and exercise (Aria, & Hisamichi, 1998; Chatzisarantis & Hagger, 2008; Courneya, Bobick, & Schinke, 1999; Hausenblas, & Giacobbi, 2009; Hoyt, Rhodes, de Moor, Beem, Stubbe, Boomsma, & de Geus, 2006; Kern, Reynolds, & Friedman, 2010; Rhodes, Courneya, & Jones, 2002; Rhodes & Smith, 2006; Szabo, 1992; Yeung & Hemsley, 1997). The link between high extraversion and PA has been demonstrated with North American sample, with only some evidence from the United Kingdom and Europe (de Bruin, de Groot, van den Putte, & Rhodes, 2009; Rhodes & Smith, 2006).

Extraverts may have fewer barriers to engaging in exercise and PA than introverts based on their personalities. They may have more reasons to exercise, as high levels of E and/or N were positively correlated with reasons given for exercising (weight control, attractiveness, tone, fitness, health, mood, and enjoyment) as found by Davis, Fox, Brewer, and Ratusny (1995). People who score high on extraversion and openness to experience, and score low on neuroticism are more likely to perceive exercise as fun and enjoyable (Courneya & Hellsten, 1998). This aligns with the knowledge that affective attitude, (e.g. exercise being fun and enjoyable) are better predictors of attitude towards behaviour intention then instrumental attitude, according to the theory of planned behaviour (Conner & Sparks, 2005). Extraverts prefer to exercise with others, as well as

being supervised when exercising, which is not surprising since sociability is a major characteristic of high extraversion individuals (Courneya & Hellsten, 1998). Exercise can clearly be an outlet for such a tendency (Courneya & Hellsten, 1998). Extraverted individuals are characterized as energetic (McCrae & John, 1992) and so lack of energy is less of a barrier for them (Courneya & Hellsten, 1998). Individuals who were least motivated to participate in physical activity in the study by Lochbaum, Bixby, and Wang (2007) reported lower levels of extraversion, conscientiousness, and greater neuroticism than the highest motivated individuals. However, a study by de Bruin et al. (2009) showed that high extraversion did not relate to all activity levels in the same way. People who scored higher on extraversion were associated with a 48% increased chance to enact upon their intentions to be moderately active, but no effect was found relating to being vigorously active. De Bruin et al. (2009) discuss that it appears that the "active and outgoing nature of [high extraversion people] is more relevant for everyday activities than for vigorous activities" (p. 737). This may be because moderate activities tend to provide opportunities for socialization and camaraderie, while vigorous activities do not provide such opportunities due to the increased exertion, i.e. increased breathing rate and concentration, vigorous activities require. There is less of an opportunity to converse, to play and to assert oneself verbally, which is the preference of extraverts (McCrae & John, 1992).

A specific barrier to physical activity that extraverts do not have to overcome is that of physical activity environments being over-stimulating. Extraverts are more physically active than introverts perhaps because people are thought to seek situations in which their personalities thrive (Eysenck & Eysenck, 1991). Extraverts seek stimulating and exciting

situations which can lead them to activities such as sport and exercise (Courneya & Hellsten, 1998), while introverts would be less likely to seek such activities, as their personalities guide them towards activities that are less socially stimulating and exciting. Eysenck and Eysenck (1991) suggest that extraverts and introverts differ in levels of arousal, with arousal being the physiological and psychological state of being awake or reactive to stimuli. It is thought that introverts possess higher base levels of arousal than extraverts, which means that introverted people may find social situations over-stimulating while extraverts may find the same social situations as energizing. The research by Eysenck and Eysenck (1991) continues by stating that, with their higher base levels of arousal, introverts withdraw from socially stimulating environments, while extraverts intentionally seek them out. Therefore, extraverts may seek stimulation through physical activity (Rhodes et al., 2002), while introverts may withdraw from physical activity settings.

Korotkov (2008) found that openness to experience, extraversion, and neuroticism moderated the stress to health behaviour relationship, where health behaviours are predicted by both stress and distress. In regards to extraversion moderating the stress to health behaviour relationship, Korotkov (2008) found that introverts tend to engage in more stress-reducing health practices than extraverts. Two explanations are put forth that may explain this finding: 1) extraverts may find less of a need to reduce stress as the stress has brought them to their optimal level of arousal, and 2) high stress levels may be overwhelming to introverts and so they are prompted to engage in health behaviours to lessen the overstimulation and arousal that the stress causes.

The activity facet of extraversion may be entirely responsible for the direct effect of

extraversion found in previous research (Hoyt et al., 2009; Rhodes et al., 2002; Rhodes & Smith, 2006). This means that the arguments that extraverts exercise due to their predisposition for positive affect, sociability, activity, or the combination of all three facets may be false (Rhodes et al., 2002). However, Rhodes and Smith (2006) recommend for the usage of broad traits, such an the broad trait of extraversion, to be used in the area of physical activity and personality research, as there is the possibility that personality might describe behaviour rather than the more supported idea that personality explains behaviour. Using broad traits (e.g. extraversion) as appose to more specific facet traits (e.g. activity trait) bypasses this problem, until stronger support is found.

Personality is an important factor to consider in understanding activity patterns across the lifespan (Kern et al., 2010). Children who were rated by parents and teachers in 1922 as having higher levels of childhood energy and sociability (high on the Extraversion scale) predicted higher levels of activity at age 29 for both males and females (Kern et al., 2010). More extraverted adolescents spent more time in sports-related PA (jogging, swimming, gymnastics, tennis, martial arts, canoeing, field sports and skating) than less extraverted adolescents (de Bruin, Kremers, van Mechlen, & Brug, 2005). In elderly adults, higher levels of extraversion and conscientiousness are associated with a reduced risk of becoming disabled in old age (Kloseck, Hobson, Crilly, Vandevoort, & Ward-Griffin, 2007; Krueger, Wilson, Shah, Tang, & Bennett, 2006). Higher extraversion and lower neuroticism is associated with reduced risk of mortality in old age and these associations are mediated in part by personality-related patterns of cognitive, social, and physical activity (Wilson, Krueger, Gu, Bienias, Mendes de Leon,

& Evans, 2005); Personality, especially extraversion, was a major determinant of engagement in activities outside the house in old age (Kloseck, et al., 2007). The identification of background factors, such as parenting style, parental socio-economic status, and relationships with others could function as potential antecedents to shaping specific behaviours, and thus influence personality (Smernou & Lautenschlager, 1991).

Individual personalities are composites of the various FFM traits, with, for example, both extraversion and conscientiousness contributing to the prediction of exercise behaviour, which shows the importance of understanding the interplay between personality dimensions for predicting exercise behaviour (Courneya & Hellsten, 1998). The direct relationship between personality and exercise has practical implications when designing exercise interventions (Courneya et al., 1999). Interventions may be more successful (e.g. improved program adherence) when they are tailored to the personalities of the participants (Courneya & Hellsten, 1998; Courneya et al., 1999). As well, Kern et al. (2010) suggest that physical activity needs to be understood within the context of the individual's personality and its long-term trajectory. When it comes to exercise interventions, Courneya and Hellsten (1998) suggest that perhaps it matters less about the activity itself that is chosen, and more about the context in which the activity takes place. Yeung & Hemsley (1997) found that extraverted people were less likely to participate in aerobics classes, due to the fact that such classes are quite structured, and that attention is not focused on the individual. These environments may not provide enough stimulation for more extraverted individuals, but sufficient stimulation for more introverted individuals. These findings stress the idea that the activity itself may not be as crucial as the *context it is played out in*.

Supplemental literature review on extraversion and physical activity references

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