The Motivational Effects of Social Contagion on Exercise Participation in Young Women

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Abstract

This experimental study examined differences between a group of women who exercised within an intrinsically-motivating group or extrinsically- motivating group on: (i) ratings of perceived exertion (RPE), percentage of maximal heart rate (% of HR max) and total physical activity (PA) counts during an exercise session; (ii) exercise persistence immediately following the experimental manipulation; (iii) change in positive and negative mood during an exercise session; and (iv) post-experimental motivation outcomes (e.g., perceived competence in executing the task, interest, effort and pressure/tension experienced in performing the task). Young inactive healthy weight females ($N = 42$; $M_{age} = 21.59 \pm 3.31$ years; $M_{BMI} = 21.59 \pm 2.11$ kg/m^2) were randomly assigned to exercise on a treadmill alongside a confederate who was providing them with either intrinsic or extrinsic verbal cues, depending on the experimental group. Exercise duration, HR and exertion were recorded. Participants also completed a self-report questionnaire assessing mood pre and post-PA and post-PA motivation. Participants in the intrinsic motivation confederate group reported significantly higher RPE values after 8 minutes of exercise, exercised at a higher % of their HR max, had a higher PA count, and a greater percentage exercised for a longer duration when compared to participants in the extrinsic motivation group. An increased perception of vigor was reported after the exercise, regardless of group. In addition, participants in the intrinsic motivation group perceived that they exerted more effort than those in the extrinsic motivation group. Overall these findings suggest that exercise motivation can be "contagious" through verbal cues and that exercising with a partner who is intrinsically motivated can have beneficial outcomes on one's own exercise behaviours.

Résumé

Cette étude examine les différences entre un groupe de femmes qui font de l'exercice dans un cadre de motivation intrinsèque en comparaison avec un de motivation extrinsèque, et ce, en matière : (i) de valeurs de la perception de l'effort (PE), du pourcentage de la fréquence cardiaque maximale (% de FC max) et du compte total de l'activité physique au cours d'une séance d'exercice; (ii) de la persistance à l'exercice immédiatement après la manipulation expérimentale; (iii) du changement positif ou négatif de l'humeur au cours d'une séance d'exercice; et (iv) des effets sur la motivation postexpérimentale (c.-à-d. la compétence perçue dans l'exécution de la tâche, l'intérêt, l'effort et la pression/tension ressentie au cours de l'exécution de la tâche). Des jeunes femmes inactives de poids santé ($N = 42$; $M_{âge} = 21.59 \pm 3.31$ ans $M_{IMC} = 21.59 \pm 2.11$ kg/m^2) ont été assignées, au hasard, à faire de l'exercice sur un tapis roulant à côté d'une chercheuse complice qui, selon le groupe expérimental, exprimait des énoncés verbaux soit de type intrinsèque ou de type extrinsèque. La durée de l'exercice, la fréquence cardiaque et l'effort physique ont été enregistrés. Les participantes ont aussi rempli un questionnaire d'auto-évaluation à propos de leur humeur avant et après l'activité physique et de leur motivation après l'exercice physique. Les participantes associées au groupe de motivation intrinsèque de la chercheuse complice ont déclaré, après 8 minutes d'exercice, de plus grandes valeurs de perception de l'effort, elles ont exécuté l'exercice à un plus grand pourcentage de leur fréquence cardiaque maximale, ont enregistré un plus grand nombre de comptes d'activité physique et un plus grand pourcentage des participantes a fait l'exercice sur une plus longue période de temps en comparaison à celles du groupe extrinsèque. Dans les deux groupes, une augmentation de la perception de la vigueur a été déclarée après l'exercice. De plus, les participantes du groupe de motivation intrinsèque ont perçu qu'elles ont fait de plus grands

efforts que celles du groupe de motivation extrinsèque. Dans l'ensemble, les résultats montrent que la motivation dans le cadre de l'exercice peut être « contagieuse » grâce aux énoncés verbaux et que le fait de pratiquer de l'exercice avec un compagnon ou une compagne qui est intrinsèquement motivée peut apporter des résultats avantageux sur le comportement à l'exercice d'une personne.

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Introduction

Participation in regular physical activity (PA) is important for maintaining a healthy lifestyle (Duncan, Hall, Wilson & Jenny, 2010; Public Health Agency of Canada, 2010). Engaging in PA leads to numerous psychological benefits such as increases in positive mood, lower levels of anxiety (Penedo & Dahn, 2005), improved self esteem and psychosocial functioning (Burton**,** Pakenham & Brown, 2009) as well as an array of physical/physiological benefits including but not limited to: better control of blood lipid levels (Fletcher et al., 1996), healthy weight loss or maintenance (Lombard, Deeks, Jolley & Teeds, 2009), and the prevention of type 2 diabetes (Gill & Cooper, 2008), hypertension, cardiovascular disease (Manson & Bassuk, 2003; Warburton, Nicol & Bredin, 2006), cancer (Lee, 2003), obesity (Lombard et al., 2009), osteoporosis (Bérard, Bravo & Gauthier, 1997) and depression (Dunn, Trivedi, & O'Neal, 2001). Based on Canadian PA guidelines, adults should accumulate at least 150 minutes a week of moderate to vigorous intensity PA (e.g., brisk walking, swimming) to achieve health benefits (Colley, Garriguet, Janssen, Craig, Clarke & Tremblay, 2011). PA can be done in smaller bouts of at least 10 minutes or longer bouts accumulating to the 150 minutes. If the activity is vigorous in nature, such as jogging, health benefits can be achieved in 75 minutes a week (Public Health Agency of Canada, 2010). Unfortunately, between 5% and 15% of Canadian adults are meeting these recommendations (Colley et al., 2011). In addition, women have been shown to engage in less PA than men regardless of age (Colley et al., 2011). Reasons for this rate of inactivity need to be understood (Public Health Agency of Canada , 2010).

Lack of motivation is consistently ranked as one of the top five barriers to PA participation (Brownson et al., 2001). Motivation is defined as a driving force that pushes an individual to achieve a goal and is fostered by three basic needs: competence, autonomy and

relatedness (Ryan & Deci, 2000). Within the Organismic Integration Theory, Deci & Ryan (1985) differentiate between different types of motivation based on factors that promote or hinder the internalization and execution of behaviours. The most fundamental distinction in motivation is between intrinsic and extrinsic motivation (Deci & Ryan, 1985). Intrinsic motivation refers to a drive that is determined by an interest or enjoyment in the task itself, and exists within the individual, whereas extrinsic motivation occurs when an individual is driven by external factors such as rewards or to avoid punishment (Deci & Ryan, 1985).

Researchers have shown that more autonomous forms of motivation, such as intrinsic motivation, are associated with greater persistence in a task (Pelletier, Fortier, Vallerand, & Brière, 2001; Vallerand & Bissonette, 1992), positive affect (Deci & Ryan 2008), enhanced performance, especially on heuristic activities or activities that involve creativity (Koestner, Ryan, Bernieri, & Holt, 1984) and greater psychological well-being and healthier lifestyles and behaviours (Pelletier, Dion, Slovenic-D'Angelo, & Reid, 2004). In addition, individuals who are more intrinsically motivated to participate in PA demonstrate greater adherence to an exercise regime and report higher levels of enjoyment then individuals who are extrinsically motivated to exercise (Ryan, Frederick, Lepes, Rubio & Sheldon, 1997; Frederick, Morrison & Manning, 1996; Frederick & Morrison, 1996). Intrinsic forms of motivation have also positively predicted objectively-assessed moderate intensity exercise bouts (Standage, Sebire & Loney, 2008). In contrast, extrinsic motivation is associated with numerous maladaptive outcomes such as anxiety and negative affect (Brière, Vallerand, Blais & Pelletier, 1995).

Given the importance of intrinsic motivation, it is important to understand how to help more people foster this type of motivation, or help individuals through the internalization process to develop intrinsic motivation. One way to foster intrinsic motivation is through the satisfaction

of the basic psychological needs for competence, autonomy and relatedness (Ryan & Deci, 2000). The Cognitive Evaluation Theory (CET) and the Basic Psychological Needs theories are used as frameworks to examine the satisfaction of the three basic psychological needs (Ryan & Deci, 2000). For example, based on the CET, certain social contexts, such as those that include positive feedback or communication that contributes to a feeling of competence, can enhance intrinsic motivation when individuals feel autonomous (Ryan & Deci, 2000). Furthermore, the satisfaction of the needs for autonomy, competence, and relatedness has led to perceptions of intrinsic motivation for exercise (Markland & Ingledew, 2007; Hagger & Chatzisarantis, 2007). A study conducted by Standage, Gillison, Ntoumanis and Treasure (2012) found that autonomy and competence positively predicted autonomous motivation (which is consistent with intrinsic motivation) toward physical education, which in turn positively predicted autonomous motivation toward exercise. Additionally Wilson, Rodgers, Blanchard and Gessell (2006) found that the need for competence and autonomy were positively correlated with more self-determined exercise motivations, which in turn were more positively related to beneficial exercise behaviour, attitudes and physical fitness. Consequently determining ways to satisfy the 3 basic psychological needs, which results in more autonomous forms of motivation, may have beneficial outcomes on PA participation. The fostering of intrinsic motivation may be a viable way to do so, yet it is unclear if simple clues such as verbal cues can influence fitness and exercise outcomes (Ryan & Deci, 2000).

In addition to the more personally-driven motives for engaging in PA, such as perceptions of competence and autonomy, there are also propositions for socially-derived motivation. It has been shown that people can self-generate alterations in intrinsic motivation on the foundation of perceiving others' purpose for engaging in an activity (Wild, Enzel &

Hawkins, 1992). As such, the motivational orientation toward an activity can be spread from one person to another, exclusively on the basis of social interaction, leading to what is referred to as the social contagion of motivational orientations (Ryan & Deci, 2002). The motivational effects of social contagion have rarely been studied in PA, since much of the previous research conducted in this area has focused on learning tasks. For example, in a study by Pelletier and Vallerand (1996), teachers were told that some of their students were either intrinsically or extrinsically motivated to learn. If a teacher was told that a student was intrinsically motivated to learn, the teacher of that student was also perceived by that student as acting in a more self-determined way (i.e., autonomous and supportive). In another study, students were told that they were being taught how to play piano by a volunteer (i.e., an intrinsically motivated teacher) or a paid instructor (i.e., an extrinsically motivated teacher) (Wild et al., 1992). Participants in the intrinsically motivated teacher group reported enjoying the lesson more, demonstrated greater interest and engaged in more exploratory behaviour when the teacher left the room, than the students in the extrinsically motivated teacher conditions (Wild et al., 1992). Similar results were also demonstrated in a magic trick learning task (Wild, Enzel, Nix & Deci, 1997), with the effects of social contagion affecting a third-generation task (i.e., the original learner taught the same trick to another person; Wild et al., 1997). Given the results of these previous studies focused on learning tasks, it is therefore likely that the motivational effects of social contagion can occur in other contexts, such as in an exercise setting. A better understanding how people's motivational orientations may be altered to optimize the manipulation of intrinsic motivation for exercise is needed since being intrinsically motivated to exercise is associated with more beneficial exercise behaviours such as greater adherence to an exercise regime (Markland, 1999)

as well as psychological well-being (Ryan & Deci, 2000) and fitness outcomes (Wilson et al., 2003).

Similar support for social contagion effects have also been reported in an exercise setting, whereby participants cycling on a stationary bicycle were primed with sentences that were either extrinsically or intrinsically focused (Banting, Dimmock & Grove, 2011). Compared to the extrinsic prime group, those who received the intrinsically focused primes enjoyed the exercise session more, exercised at a greater percentage of heart rate maximum (% HR max), reported a lower rating of perceived exertion (RPE) and exercised for a longer duration (Banting et al., 2011). It is still unclear however if verbal primes would have similar effects in an exercise setting.

There are many related objectives of this experimental study. Given the theoretical propositions and empirical findings, the first purpose was to examine differences between the intrinsic and extrinsic motivation groups on PA attributes of ratings of perceived exertion (RPE), heart rate (% of HR max) and total PA (activity counts) during an exercise session. It was hypothesized that participants in the intrinsic motivation group with will report lower RPE scores, higher PA counts as well as exercise at a higher % of HR max than participants in the extrinsic motivation confederate group. The second purpose was to examine group differences on exercise persistence. It was hypothesized that participants in the intrinsic motivation confederate group will continue exercising longer than participants in the extrinsic group. The third purpose was to examine group differences on change in positive and negative mood during the exercise session. It was hypothesized that participants will report greater vigor scores and lower perceived levels of fatigue in the intrinsic motivation group after the exercise session. Finally, the fourth purpose was to examine group differences on post-experimental motivation

outcomes (e.g., perceived competence in executing the task, interest, effort and pressure/tension experienced in performing the task). It was hypothesized that participants in the intrinsic motivation group will report greater levels of perceived competence, interest, effort and lower levels of pressure/tension.

Review of the Literature

Physical Activity

Regular physical activity (PA) contributes to the primary and secondary prevention of several chronic diseases and is associated with a reduced risk of premature death (Warburton, Nicol & Bredin, 2006). Most physically active people have a lower disease risk, with optimal improvements in health status observed when individuals who are least fit become physically active (Warburton et al., 2006). However individuals who engage in exercise above those recommended in the guidelines are likely to gain further health benefits (Warburton et al., 2006).

The new PA guidelines set forth by the Canadian Society for Exercise Physiology, in cooperation with ParticipACTION, other stakeholders, and the Public Health Agency of Canada, suggest that to achieve health benefits adults between the ages of 18 to 64 years old should accumulate at least 150 min of moderate to vigorous intensity aerobic PA per week (Tremblay et al., 2011). It is also suggested that adults should incorporate strength training as well as bone strengthening activities that target the major muscles groups on at least 2 days of the week (Tremblay et al., 2011). Unfortunately it is estimated that only 15% of Canadian adults accumulate 150 minutes of moderate to vigorous physical activity per week (Colley et al., 2011). Men have consistently been shown to engage in more PA than women, including accumulating an average of 1,100 more steps a day than women (Colley et al., 2011) and engaging in more vigorous activity.

There are several determinants that may influence an individual's PA behaviours (Cavill, Kahlmeier & Racioppi, 2006). These factors can be non- modifiable such as gender and age or can be modifiable such as motivation, social support and environment (Zimmermann-Sloutskis, Wanner, Zimmermann & Martin, 2010). A better understanding of the modifiable factors, such

as motivation, will allow for the development of specific and effective PA intervention programs (Tammelin, 2005). In particular, motivation has been consistently ranked as one of the top 5 barriers to PA participation (Brownson et al., 2001), therefore, efforts to help understand and increase motivation for PA may help foster higher rates.

Self -Determination Theory

The Self-Determination Theory (SDT) has been advanced as a framework to study motivation (Deci & Ryan, 1985), and the use of SDT has increased rapidly in research focused on understanding PA motivation, antecedents and outcomes. This theory is comprised of six mini-theories. The Basic Psychological Needs Theory suggests that psychological well-being and optimal functioning is predicated by an individual's sense of autonomy, competence, and relatedness (i.e. the psychological needs). These three needs are said to motivate an individual to initiate behaviour, are essential for psychological health and well-being, are universal and innate in nature (Deci & Ryan, 1985). The Cognitive Evaluation Theory (CET) targets intrinsic motivation and highlights the importance of competence and autonomy support in fostering intrinsic motivation (Deci & Ryan, 1985). The CET suggests that interpersonal structures and events, including feedback from others, contribute toward feelings of competence, can enhance intrinsic motivation (Deci & Ryan, 1985). The Goal Contents Theory stems from the distinction between intrinsic and extrinsic goals. Goals are seen as affording different basic need satisfactions and are consequently differentially associated with well-being (Deci & Ryan, 1985). The Causality Orientations Theory describes individual differences in people's tendencies toward orientating to an environment in ways that support their self-determination (Ryan & Deci, 2000)**.** According to this theory the 3 orientations are; autonomous orientations, which result from satisfaction of the basic needs; controlled orientations, which results from satisfaction of the need

for competence and relatedness and the impersonal orientations, which results from failing to fulfil all three needs and is related to poor functioning. Individuals are thought to have some amount of each of the orientations (Ryan & Deci, 2000). The fifth sub-theory is the Vitality Theory, which describes how efforts to control oneself drain psychological energy and vitality but autonomous forms of self-regulation do not. Specifically, activities that satisfy psychological needs for relatedness, competence, and autonomy will result in energy maintenance or enhancement (Deci & Ryan, 2000; Ryan & Deci, 2000). The final sub-theory is the Organismic Integration Theory (OIT) which describes differences in the ways in which people's behaviours are regulated and how these differences are experienced as motivation (Deci & Ryan, 1985). This study is framed within OIT given the emphasis on optimizing the manipulation of intrinsic motivation**.**

According to Deci and Ryan (1985), the OIT depicts human motivation as a continuum, ranging from no motivation (i.e., amotivation) to non-self-determined (i,e., extrinsic motivation) to the most self-determined (i.e., intrinsic motivation). An individual who endorses intrinsic motivation performs a task because of the inherent pleasure or sense of accomplishment from executing that task (Deci & Ryan, 1985). Individuals are generally intrinsically motivated by tasks that they have control over, that are deemed by the individual as being enjoyable, stimulating, challenging and tasks in which the individual demonstrates a degree of proficiency (Deci & Ryan 1985). Emotions associated with intrinsically motivated behaviours are stimulation and a sensation of accomplishment (Ryan & Deci, 2000). In contrast, an individual who is extrinsically motivated is influenced by external factors such as to seek out rewards or to avoid punishment (Deci & Ryan, 1985). The four distinct forms of extrinsic motivation consist of external, introjected, identified and integrated motivation. These four behavioural regulations

sequentially increase in their degree of self-determination from controlling to autonomous motivation, beginning with external motivation (Duncan et al., 2010). External motivation is a form of controlling motivation, occupies the least self-determined end of the motivation continuum, and is described as behaviours that are controlled by constraints or incentives (e.g., a man who participates in a race because he will receive a free water bottle or a free t-shirt). Introjected motivation is characterized by behaviours that are reinforced by internal pressures or to avoid guilt, ego threat or shame (e.g., a woman who decides to work out solely to acquire a more physically appealing build with the goal of impressing others). Identified motivation is described as behaviours that are thought to be important and are done willingly, yet still for extrinsic reasons (e.g., a man decides to register for a weekly spinning class because he feels exercise is important and it helps him socialize). Integrated motivation, which is the most self-determined form of extrinsic motivation, is characterized by performing activities that are personally important to the individual and are directed towards a valued outcome yet still constrained by external reasons (e.g., a woman exercises and eats healthy because that's what good exercisers do). Amotivation, positioned at the opposite end of the self-determination continuum to intrinsic motivation, is described as an absolute lack of motivation whereby the individual sees no association between the action and the outcome in question (Ryan, 1995). Ryan and Deci (2000) have shown that amotivation has been linked to behavioural disengagement as well as a host of other negative psychological conditions such as depression and increased stress, whereas intrinsic motivation has been linked to task persistence as well as psychological health.

Individuals who are more intrinsically motivated to participate in PA have been shown to exhibit more favourable exercise behaviours such as greater measured persistence (Pelletier,

Fortier, Vallerand, & Brière, 2001; Vallerand & Blssonette, 1992), choice of PA during physical education classes (Lonsdale, Sabiston, Raedeke, Ha & Sum, 2009), higher reports of positive affect following an exercise session (Deci & Ryan 2008) and higher levels of enjoyment compared to individuals who are extrinsically motivated to exercise (Ryan, Frederick, Lepes, Rubio & Sheldon, 1997; Frederick, Morrison & Manning, 1996; Frederick & Morrison, 1996). Additionally, a study by Standage, Sebire and Loney (2008) examined the utility of motivation in predicting bouts of moderate intensity exercise behaviours assessed by a heart rate monitor and accelerometer. It was demonstrated that intrinsic motivation positively predicted moderate intensity exercise bouts of 10 minutes or greater as well as 20 minutes or greater, which is essential for meeting PA guidelines (Standage et al., 2008). Additionally, habitual exercisers have been shown to be more intrinsically motivated and tend to exert more effort (Mullan & Markland, 1997) and participate in more strenuous types of PA (Edmunds, Ntoumanis & Duda, 2006). These findings highlight the importance of fostering intrinsic motivation to increase PA. While most of the research presented has demonstrated fostering motivation via psychological needs and relevant personally-derived standards, another way in which intrinsic motivation can be cultivated is through motivational priming.

Motivational Priming

Levesque and Pelletier (2003) indicated that an individual's motivational orientation can be primed. What this means is that the perception of another person's behaviour can activate a similar behaviour in the observer. This can lead to synchronicity of the behaviours without the intention or the awareness of it (Freidman et al., 2009). Levesque and Pelletier (2003) found that individuals given an intrinsic motivation prime pertaining to a scrambled sentence task experienced greater interest in the task and performed better on a puzzle than those who received

an extrinsic motivation prime. The underlying mechanism is such that an intrinsic motivational orientation is represented in terms of pleasure and interest and is associated with a sense of freedom, whereas extrinsic motivational priming is mentally represented in terms of monotony and isolation (Freidman et al., 2009). Based on the previous research it is therefore suggested that observing others express intrinsically or extrinsically motivated behaviours should prime the observer's corresponding motivational orientation and prompt behaviours corresponding with the specific motivational orientation (Freidman et al., 2009). It has also been shown that primes pertaining to others' motives have the ability to alter the significance of an event in a subtle way; this may ultimately lead people to either become imaginatively involved in an activity or to devalue it (Wild, Enzel & Hawkins, 1992). This implies that an individual's motivational orientation toward an activity can be spontaneously spread from person to person solely on the foundation of interpersonal primes leading to social contagion (Wild et al., 1992).

The social contagion model was developed to better understand as well as to investigate the mechanisms that lead to the effect that behaviours may be ‘‘contagious’’. It has been proposed that in dyadic relationships such as the relationship between an exercise instructor and an individual participating in the class, the perception of the other person's motivational orientation (i.e., intrinsic, extrinsic, amotivated) influences the development of expectancies in that social context (Deci & Ryan, 1985, 1987). Different expectancies are formed by perceiving others' reasons for engaging in an activity. These expectancies relate to the quality of involvement, for example the amount of interest or enjoyment the perceiver might experience when participating in the task (Wild et al., 1992). An additional expectancy involves the quality of the interpersonal interaction that is likely to occur. This can consist of different kinds of

support such as controlling or autonomous forms of support (Wild et al., 1992). As a result, these expectancies form a ‘‘cognitive set’’ that is used to comprehend subsequent activity involvement as well as interpersonal relationships, this in turn results in affecting the perceivers’ own intrinsic drive (Wild et al.,1992).

This theory was tested using a story comprehension task in an experimental study (Wild, Enzel, Nix & Deci, 1997). Participants were asked to read a short story depicting an individual who assumed either an intrinsic or extrinsic motivational orientation. Both versions of the story depicted a student who was spending the summer working and giving walking tours of Nantucket Island. In one condition, three portions of the story were written in a way to facilitate the perception of extrinsic motivation for working as a tour guide; aside from these alterations both versions were identical in content (Wild et al., 1997). Extrinsic regulation was emphasized by stating that Pat (the student) spent his afternoons as a paid tour guide, that he received 25$ for every two hours of tours he conducted, and that Pat reflected on the money he’d acquired by the end of the summer (Wild et al., 1997). In the other condition, the same three portions were altered to facilitate the perception of intrinsic motivation: Pat spent his afternoon as a volunteer tour guide that he volunteered two hours of his time for each tour he conducted, and that Pat often stayed after the tour to reflect on the experiences he’d acquired (Wild et al., 1997). Immediately after reading the story, participants were asked an open-ended question to measure the perceived motivation of the student. Subsequently, participants were asked to complete a sequence of scale items to assess the expectancies experienced following reading each scenario. As predicted, greater perceptions of intrinsic motivation were reported after reading about the volunteer than after reading about a paid employee. It was also found that the volunteer position, as opposed to the paid position, was judged as being more valuable and pleasurable. It was

therefore concluded that the perceptions of the individual's target motivation mediated the relationship between exposure to an interpersonal target's motivation and beliefs about enjoyment as well as the value of the activity (Wild et al., 1992).

In a subsequent study, Wild and colleagues (1997) wanted to replicate the earlier findings in other social contexts as well as to determine if the process of expectancy formation was suggestible, depending on additional perceptions of the interpersonal target's motivation. The participants were asked to read a story about an individual who called a community college to acquire about information regarding American Sign Language lessons (ASL). The ASL instructor acted as the interpersonal target in this scenario. Six versions of the story were designed (Wild et al., 1997). The first portion of study was altered in a way that described either a volunteer ASL teacher or a paid instructor. The other variable that was manipulated was whether the instructor's motivational orientation was confirmed, disconfirmed, or if no additional information was provided in the story. After reading one of the six versions, the participants were asked to respond to a free report item, they were also asked to rate the task involvement as well as rate the quality of their relationship with the instructor. The results demonstrated that the participants who read about the intrinsically motivated instructor anticipated the task to be more pleasant and interesting. It was also perceived that the instructor would experience more positive affect and a better quality of interpersonal relations when compared to the extrinsically motivated instructor. It was interesting to note that these results were entirely reversed when the information in the story completely disconfirmed the initial information provided about the instructor's motivational orientation. This therefore implied that controlling for the apparent motivation of the instructor removed or considerably reduced the effects of the story components on expected judgment (Wild et al., 1997). The results from these

studies by Wild and colleagues confirm that social contagion occurs when one is perceived to have intrinsic or extrinsic goals for performing tasks.

Pelletier and Vallerand (1996) conducted an experimental study to further explore social contagion and specifically behavioural confirmation in a learning environment. If a teacher was told that a student was intrinsically motivated, the teacher of that student was also perceived by that student as acting in a way that would imply they also were intrinsically motivated (i.e., autonomous and supportive). Therefore, perceiving another person's motivational orientation toward an activity may bring forth a cognitive set that presents a self-generated source of influence on motivation (Pelletier & Vallerand, 1996). So taking from this work it may be possible that the same outcome may occur in an exercise setting, whereby an exerciser perceived as intrinsically motivated may affect the motivational orientation of their exercise partner and as a result they too may become intrinsically motivated to exercise. This proposition has not been studied in a PA context.

The effects of social contagion were also demonstrated in experimental studies manipulating the social relationship, such that one individual has authority over the other. Wild, Enzel and Hawkins (1992) conducted a study in which novice music students were taught to play piano under a condition where the students believed that their teacher was a volunteer (i.e., intrinsic) or was being financially compensated (i.e., extrinsic). The teachers were blind to both conditions and were trained to provide neutral teaching styles that were neither controlling nor autonomous in nature. The results of the experiment demonstrated that both conditions required the same number of trials to learn the same basic song however participants in the intrinsically motivated teacher group reported enjoying the lesson more than the students in the extrinsically motivated teacher conditions (Wild et al., 1992). Those same participants described experiencing

an increased positive affect following the lesson as well as demonstrated greater interest in learning additional piano skills when compared to participants in the perceived extrinsically motivated teacher condition. In addition, students in the intrinsically motivated teacher condition engaged in more exploratory behaviour when the teacher left the room, while students in the extrinsically motivated teacher conditions played the same song they were taught repeatedly. In short, it appeared that the participants self-generated their own motivational orientation toward an activity on the basis of their perception of their teacher's motivation for teaching the lesson. This seemed to have occurred despite the fact that all learners received the same standardized lesson (Wild et al., 1992). Similar conditions may be acquired in an exercise setting whereby novice exercisers may perceive other exercisers as either intrinsically or extrinsically-motivated for engaging in PA. If one perceives others to be exercising for intrinsic reasons, they may themselves enjoy the exercise more and put in more effort, compared to those who perceive others to be exercising for extrinsic reasons. These perceptions may be fostered by verbal communication or indirectly via observation (Wild et al., 1992). This may have implications in an exercise setting, whereby this transfer of motivational climate may still have an affect even when their intrinsically motivated partner is gone, hopefully leading to an increase in their exercise habits, even in the absence of their intrinsically motivated partner.

To explore the notion that social contagion of motivational orientations could spread from person to person simply during a social interaction, Wild, Enzel, Nix and Deci (1997) conducted a ‘‘serial learning procedure’’ of a magic trick. This experimental procedure involved a confederate teacher teaching a magic trick to a first learner, who was then asked to teach the same trick to another learner (Wild et al., 1997). As in the previous studies, the pre-experiment story emphasized that the person teaching the magic trick was either a paid teacher or a

volunteer. All perceivers were taught the same trick using the same neutral teaching style. After performing the trick correctly twice, all participants agreed to teach this same task to another person. Learners who were taught by an intrinsically motivated confederate teacher reported greater levels of enjoyment and interest in learning the task than did the learners taught by an extrinsically motivated confederate teacher. The effects were also shown in the third generation learners. This therefore implied that the motivational orientation for engaging in the activity assumed by the first learner also influenced the second learner. It also suggested that the motivational orientation toward learning a task can be unconsciously spread from person to person in the absence of labels (Wild et al., 1997). The perception of another person's motivation for participating in an activity can affect the perceiver's own motivational climate (Wild et al., 1992). This type is scenario is also conceivable in an exercise context since novice exercisers are often taught by others.

Very little research exploring social contagion has been conducted in fitness and exercise settings. In one experimental study cyclists were primed with sentences that were either an extrinsically or intrinsically focused, while on a stationary bicycle (Banting, Dimmock & Grove, 2011). It was found that, compared to the participants in the extrinsic prime group, those who received the intrinsically focused primes enjoyed the exercise session more, exercised at a greater percentage of heart rate maximum (% HR max) and reported a lower rating of perceived exertion (RPE). In addition, participants exposed to the extrinsic primes exercised for a shorter duration and had lower intentions to exercise than did the participants in the other experimental group (Banting et al., 2011). Based on this research, social contagion effects may be plausible in an exercise setting. These findings are consistent with the work of Wild and colleagues (1992; 1997) which utilized narratives as a way to set up the priming of various forms of motivation.

Yet, little is known about social contagion effect fostered through communication or indirect social interaction.

The presence of others may affect an individual's participation in PA through social facilitation (i.e., the tendency for people to do better on simple tasks in the presence of others; Zajonc, 1965). Norman Triplett published the first experiment in social psychology and sports psychology based on social facilitation in 1898 (Strube, 2005). His first study found that cyclists performed better in the presence of others than when cycling alone (Triplett, 1898). This research paved the way for future investigation of how the presence of others affects an individual's performance and participation (Strube, 2005). For example, in a study by Salvy, Roemmich, Bowker, Romero, Stadler and Epstein (2008), an individuals' motivation to be physically active increased in the presence of a friend when compared to engaging in PA alone. These changes in exercise behaviours are thought to occur because the presence of others can cause an individual to evaluate and adjust their exercise performance in response to the individuals within their social environment (Strauss, 2002). This change can result from making personal comparisons between an individual's own abilities and the abilities of those around them (Strauss, 2002). The presence of another person when engaging in PA is believed to enhance an individual's competitive instincts (Anderson-Hanley, Snyder, Nimon & Arciero, 2011). Studies have shown that PA performance improves when in a competitive setting (Rhea, Landers, Alvar & Arent, 2003; Plante et al., 2010) and that these improvements may be attributed to increased levels of arousal (Anderson-Hanley et al., 2011) and positive changes in mood (Plante, Coscarelli & Ford, 2001; Edwards & Hardy, 1996).

Given the results of these previous studies it is therefore likely that the motivational effects of social contagion may be plausible in exercise settings, yet few studies to date has been

conducted in this area. By having a better understanding of how people's motivational orientations may be altered or affected, we can better design exercise intervention programs that optimize the manipulation of intrinsic motivation. Individuals exercising with novice exercise partners should therefore be cognizant of their verbal primes as it may affect their partners exercise behaviours. Fostering intrinsic motivation in inactive individuals may help beginning exercisers adopt more active lifestyles as well as adhere to an exercise regime, leading to greater physiologic and psychological well-being (Biddle, Fox & Boutcher, 2000).

Summary

Intrinsic motivation is one factor that can enhance PA behaviour, adherence, effort, and persistence and is associated with more positive psychological outcomes than extrisnic motivation (Mullan & Markland, 1997; Ryan & Deci, 2000; Ryan & Deci, 2007). Given the aforementioned research, social contagion can therefore be a viable way of fostering intrinsic motivation (Wild et al., 1992). By promoting a more intrinsic form of motivation, individuals may be more stimulated to engage in PA, report greater enjoyment and affect, while participating and exert more effort (Ryan & Deci, 2000). Social contagion seems like a practicable way to manipulate motivation, yet there are limited studies examining this in a PA setting, since much of the previous research conducted in this area has focused on learning tasks.

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Manuscript

The Motivational Effects of Social Contagion on Exercise Participation in Young Women

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Author Note

Contribution of authors: TS recruited all participants and collected the data. TS and CS developed the objectives, designed the study, obtained ethics approval, developed the questionnaires, analyzed and interpreted the data and wrote the manuscript. EG and RA contributed to the design of the study, reviewed the final manuscript.

List of Abbreviations: Physical activity (PA); percentage of maximal heart rate (% HR max); Rating of Perceived Exertion (RPE); body mass index (BMI); Intrinsic Motivation Inventory (IMI); analysis of covariance (ANCOVA); analysis of variance (ANOVA); Profile of Mood States-short form (POMS-SF), Behavioural Regulation in Exercise Questionnaire-2 (BREQ-2) and multivariate analysis of covariance (MANCOVA)

Abstract

This study had four related objectives, including examining intrinsic and extrinsic motivation priming group differences on: (i) ratings of perceived exertion (RPE), percentage of maximum heart rate (% of HR max) and physical activity (PA) counts during an exercise session; (ii) exercise continuance and duration following the study manipulation; (iii) vigor and fatigue during the exercise session; and (iv) post-experimental motivation outcomes of perceived competence, interest, effort and pressure/tension. Inactive females (n = 42) exercised at a self-selected pace on a treadmill beside a confederate who was providing either intrinsic or extrinsic verbal primes. The intrinsic motivation group had higher RPE values at 8 minutes, higher % HR max, more PA counts, greater duration of exercise, and higher perceived effort compared to the extrinsic motivation group. A time effect was noted for vigor. Based on these findings, exercise motivation can be "contagious" through verbal primes, suggesting that exercising with or around intrinsically motivated individuals may have beneficial outcomes.

Introduction

Participation in regular physical activity (PA) helps to initiate and maintain a healthy lifestyle (Warburton, Nicol & Bredin, 2006). PA has been shown to provide numerous psychological benefits, including increased positive mood and lower levels of anxiety (Penedo & Dahn, 2005) as well as an array of physical benefits such as better control of blood lipid levels in addition to healthy weight loss or maintenance (Lombard, Deeks, Jolley & Teeds, 2009) and the prevention of many health conditions such as diabetes, hypertension, cardiovascular disease, cancer, and obesity (Warburton et. al., 2006). According to the national guidelines on physical activity and public health, adults should accumulate at least 150 minutes a week of moderate to vigorous intensity PA to achieve health benefits (Colley, Garriguet, Janssen, Craig, Clarke & Tremblay, 2011; Haskell et al., 2007). Unfortunately, fewer than 15% of adults are meeting these recommendations (Colley et al., 2011). In addition, women have been shown to engage in less PA than men regardless of age (Colley et al., 2011). Examining motivation may be one promising approach to understanding these low levels of PA, in particular among women.

Lack of motivation is ranked among one of the top 5 barriers to PA participation (Brownson et al., 2001). Based on the Self-Determination Theory (SDT; Deci & Ryan, 1985), there are two fundamentally distinct types of motivation: intrinsic (i.e., a drive that is determined by an interest or enjoyment in the task itself, and exists within the individual) and extrinsic (i.e., a drive that is determined by external factors such as rewards or to avoid punishment). Individuals who are more intrinsically motivated to participate in PA demonstrate greater adherence to an exercise regime and report higher levels of enjoyment (Frederick & Morrison, 1996). Individuals reporting intrinsic motivation also report more positive emotions, more effort, and greater interest in the task compared to individuals who are extrinsically motivated (Pelletier,

Fortier, Vallerand, Tuson, Brière & Blais, 1995). It is particularly important to focus on understanding and developing intrinsic motivation in women, since women tend to report lower levels of exercise enjoyment and adherence compared to their male counterparts (Amorose & Horn, 2000).

One way to understand the development of intrinsic motivation in women may be through social contagion. Specifically, an individual's motivational orientation toward an activity can be spontaneously spread from person to person solely on the foundation of interpersonal primes (Wild, Enzel & Hawkins, 1992). Different expectancies are formed by perceiving others' reasons for engaging in an activity and are related to the quality of involvement, such as interest and enjoyment in the task (Friedman et al., 2009; Wild et al., 1992). These expectancies form a ''cognitive set'' that is used to understand subsequent activity involvement as well as interpersonal relationships, and results in affecting the perceivers' own intrinsic drive (Wild et al., 1992). For example, in dyadic relationships (e.g., a personal trainer and client or two exercising friends), the perception of the trainer's or friend's motivational orientation may influence the development of the others' expectancies and behaviors. Based on social contagion effects, if individuals display characteristics that are consistent with being intrinsically motivated to participate in PA, the individuals around them may also pick up this motivation orientation.

Evidence for social contagion tenets has been provided in experimental studies (Levesque & Pelletier, 2003; Wild et al., 1992; Wild, Enzel, Nix & Deci, 1997). For example, Wild et al. (1997) found that their participants reported higher levels of intrinsic motivation after reading stories depicting an intrinsically-motivated person (e.g., volunteer) compared to an extrinsically motivated person (e.g., paid worker). Consistent with social contagion, Pelletier and Vallerand (1996) found that teachers who were told that a student was intrinsically motivated perceived the

student as acting in intrinsically motivated ways compared to students who were perceived by the teacher as being extrinsically motivated. Additionally, Levesque and Pelletier (2003) found that individuals given an intrinsic motivation prime pertaining to a scrambled sentence task experienced greater interest in the task and performed better on a puzzle than those who received an extrinsic motivation prime. Consideration of these findings for PA environments may be helpful in fostering intrinsic motivation, and therefore greater persistence and enjoyment in PA tasks. For example, it may be that an exerciser labeled or perceived as intrinsically motivated may affect the motivational orientation of their exercise partner or group, who may develop intrinsic motivation to exercise, resulting in greater exercise adherence and enjoyment.

Social contagion effects have been reported in two more recent studies focused on the exercise setting. In the first study on motivational priming, participants cycling on a stationary bicycle were primed with sentences that were either extrinsically or intrinsically focused (Banting, Dimmock & Grove, 2011). Compared to the participants in the extrinsic prime group, those who received the intrinsically focused primes enjoyed the exercise session more, exercised at a greater percentage of heart rate maximum and reported a lower rating of perceived exertion. In addition, participants exposed to the extrinsic primes exercised for a shorter duration and had lower intentions to exercise than did the participants in the other experimental group (Banting1 2011). In another study employing a hypothetical exercise scenario, Ng, Thogersen-Ntoumani & Ntoumanis (2012) found that primes (e.g., quotes varying in motivation quality) perceived to be from obese exercisers influenced exercise science students' perceptions of the hypothetical exercisers' beliefs and capabilities. If the exerciser was perceived to be autonomously (intrinsically) motivated, the students thought they would be more capable of overcoming barriers. However, the students also reported more autonomy support and investment of effort

for exercisers who were perceived to have more controlled motives. Based on these exercise-related studies, social contagion effects may influence exercisers' own beliefs, behaviors, and physiological outcomes during exercise and may affect the way exercise science students work with fitness clients and/or patients seeking exercise routines. While both studies have indirectly advanced our understanding of social contagion effects, the use of scrambled sentences and hypothetical scenarios limit the "real-world" effects related to social contagion. For example, PA participation often occurs in the presence of others and social contagion effects may occur based on the presence or casual statements provided by other exercisers in the PA environment. Based on the seminal social facilitation work of Norman Triplett (1898), Salvy, Roemmich, Bowker, Romero, Stadler and Epstein (2008) reported that an individuals' motivation to be physically active increased in the presence of a friend compared to engaging in PA alone. The presence of another individual therefore seems to be a viable way to improve PA participation (and possibly underlying motivational regulations). Taken together, the mix of sport and exercise psychology findings on motivational priming, social facilitation, and social contagion suggest that the strongest effects of motivation primes may be observed in the presence of other exercisers who themselves are providing primes.

Based on theoretical tenets, and extant literature findings, the purpose of this current research was four-fold, and included examining intrinsic and extrinsic motivation priming group differences on: (i) ratings of perceived exertion (RPE), percentage of maximum heart rate (% of HR max) and PA counts during an exercise session; (ii) exercise continuance and duration following the study manipulation; (iii) vigor and fatigue during the exercise session; and (iv) post-experimental motivation outcomes of perceived competence, interest, effort and pressure/tension. Fitness level and current exercise motivation were controlled in all analyses

since fitness level could explain physiological effects during exercise (Kaufman, Berg, Noble &Thomas, 2006) and exercise motivation could affect the strength of the verbal motivational priming and the emotional and physiological effects during exercise (Standage, Gillison, Ntoumanis & Treasure, 2012; McDonough & Crocker, 2007). It was hypothesized that participants in the intrinsic motivation group would report greater RPE scores and PA counts as well as exercise at a higher % of HR max than participants in the extrinsic motivation prime group. Furthermore, it was also hypothesized that participants in the intrinsic motivation prime group would continue exercising longer, and report increased vigor and lower levels of fatigue after the exercise session, compared to the participants in the extrinsic motivation group. Finally it was hypothesized that participants in the intrinsic motivation group would report greater levels of perceived competence, interest, effort and lower levels of pressure/tension post-exercise compared to participants in the extrinsic group.

Methods

Participants

Forty-two female university students were recruited through posted advertisements on the university classifieds and in local buildings. Inclusion criteria included: (i) between 18 and 30 years of age; (ii) healthy weight (Body Mass Index (BMI) of 18.5 to 24.9 kilograms per meter squared); and (iii) inactive (i.e., exercised less than 3 times per week for 30 minutes a day).

Measures

Demographics. Age was reported, and the experimenter used a standard protocol (Ross & Marfell-Jones, 1991) to measure height (in meters) and weight (in kilograms) used to calculate BMI (e.g., weight/height^2). Participants reported past week (last 7 days) physical activity as the number of minutes that they engaged in each of light, moderate, and strenuous PA. Examples of

each intensity activity were provided based on a common measure (Godin & Shephard, 1985).

Fitness Level. The 6 minute walk test was used as an objective measure of the participants' fitness level. The correlation of the 6 minute walk test to peak VO_2 is shown to be moderate to good, with the 6 minute walk test being between 83% and 91% accurate in predicting peak VO_2, which is an indicator of fitness (American Thoracic Society Statement, 2002). Participants were instructed to walk back-and-forth along a 15-meter long hallway as quickly as possible for a period of 6 minutes. The total distance covered by the participant over the 6-minute assessment was recorded. Fitness was used as covariate in the current study.

Motivation Orientation. Autonomous motivation was assessed using the intrinsic (N_{items} = 4) and identified (N_{items} = 4) regulation subscales of the Behavioral Regulation in Exercise Questionnaire II (BREQ-2; (Markland & Tobin, 2004). The questionnaire scores have been shown to be reliable (e.g., Markland & Tobin, 2004; Sabiston, Brunet, Kowalski, Wilson, Mack, & Crocker, 2010) and Cronbach's alpha reliabilities for the subscale scores were calculated to be above 0.73 in the current study. Autonomous motivation was included in the current study as a covariate in all analyses.

Heart rate (HR), Exertion and Physical Activity (PA) Counts. HR was measured using a FT4 polar HR monitor (Polar Electro, Inc., Woodbury, NY) worn by the participant, who was blind to the output on the accompanying watch. The level of exertion was measured using the Rating of Perceived Exertion Scale (RPE; Borg, 1982) and PA counts were recorded by a GT3X accelerometer (Actigraph, Pensacola, FL) worn at the hip. Data from the accelerometer were collected and downloaded in 30-second epochs. HR, RPE, and PA counts were assessed and analyzed for the 10-minute study period.

Mood. The vigor (N_{items} = 6) and fatigue (N_{items} = 5) subscales of the Profile of Mood

States-SF (POMS-SF) were used to assess the participants' mood pre and post the experimental manipulation (Shacham, 1983). The internal consistency estimates of the scale scores have reportedly ranged from 0.80 to 0.91 (Curran, Andrykowski & Studts, 1995), which is comparable to the internal consistency coefficients from this study (α = 0.85 & 0.89, respectively).

Motivational Outcomes. The Intrinsic Motivation Inventory (IMI; McAuley, Duncan & Tammen, 1987) was used to assess the participants' interest in the task (N_{items} = 7), perceived competence (N_{items} = 6), effort (N_{items} = 5) and felt pressure/tension (N_{items} = 5). The internal constancy of the subscales of this measure have been reported to range between 0.78 and 0.91 (McAuley et al., 1987; Deci et al., 1994), and in the current study the coefficients ranged from α = 0.73 to 0.91.

Procedure

Female university students who saw the posted study advertisement contacted the experimenter to review eligibility criteria and schedule a lab visit. The participants provided informed consent, participated in a 6-minute walk test, and completed a self-report questionnaire that assessed demographic details, mood and exercise motivation. The participants were randomly assigned to either an intrinsic or extrinsic motivation group based on a table of numbers, but were not informed of this procedure. Blinding to the experimenter was not possible since the manipulation was overt statements provided by the confederate during the exercise session. The participants were set up on a Star Trac s-TRC treadmill (Irvine, CA) and fitted with the HR monitor and accelerometer. A confederate who was acting as another participant (upper-level undergraduate student, healthy weight female) was also set up on a treadmill with the HR monitor and accelerometer. The treadmills were positioned such that the display panels were not visible to the other participant/confederate. Participants were asked to walk or run at a self-

selected pace for the scheduled 15-minute exercise bout. They were instructed to keep the treadmill incline at zero.

For the individuals in the extrinsic motivation group, the confederate was directed to provide an extrinsically-focused verbal prime after 3 minutes of exercise "I don't like to exercise; I am just here for the $20" (the amount of compensation for the study participation). After 6 minutes of exercising the confederate was directed to provide another extrinsically-focused verbal prime: "If I were to exercise more often I would do so only to look better, I really don't like this". Similarly, in the intrinsic motivation group, the confederate provided intrinsically-focused verbal prime after 3 minutes "I love exercising, I signed up for this study because I find running so enjoyable, I wish I had more time to do it''. After 6 minutes the confederate was directed to provide another intrinsic verbal prime "I am really enjoying this exercise". These verbal primes were developed to be consistent with the primes used in other social contagion and motivation priming studies (e.g., Banting et al., 2011; Levesque & Pelletier, 2003; Ng, et al., 2012; Pelletier & Vallerand, 1996; Wild et al., 1992; 1997).

At baseline, and every two minutes, the lead researcher recorded HR and RPE. After the 10-minute assessment of HR and RPE, the researcher mentioned that she forgot something in another room and she instructed the participant and confederate that they could stop if they desired because she had collected enough data from them, or they could continue to exercise. While exercising with participants in the extrinsic motivation group, the confederate stopped immediately, without saying another word. She continued to exercise without saying a word with the participants in the intrinsic motivation group. At 12 minutes, the researcher returned and asked all participants to stop exercising. The participants were then asked to complete a post-experimental self-report questionnaire which included funnel debriefing questions used to probe

for suspicion about the purpose of the study. Participants were excluded from the analyses if they suspected that their behavior during the exercise session was a dependent measure in the experiment (Freidman et al., 2009). This protocol was approved by the Mcgill University Behavioral Research Ethics Board II in July 2011.

Data Analysis

Following observation of data and tests of assumptions, preliminary analyses were conducted to test if there were significant differences ($p < .05$) between the intrinsic and extrinsic motivation priming groups on baseline descriptives. The first study objective (i.e., to compare RPE at each of 5 time points during exercise session, percentage of maximal heart rate (% HR max[1]) and PA counts[2] during the exercise session between the intrinsic and extrinsic motivation group) was tested using separate repeated measures ANOVA (RPE) and ANCOVA. To test the second objective (i.e., to compare exercise duration), the percentage of participants who continued to exercise after 10 minutes was analyzed using chi-square. The third objective (i.e., to examine time, group, and group by time interaction effects on vigor and fatigue) was tested using Repeated Measures ANCOVA. Finally, the fourth objective (i.e., to examine group differences on post-experimental perceptions of competence, interest, effort and pressure/tension) was tested in multivariate analysis of covariance (MANCOVA). Follow-up univariate analyses were conducted to further explore significant multivariate effects. In all analyses, appropriate, effect sizes (Cohen's d; Cohen, 1988) were calculated and autonomous motivation and fitness were entered as covariates, as they may been confounding variables in the analysis. All statistical analyses were performed using SPSS v20.

Results

Description of Sample

Participants ranged in age from 18 to 30 (M_{age} = 21.6 + 3.3) years. Participants' weight ranged from 42 to 70 (M = 56.42 + 6.82) kilograms and their height ranged from 1.54 to 1.78 (M = 1.64 + 0.06) metres. The mean BMI was 21 (+ 2.11) kg/m^2. They reported participating in an average of 29.21 (SD = 16.51) minutes of PA in the last week. None of the participants reported being aware of the true nature of the study following the post-experimental debriefing.

Preliminary Analyses

Data for each measure, and at each time point (pre and post) where appropriate, were normally distributed based on skewness (($skewness_{max}$ = 2.66 (SE = 1.81), $skewness_{min}$= -1.3 (SE = 0.36)) and kurtosis values (($kurtosis_{max}$ = 5.55 (SE = 0.72), $kurtosis_{min}$= -1.1 (SE = 0.72)) (Tabachnick & Fidell, 2007). Moreover, assumptions of linearity and homoscedasticity were also met, and the homogeneity of variance assumption was not violated. No between group differences on age, BMI, exercise motivation, fitness or prior PA participation were observed (see Table 1).

Experimental Group Differences during the Exercise Session

The descriptive data for the outcome measures are presented in Table 2. RPE means were higher for the intrinsic group across all measurements, yet a RM ANCOVA showed non-significant time effect ($F(1,38) = 0.66$, $p = 0.62$), group effect ($F(1,38) = 3.19$, $p = 0.08$), and group X time interaction ($F(1,38) = 0.30$, $p = 0.88$). ANCOVA's with Bonferroni correction were also performed to examine group differences at each RPE measure, given the priming effects were provided at specific times. Reported RPE at 8 minutes was higher in the intrinsic motivation group, $F(1, 38) = 5.36$, $p = 0.03$. Medium effects were detected for RPE at 2 (d = 0.46), 4 (d= 0.40), 6 (d= 0.42) and 10 minutes (d = 0.35) between the intrinsic and extrinsic motivation group. Large effect sizes were detected for RPE at 8 minutes (d = 0.67).

The participants in the intrinsic motivation group exercised at a higher percentage of their maximal HR than the participants in the extrinsic motivation group, $F(1, 38) = 5.93$, $p = 0.02$. The participants in the intrinsic motivation group also performed more PA during the exercise session based on the recorded higher PA counts, $F(1, 38) = 8.02$, $p = 0.01$ (see Table 2). Large effect sizes were detected for % HR max ($d = 0.74$) and PA counts ($d = 0.77$) between the experimental groups (see Table 2).

Post- Exercise Session

After the 10-minute exercise session, all 21 participants (100%) in the intrinsic motivation group continued to exercise compared to 6 of the 21 (29%) participants from the extrinsic motivation group, $\chi2(1) = 7.00$, $p = 0.01$.

Pre and Post Exercise Session

As presented in Table 3 and 4, there was a significant time effect for vigor ($F(1, 38) = 9.92$, $p = 0.01$) but not for fatigue ($F(1, 38) = 1.53$, $p = 0.22$). The main effects for group were not significant for vigor ($F(1, 38) = 0.98$, $p = 0.33$) or fatigue ($F(1, 38) = 0.75$, $p= 0.39$). The time by group interaction was not significant for vigor ($F(1, 38) = 0.63$, $p = 0.43$) or fatigue ($F(1, 38) = 0.78$, $p = 0.38$). Small effects were detected for fatigue values in the intrinsic ($d = 0.23$) and extrinsic group ($d = 0.06$). Medium effects were detected for vigor in the intrinsic ($d = 0.33$) and extrinsic group ($d = 0.46$).

Post Exercise

The multivariate model for motivation was significant, Wilks $\lambda = 0.76$, $F(5, 35) = 2.77$, $p = 0.04$. In follow-up univariate analyses, effort was significantly higher in the intrinsic motivation group, $F(1, 39) = 6.28$, $p = 0.02$, $d = 0.60$. There were no differences in interest ($F(1, 39) = 0.28$, $p = 0.60$, $d = 0.14$) and pressure/tension ($F(1, 39) = 0.10$, $p = 0.75$, $d = 0.30$) between

the intrinsic and extrinsic motivation group. There was no group difference for perceptions of competence, in spite of large effect size ($F(1, 39) = 2.07$, $p = 0.16$, $d = 0.60$). These results are presented in Table 4.

Discussion

Given the importance of fostering intrinsic motivation and the limited research in the area of social contagion and exercise behavior, the overall purpose of this study was to determine if motivation to participate in PA can be contagious through verbal primes. Based on the study findings, and in line with theoretical rationale, it may be possible that exercise motivation is "contagious" through verbal priming. These findings support theoretical tenets, provide considerations for experimental designs in sport and exercise, and may inform practice in the way exercise psychology professionals work with clients (Ng et al., 2012).

The first hypothesis was that, compared to the extrinsic motivation priming group, participants who were randomly assigned to the intrinsic motivation group would report higher RPE values, exercise at a higher % HR max and have greater PA counts during the exercise session. The results from this study partially support the first hypothesis. While RPE values after 2, 4, and 6 minutes of exercise were not significantly different between the two groups, there was a significant difference in RPE values after 8 minutes of exercise. It is possible that the internalization of intrinsic motivation may be a process that takes some time (Deci & Ryan, 2012), and therefore that some time may be needed for the verbal primes to be effective. For example, the first verbal prime was provided after 3 minutes of exercising, which means that the participant only had about 1 minute to process the prime prior to the 4-minute assessment of RPE. Whereas the second verbal prime, which was provided after 6 minutes of exercising, may have had a greater effect on RPE since the participants may have had the time to process the first

verbal prime and receive confirmation in the second verbal prime. Although limited research has examined the effects of social contagion in an exercise setting, and the mechanisms explaining the effects of verbal primes on performance outcomes are not known, researchers have indicated that verbal persuasion and primes can have an effect on PA perceptions and participation through effects on self-efficacy and social support.

First, verbal persuasion can be a powerful way to increase self-efficacy (Samson & Solmon, 2011), which in turn impacts an individual's activity choice, effort, intensity as well as persistence (Bandura, 2000). Perhaps the intrinsic motivation verbal primes provided in the current study by the confederate may have been interpreted as a form of verbal persuasion whereby increasing the self-efficacy of the exercising participant resulting in higher RPE scores, exercising at a higher % HR max, and greater PA counts. Future research should be conducted to examine this potential mediating role of self-efficacy in the relationship between verbal primes and PA outcomes. Nonetheless, findings from this study suggest that verbal primes may be effective in fostering self-determined motivation. Therefore, exercise trainers and psychology consultants may consider providing intrinsically-motivating verbal primes to their beginner exercisers. Second, participating in PA with an exercise partner may also have beneficial outcomes on one's own PA behaviors by increasing motivation to participate and adherence (Darlow & Xu, 2011). For individuals who are not physically active, such as the current study sample participants, an exercise partner may be perceived as providing support for PA. Exercising with another person can provide a form of social support, which has been associated with improved PA participation (Darlow & Xu, 2011). As such, another potential mediating variable between motivational verbal priming and exercise outcomes may be perceived social support, and future research endeavours could examine this proposition.

The findings from this study confirmed the second hypothesis in that a greater percentage of participants in the intrinsic motivation group continued to exercise after the 10-minute exercise session compared to the extrinsic motivation group. In fact, all of the participants in the intrinsic motivation group continued to exercise. While these effects may be based on the motivational primes provided during exercise, it is also possible that social influence and facilitation persuaded continued exercise (Plante, et al., 2010; Salvy et al., 2008). Research by Luszczyska and collegues (2005) found that individuals were likely to mimic the behaviors of those around them. It has also been shown that individuals feel the need to engage in socially acceptable behaviors, such as exercise, especially when they observe others around them doing the same (Luszczyska et al., 2005; Plante et al., 2010; Salvy et al., 2008). In the current study, the participants may have observed the confederate continue to exercise after the experimenter left the room in the intrinsic motivation group and the participants perceived that it was socially unacceptable to stop exercising, whereas in the extrinsic group the participants perceived that it was more socially acceptable to stop exercising and mimicked that behavior. Future research is needed to tease apart the possible social facilitation and motivational priming effects provided by others as social contagion. This may have implications for experimental studies in sport and exercise domains, in that studies designed to have more than one person training or testing at the same time may be contaminated by these contagion effects. Furthermore, exercise trainers and consultants should be aware of the possible contagion effects (Ng et. al., 2012), especially if they use group-based programs since one extrinsically-motivated person, or just one comment of that nature, may influence the achievements of the group.

The participants reported greater vigor scores after the 10-minute exercise session, in both experimental conditions. It has been shown that exercise, specifically aerobic exercise,

improves vigor and decreases fatigue in young adults (Dishman, Thom, Puetz, O'Connor & Clementz, 2010). It may be that a self-selected 10-minute exercise session was long enough to experience increases in vigor however was not long enough to affect fatigue levels in either experimental group. In the study by Dishman and colleagues (2010), participants engaged in PA for a total of 25 minutes (including a warm-up) compared to the current study PA period of 10 to 12 minutes. Also, participants in Dishman et al.'s (2010) study had to exercise at 75% of their VO_2 max, whereas the participants in the current study exercised at a self-selected pace, and were able to change their pace as they wanted throughout the exercise bout, hence perhaps restricting any fatigue. It has been shown that females tend to dislike and avoid exercise intensities that are more vigorous (Standage et al., 2012). Differences in fatigue could have been found if participants were told to exercise for a greater amount of time and at a greater intensity.

The observation of no group or group by time interaction on mood may be a result of the experimental manipulation. The internalization of motivation may be a process that takes time to be effective and may have influenced vigor or fatigue differently. Internalization refers to the process through which an individual acquires various behavioral regulations and gradually transforms them into a personal value or goal (Deci & Ryan, 1985). Ginis, Burke, and Gauvin (2007) found that women who exercised with a partner for 20 minutes experienced an increased level of exhaustion and decreases in feelings of revitalization compared to women who exercised either alone or without mirrors. Therefore, it may be that simply exercising beside another female influences mood and that 20 minutes may be adequate for the internalization of motivation to occur (Ginis et al., 2007). Researchers may want to examine the minimum amount of time required for the internalization of motivation to occur.

In partial support of the last study hypothesis, perceived effort was significantly higher in

the intrinsic motivation group and there were no group differences in perceived competence, interest and pressure/tension. In line with the current literature and hypothesis, participants in the intrinsic primed group perceived that they exerted more effort. This may have occurred because they enjoyed the exercise session more after having confirmation by the confederate and as a result exerted more effort (Ryan & Deci, 2000). Contrary to the hypothesis, although not statistically significant, it is important to note that the mean values on competence and interest were higher in the extrinsic motivation group and the mean values for pressure/tension were lower. Based on social comparison theory (Festinger, 1954), individuals have a desire to assess how they are doing by seeking standards on which they can compare themselves. If objective standards are not available, individuals look to their social environments and compare themselves with those around them. What may have occurred in this study was a form of downward social comparison whereby the study participants perceived that they were better off than the study confederate in the extrinsic motivation group (e.g. when the confederate stated that they didn't like to exercise, or were only doing the study for money, the participant may have felt less strongly for these statements). Therefore, this comparison may have elicited favorable exercise behaviors in the extrinsic motivation group (Dijkstra, Gibbons, Buunk, 2010). Researchers have shown that when self-enhancement is a prevailing motive, individuals favour to compare themselves downward with others who they feel are worse off than them. Downward social comparisons tend to enhance self esteem and positive affect (Dijkstra et al., 2010). It may therefore be that the participants' downward social comparison between themselves and the study confederate resulted in outcomes that are opposite to what we would expect.

We would like to acknowledge the following limitations to this study. First, the sample included self-selected young adult females who may have been more motivated to be physically

active or to change their behaviors in the near future. Additionally, participants exercised next to the study confederate for 10 minutes and therefore this time could have limited the internalization of intrinsic motivation. Intrinsic motivation verbal primes and internalization may be a process that occurs over a longer time span or after exercising several times with a partner (Deci & Ryan, 2012) to affect mood and motivational outcomes. In addition due to the deceptive nature if the study a measure of the participants perception of the study confederate was not included.

In conclusion, these findings offer important new information on how the theoretical framework of social contagion may be used in an exercise setting to promote PA. Individuals exercising with novice exercise partners, personal fitness trainers, and exercise psychology consultants (among others) should therefore be cognizant of their verbal primes as it may affect their partners'/clients' exercise behaviors. Fostering intrinsic motivation in inactive individuals may help beginning exercisers adopt more active lifestyles as well as adhere to an exercise regime, leading to greater physiologic and psychological well-being (Biddle, Fox & Boutcher, 2000). Developing ways to help sedentary individuals adopt and maintain more active lifestyles represents a public health priority and proper pairing of exercise partners may result in more favourable exercise outcomes.

Notes

[1]% max HR was used as a composite indicator of HR given the exercise was self-selected and could be altered by the participant throughout the study

[2]PA counts were truncated at 10 minutes upon download to control for within-person and between-group differences in exercise duration.

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Table 1.

Exercise motivation, fitness and physical activity-related characteristics of 42 female participants by experimental group

		Total *M(SD)* *n = 42*	*Intrinsic M(SD)* *n = 21*	*Extrinsic M(SD)* *n = 21*	*F*	*p*
Exercise motivation	*Autonomous regulation*	*1.42(0.44)*	*1.32 (0.46)*	*1.51(0.41)*	*2.0*	*0.17*
Fitness	*Distance walked in 6 minute walk test (m)*	*593.39(50.36)*	*586.34(43)*	*600.55(56.81)*	*0.84*	*0.34*
PA participation	*Strenuous (minutes)*	*8.10(9.84)*	*7.20(9.51)*	*9.00(10.52)*	*0.32*	*0.57*
	Moderate (minutes)	*11.34(10.36)*	*10.50(8.72)*	*10.14(11.89)*	*0.25*	*0.62*
	Mild (minutes)	*10.68(7.93)*	*12.71(8.79)*	*8.55(6.48)*	*2.95*	*0.64*

[1] PA participation reported from the previous 7 days (week).

Table 2.
Experimental group differences during the exercise session on RPE, % HR max and PA counts

	Total *M(SD)* *n = 42*	*Intrinsic* *M(SD)* *n = 21*	*Extrinsic* *M(SD)* *n = 21*	F	*p*	Cohen's *d*
RPE 2min	11.07(2.19)	11.57(2.23)	10.57(2.08)	1.75	0.19	0.46
RPE 4min	12.00(1.94)	12.38(1.69)	11.62(2.13)	1.97	0.17	0.40
RPE 6min	12.88(1.97)	13.28(1.52)	12.47(2.29)	2.19	0.15	0.42
RPE 8min	13.47(1.64)	14.00(1.31)	12.95(1.80)	5.36*	0.03	0.67
RPE 10min	13.85(1.65)	14.14(1.49)	13.57(1.77)	1.30	0.26	0.35
%HR max	76.91(10.42)	80.57(7.51)	73.26(11.74)	5.93*	0.02	0.74
PA counts[1]	78915.28(26356.97)	88512.95(20949.49)	69317.61(28138.78)	8.02*	0.01	0.77

*$p<.05$; [1] PA counts were truncated at 10 minutes to control for within-person and between-group differences in exercise duration.

Table 3.
Mean pre and post exercise group differences on vigor and fatigue

	Vigor	Fatigue
Total Sample (*N*=42)		
Pre	1.28±1.73	0.89±0.79
Post	1.62±0.88	1.01±0.76
Intrinsic Group (*n*=21)		
Pre	1.34±0.73	0.76±0.77
Post	1.64±0.99	0.94±0.77
Extrinsic Group (*n*=21)		
Pre	1.22±0.75	1.03±0.80
Post	1.60±0.82	1.08±0.76

*$p<.05$

Table 4.
Time, group and time by group interaction on vigor and fatigue

	Vigor			Fatigue		
	F	Partial η^2	*p*	F	Partial η^2	*p*
Time	9.92	0.02	0.01*	1.53	0.04	0.22
Group	0.98	0.03	0.33	0.75	0.02	0.39
Time X group	0.63	0.02	0.43	0.78	0.20	0.38

**p<.05*

Table 5.
Differences on post exercise measures of competence, interest, effort and pressure/tension between the intrinsic and extrinsic motivation group

	Means (SD)		*F*	*p*	Cohen's *d*
Subscales	Intrinsic	Extrinsic			
Competence	4.11(1.52)	4.86(0.91)	2.07	0.16	0.60
Interest	4.69(1.40)	5.10(1.34)	0.28	0.60	0.30
Effort	5.01(1.28)	4.30(1.09)	6.28	0.02*	0.60
Pressure/Tension	2.39(1.26)	2.23(1.04)	0.10	0.75	0.14

**p<.05*

Appendices

Appendix A: Manuscript tables

Table 1.

Exercise motivation, fitness and physical activity-related characteristics of 42 female participants by experimental group

		Total *M(SD)* *n = 42*	*Intrinsic M(SD)* *n = 21*	*Extrinsic M(SD)* *n = 21*	*F*	*p*
Exercise motivation	*Autonomous regulation*	*1.42(0.44)*	*1.32 (0.46)*	*1.51(0.41)*	*2.0*	*0.17*
Fitness	*Distance walked in 6 minute walk test (m)*	*593.39(50.36)*	*586.34(43)*	*600.55(56.81)*	*0.84*	*0.34*
PA participation	*Strenuous (minutes)*	*8.10(9.84)*	*7.20(9.51)*	*9.00(10.52)*	*0.32*	*0.57*
	Moderate (minutes)	*11.34(10.36)*	*10.50(8.72)*	*10.14(11.89)*	*0.25*	*0.62*
	Mild (minutes)	*10.68(7.93)*	*12.71(8.79)*	*8.55(6.48)*	*2.95*	*0.64*

[1] PA participation reported from the previous 7 days (week).

Table 2.
Experimental group differences during the exercise session on RPE, % HR max and PA counts

	Total *M(SD)* *n = 42*	*Intrinsic* *M(SD)* *n = 21*	*Extrinsic* *M(SD)* *n = 21*	F	*p*	Cohen's *d*
RPE 2min	11.07(2.19)	11.57(2.23)	10.57(2.08)	1.75	0.19	0.46
RPE 4min	12.00(1.94)	12.38(1.69)	11.62(2.13)	1.97	0.17	0.40
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RPE 10min	13.85(1.65)	14.14(1.49)	13.57(1.77)	1.30	0.26	0.35
%HR max	76.91(10.42)	80.57(7.51)	73.26(11.74)	5.93*	0.02	0.74
PA counts[1]	78915.28(26356.97)	88512.95(20949.49)	69317.61(28138.78)	8.02*	0.01	0.77

*$p<.05$; [1] PA counts were truncated at 10 minutes to control for within-person and between-group differences in exercise duration.

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Pre	1.28±1.73	0.89±0.79
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Extrinsic Group (*n*=21)		
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Time, group and time by group interaction on vigor and fatigue

	Vigor			Fatigue		
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Time X group	0.63	0.02	0.43	0.78	0.20	0.38

**p<.05*

Table 5.
Differences on post exercise measures of competence, interest, effort and pressure/tension between the intrinsic and extrinsic motivation group

	Means (SD)		*F*	*p*	Cohen's *d*
Subscales	Intrinsic	Extrinsic			
Competence	4.11(1.52)	4.86(0.91)	2.07	0.16	0.60
Interest	4.69(1.40)	5.10(1.34)	0.28	0.60	0.30
Effort	5.01(1.28)	4.30(1.09)	6.28	0.02*	0.60
Pressure/Tension	2.39(1.26)	2.23(1.04)	0.10	0.75	0.14

**p<.05*

Appendix B: Information and consent form

Department of Kinesiology and Physical Education

Health behaviour and emotion lab

475 Pine Avenue West

Montreal, Quebec

H2W 1S4

P: (514) 398-4184

Motivation and Exercise Participation in Young Female Adults

INFORMED CONSENT

Researcher: Tanya Scarapicchia, M.A. candidate, Exercise and Health Psychology

Supervisor: Catherine Sabiston, Ph.D; tel: 514-398-4184 ext 00890

Introduction

You are being asked to participate in a research study examining motivation and exercise participation in young women. We are asking you to participate in this research so that we can better understand what factors lead to motivation and exercise performance (running on a treadmill) over a short time. Women between the ages of 18 to 25 years of age who are of healthy weight (BMI 18.5-24.9) and who currently exercise less than 3 times a week for 30 minutes a day may join this study. Results from this study will be presented at scientific conferences and will be published in a Master's thesis and academic journals. This consent form explains the research study and your part in the study. Please read it carefully and ask questions about any information you do not understand.

Purpose of the Study

To better understand exercise participation in young adults.

Study Procedures

Your participation in this study involves:

a) A telephone assessment that will measure safety of exercise and eligibility for study participation.

b) A one-time visit to the laboratory (located in McGill University Currie Gymnasium). During this lab visit,

I) A researcher will weigh you using a portable scale and take your height

II) You will be asked to perform a 6 minute walk test, where you will walk as quickly as possible for six minutes to cover as much ground as possible. This information will be used to calculate your fitness level

III) A researcher will ask you to fill out a survey pertaining to exercise and demographics

IV) After a period of rest you will then be asked to walk or jog on a treadmill at a self-selected pace for up to 15 minutes. During this time, you will wear a heart rate monitor and an accelerometer (a small device that records the number of steps you take while exercising on the treadmill).

c) Your visit should take approximately 1.5 hours

Benefits and Risks to Participants

During the main study protocol (fitness test on the treadmill and running at self-selected pace on the treadmill) there exists a minimal risk of breathing discomfort, leg muscle fatigue and falling. Every effort will be made to minimize that risk through preliminary testing and observation during testing. Trained personnel, including an on-site physician, will be available to deal with these situations should they arise. Every effort to prevent injury that could result from your participation in this study will be taken by the investigators and study personnel.

You will be compensated $20 for your time

Confidentiality

Information gathered during the questionnaire assessment, fitness test, and exercise on the treadmill will be used for research purposes only, and the identity of individual participants will not be revealed at any time. Results from this study will be used only in the preparation of academic research publications and presentations, and in partial fulfillment of a Master's thesis. No persons other than the primary researcher and academic supervisor will have access to the completed questionnaires, exercise data, or any other supporting documentation, which will be securely stored for a minimum of five years as required by McGill University. After this time, the principal investigator will destroy all related study documents.

Participant Concerns:

- You are under no obligation to participate in this study. Also, you will be advised of any new information that may influence your decision to participate in the study,
- You are free to withdraw from this study at any time with absolutely no penalty,
- You may refuse to respond to any item(s) on the survey,
- You do not waive any legal rights by signing this consent form.
- There are no known conflicts of interest on the part of the researchers or McGill University

Contact information about the rights of research subjects:

If you have any concerns about the treatment or rights of research participants, you may contact the Research Ethics Officer for Human Subjects at (514) 398-6831.

Contact information about the study:

If you have any questions concerning the procedures of this study or desire further information please contact Tanya Scarapicchia at telephone: (514) 398-4184 ext. 0481, or email: tanya.scarapicchia@mail.mcgill.ca

Consent:

Your signature below indicates that

- you have been informed of the objectives and procedures of this research study, as outlined above
- you have a copy of this consent form for your records
- you are 18 years of age or older and consent to participate in this project, as outlined above.

I have read the above information and I agree to participate in this study

Signature: _____ Researcher's signature: _____

Name: _____ Date: _____

Appendix C: PAR-Q

PAR Q & YOU©

PHYSICAL ACTIVITY READINESS QUESTIONNAIRE

PAR-Q is designed to help you help yourself. Many health benefits are associated with regular exercise. Completing PAR-Q is a sensible first step to take if you are planning to increase the amount of physical activity in your life. For most people, physical activity should not pose any problem or hazard. PAR-Q has been designed to identify the small number of adults for whom physical activity might be inappropriate or those who should have medical advice concerning the type of activity most suitable for them. Common sense is your best guide in answering these few questions. Please read them carefully and check **YES** or **NO** for each question.

YES	NO		
☐	☐	1.	Has your physician ever said you have heart trouble?
☐	☐	2.	Do you frequently have pains in your heart and chest?
☐	☐	3.	Do you often feel faint or have spells of severe dizziness?
☐	☐	4.	Has a physician ever said your blood pressure was too high?
☐	☐	5.	Has your physician ever told you that you have a bone or joint problem such as arthritis that has been aggravated by exercise or might be made worse by exercise?
☐	☐	6.	Is there a good physical reason not mentioned here why you should not follow an activity program even if you wanted to?
☐	☐	7.	Are you over age 65 and not accustomed to vigorous exercise?

IF YOU ANSWERED

YES TO ONE OR MORE QUESTIONS:
If you have not recently done so, consult with your personal physician by telephone or in person **BEFORE** increasing your physical activity or taking a fitness test. Tell him or her what questions you answered YES on PAR-Q, or show your copy.

PROGRAM

After medical evaluation, seek advice from your physician as to your suitability for:
- unrestricted physical activity, probably on a gradually increasing basis.
- restricted or supervised activity to meet your specific needs, at least on an initial basis. Check in your community for special programs or services.

NO TO ALL QUESTIONS:
If you answered PAR-Q accurately, you have reasonable assurance that you are suited for:

- **A GRADUATED EXERCISE PROGRAM**

A gradual increase in proper exercise promotes good fitness development while minimizing or eliminating discomfort.

- **AN EXERCISE TEST** Simple tests of fitness or more complex types may be undertaken if you so desire.

POSTPONE

If you have a temporary minor illness, such as a common cold, vigorous exercise or exercise testing should be postponed.

(Shephard, 1988)

Appendix D: Pre-exercise Questionnaires

Department of Kinesiology and Physical Education
Health behaviour and emotion lab
475 Pine Avenue West
Montreal, Quebec
H2W 1S4
P: (514) 398-4184

Motivation and Exercise Participation in Young Female Adults

We would like your personal responses on the following items. This is NOT a test. There are no right or wrong or good or bad answers. Your answers are very important to us, so please make sure you complete all questions honestly.

Thank you for your support of this research,

Tanya Scarapicchia
M.A. candidate
Exercise and Health Psychology
McGill University

Dr. Catherine Sabiston,
Associate professor
Exercise & Health Psychology
McGill University

Physical Activity

1. During a typical **7-Day period** (a week), how many times on the average do you do the following kinds of exercise for **more than 15 minutes** during your free time. Write in the space provided. Any exercise for more than 15 minutes would be counted as 1.

	# of times in a typical week of 15 minutes or more
a) STRENUOUS EXERCISE **(HEART BEATS RAPIDLY)** (e.g., running, jogging, hockey, football, soccer, squash, basketball, cross country skiing, judo, roller skating, vigorous swimming, vigorous long distance bicycling)	_____
b) MODERATE EXERCISE **(NOT EXHAUSTING)** (e.g., fast walking, baseball, tennis, easy bicycling, volleyball, badminton, easy swimming, alpine skiing popular and folk dancing)	_____
c) MILD EXERCISE **(MINIMAL EFFORT)** (e.g., yoga, archery, fishing from river bank, bowling, horseshoes, golf, snow-mobiling, easy walking)	_____

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

☐ OFTEN
☐SOMETIMES
☐NEVER/RARELY

3. Over the **past 7 days**, on how many days were you physically active where you were breathing hard and sweating for a total of at least **30 minutes** per day? (Circle the number of days)

0 1 2 3 4 5 6 7

4. Over a typical or usual week, on how many days are you physically active where you were breathing hard and sweating for a total of at least 30 minutes per day? (Circle the number of days)

0 1 2 3 4 5 6 7

Profile of Mood States –Short Form

Below is a list of words that describe feelings people have. Please read each one carefully. Then circle ONE answer to the right, which best describes **how you are feeling right now.**

	Not at all	**A little**	**Moderately**	**Quite a bit**	**Extremely**
Tense	0	1	1	3	4
Angry	0	1	1	3	4
Worn out	0	1	1	3	4
Unhappy	0	1	1	3	4
Lively	0	1	1	3	4
Confused	0	1	1	3	4
Peeved (mad)	0	1	1	3	4
Sad	0	1	1	3	4
Active	0	1	1	3	4
On Edge	0	1	1	3	4
Grouchy	0	1	1	3	4
Blue	0	1	1	3	4
Energetic	0	1	1	3	4

Hopeless	0	1	1	3	4
Uneasy	0	1	1	3	4
Restless	0	1	1	3	4
Unable to Concentrate	0	1	1	3	4
Fatigued	0	1	1	3	4
Annoyed	0	1	1	3	4
Discouraged	0	1	1	3	4
Resentful	0	1	1	3	4
Nervous	0	1	1	3	4
Miserable	0	1	1	3	4
Cheerful	0	1	1	3	4
Bitter	0	1	1	3	4
Exhausted	0	1	1	3	4
Anxious	0	1	1	3	4
Helpless	0	1	1	3	4
Weary	0	1	1	3	4
Bewildered	0	1	1	3	4

(confused)					
Furious	0	1	1	3	4
Full of pep	0	1	1	3	4
Worthless	0	1	1	3	4
Forgetful	0	1	1	3	4
Vigorous	0	1	1	3	4
Uncertain about things	0	1	1	3	4
Bushed (tired)	0	1	1	3	4

Exercise Regulations Questionnaire (BREQ-2)

Using the scale below, please indicate to what extent each of the following items is true for you. Please note that there are no right or wrong answers and no trick questions. We simply want to know how you personally feel about exercise. Your responses will be held in confidence and only used for our research purposes.

	Not true for me		**Sometimes true for me**		**Very true for me**
I exercise because other people say I should	0	1	2	3	4
I feel guilty when I don't exercise	0	1	2	3	4
I value the benefits of exercise	0	1	2	3	4
I exercise because it's fun	0	1	2	3	4
I don't see why I should have to exercise	0	1	2	3	4
I take part in exercise because my friends/family/partner say I should	0	1	2	3	4
I feel ashamed when I miss an exercise session	0	1	2	3	4
I consider exercise to be part of my identity	0	1	2	3	4
It's important to me to exercise regularly	0	1	2	3	4
I can't see why I should bother exercising	0	1	2	3	4
I exercise because it is consistent with goals	0	1	2	3	4

I enjoy my exercise sessions	0	1	2	3	4
I exercise because others will not pleased with me if I don't	0	1	2	3	4
I don't see the point in exercising	0	1	2	3	4
I feel like a failure when I haven't exercised in a while	0	1	2	3	4
I think it is important to make the effort to exercise regularly	0	1	2	3	4
I find exercise a pleasurable activity	0	1	2	3	4
I feel under pressure from my friends/family to exercise	0	1	2	3	4
I get restless if I don't exercise regularly	0	1	2	3	4
I get pleasure and satisfaction from participating in exercise	0	1	2	3	4
I consider exercise a fundamental part of who I am	0	1	2	3	4
I think exercising is a waste of time	0	1	2	3	4
I consider exercise consistent with my values	0	1	2	3	4

Self –Conscious Emotions Scale

The following are some statements which may or may not describe how you are feeling right now. Please rate each statement using the 5-point scale below. Remember to rate each statement based on how you are feeling **right at this moment.**

	Not feeling this way at all		Feeling this way somewhat		Feeling this way very strongly
I feel good about myself	1	2	3	4	5
I want to sink into the floor and disappear	1	2	3	4	5
I feel remorse, regret	1	2	3	4	5
I feel worthwhile, valuable	1	2	3	4	5
I feel small	1	2	3	4	5
I feel tension about something I have done	1	2	3	4	5
I feel capable, useful	1	2	3	4	5
I feel like I am a bad person	1	2	3	4	5
I cannot stop thinking about something bad I have done	1	2	3	4	5
I feel proud	1	2	3	4	5

I feel humiliated, disgraced	1	2	3	4	5
I feel like apologizing, confessing	1	2	3	4	5
I feel pleased about something I have done	1	2	3	4	5
I feel worthless, powerless	1	2	3	4	5
I feel bad about something I have done	1	2	3	4	5

Appendix E: Post-exercise Questionnaires

Profile of Mood States –Short Form

Below is a list of words that describe feelings people have. Please read each one carefully. Then circle ONE answer to the right, which best describes **how you are feeling right now.**

	Not at all	**A little**	**Moderately**	**Quite a bit**	**Extremely**
Tense	0	1	1	3	4
Angry	0	1	1	3	4
Worn out	0	1	1	3	4
Unhappy	0	1	1	3	4
Lively	0	1	1	3	4
Confused	0	1	1	3	4
Peeved (mad)	0	1	1	3	4
Sad	0	1	1	3	4
Active	0	1	1	3	4
On Edge	0	1	1	3	4
Grouchy	0	1	1	3	4
Blue	0	1	1	3	4
Energetic	0	1	1	3	4

Hopeless	0	1	1	3	4
Uneasy	0	1	1	3	4
Restless	0	1	1	3	4
Unable to Concentrate	0	1	1	3	4
Fatigued	0	1	1	3	4
Annoyed	0	1	1	3	4
Discouraged	0	1	1	3	4
Resentful	0	1	1	3	4
Nervous	0	1	1	3	4
Miserable	0	1	1	3	4
Cheerful	0	1	1	3	4
Bitter	0	1	1	3	4
Exhausted	0	1	1	3	4
Anxious	0	1	1	3	4
Helpless	0	1	1	3	4
Weary	0	1	1	3	4
Bewildered	0	1	1	3	4

(confused)					
Furious	0	1	1	3	4
Full of pep	0	1	1	3	4
Worthless	0	1	1	3	4
Forgetful	0	1	1	3	4
Vigorous	0	1	1	3	4
Uncertain about things	0	1	1	3	4
Bushed (tired)	0	1	1	3	4

Self –Conscious Emotions Scale

The following are some statements which may or may not describe how you are feeling right now. Please rate each statement using the 5-point scale below. Remember to rate each statement based on how you are feeling **right at this moment.**

	Not feeling this way at all		**Feeling this way somewhat**		**Feeling this way very strongly**
I feel good about myself	1	2	3	4	5
I want to sink into the floor and disappear	1	2	3	4	5
I feel remorse, regret	1	2	3	4	5
I feel worthwhile, valuable	1	2	3	4	5
I feel small	1	2	3	4	5
I feel tension about something I have done	1	2	3	4	5
I feel capable, useful	1	2	3	4	5
I feel like I am a bad person	1	2	3	4	5
I cannot stop thinking about something bad I have done	1	2	3	4	5
I feel proud	1	2	3	4	5

I feel humiliated, disgraced	1	2	3	4	5
I feel like apologizing, confessing	1	2	3	4	5
I feel pleased about something I have done	1	2	3	4	5
I feel worthless, powerless	1	2	3	4	5
I feel bad about something I have done	1	2	3	4	5

The Post- Experimental Intrinsic Motivation Inventory

For each of the following statements, please indicate how true it is for you when referring to your exercise partner during the study

	Not at all true			**Somewhat true**			**Very true**
I felt really distant to this person.	1	2	3	4	5	6	7
I really doubt that this person and I would ever be friends	1	2	3	4	5	6	7
I felt like I could really trust this person.	1	2	3	4	5	6	7
I'd like a chance to interact with this person more often.	1	2	3	4	5	6	7
I'd really prefer not to interact with this person in the future.	1	2	3	4	5	6	7

Respond to each of the following questions while thinking about your exercise session

	Not at all true			**Somewhat true**			**Very true**
I did not feel nervous at all while doing this activity	1	2	3	4	5	6	7
This activity was	1	2	3	4	5	6	7

fun to do							
I felt very tense while doing this activity	1	2	3	4	5	6	7
I was very relaxed in doing this activity	1	2	3	4	5	6	7
I was anxious while doing this activity	1	2	3	4	5	6	7
I enjoyed doing this activity very much	1	2	3	4	5	6	7
I felt pressured while doing this activity	1	2	3	4	5	6	7
I thought this was a boring activity	1	2	3	4	5	6	7
This activity did not hold my attention at all	1	2	3	4	5	6	7
I would describe this activity as very interesting	1	2	3	4	5	6	7
I am satisfied with my performance at this task	1	2	3	4	5	6	7
I thought this activity was quite enjoyable	1	2	3	4	5	6	7
While I was doing this activity, I was thinking about	1	2	3	4	5	6	7

how much I enjoyed it							
After working at this activity for a while, I felt pretty competent	1	2	3	4	5	6	
I didn't put much energy into this	1	2	3	4	5	6	7
I think I am pretty good at this activity	1	2	3	4	5	6	7
I think I did pretty well at this activity, compared to other students	1	2	3	4	5	6	7
I didn't try very hard to do well at this activity	1	2	3	4	5	6	7
I was pretty skilled at this activity	1	2	3	4	5	6	7
This was an activity that I couldn't do very well	1	2	3	4	5	6	7
It was important to me to do well at this task	1	2	3	4	5	6	7
I put a lot of effort into this	1	2	3	4	5	6	7
I tried very hard on this activity	1	2	3	4	5	6	7

Funnel Debrief

What do you believe was the purpose of the study?

_____

_____

_____

_____

_____

_____

How did you feel while participating in the study? Explain.

_____

_____

_____

_____

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Appendix F: Recruitment Poster

Dr. Catherine Sabiston
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Montreal, Quebec
H2W 1S4

Motivation and Exercise Participation in Young Female Adults

We are looking for women to participate in a study examining exercise participation among young adults.

You may be eligible to participate in the study of you are:

- Female
- 18 – 30 years old
- Have a Body Mass Index (BMI) between 18.5- 24.9 (healthy weight)
- Exercise less than 3 times a week for 30 minutes a day
- Healthy

If you are interested in participating, you will be asked to complete questionnaires, complete a sub maximal exercise test, wear a heart rate monitor and accelometer and run on a treadmill for 15 to 20 minutes. You will be asked to come to the laboratory at McGill once for 1.5 hours. You will be compensated $20 for your time.

If you are interested in participating in this study, please contact Tanya Scarapicchia (tanya.scarapicchia@mail.mcgill.ca)

Appendix G: Script Used During Procedure by Confederate

Extrinsically focused confederate statement

"I don't like to exercise; I am just here because we are being compensated $20"- statement will be said 3 minutes after the start of the exercise session

"If I were to exercise more often I would do so only to look better, I really don't like this"- statement will be said after 6 minutes from the start of the exercise session

Intrinsically focused confederate statement

"I love exercising, I signed up for this study because I find running so enjoyable, I wish I had more time to do it''- statement will be said 3 minutes after the start of the exercise session

"I am really enjoying this exercise"- statement will be said after 6 minutes from the start of the exercise session

Appendix H: Post Experiment Debriefing Script

Note

The post experiment debriefing script will be said to the participants after the funnel debriefing. This script will describe to the participants that an element of deception was used and why, the true purpose of the study and our hypothesis.

The experiment you just participated in contained and element of deception so that we (the investigators) are able to investigate an individual's true exercise behaviours when exercising with someone else who is providing either intrinsically or extrinsically focused statements. The true purpose of the study was therefore to determine if an individual's motivation is affected by exercising with another individual using the theoretical framework of social contagion as well as to determine what effects this may have on the participants' effort, duration and the intensity of exercise. Your potential changes in motivation levels (i.e. from the questionnaire) will be one way to illustrate the social contagion effects. Based on self-determination and social contagion theories, we hypothesize that participants who exercise with the confederate saying intrinsically-motivated statements will expend more energy, and push themselves harder compared to individuals who exercise with the confederate saying extrinsically-motivated statements. These individuals will also report greater increases in their intrinsic motivation and lower levels of extrinsic motivation. Now that you are aware of the true nature of study you can choose to withdraw if you no longer wish to be part of this study or sign if you still agree to have your data included in the study.

Appendix I: 6 Minute Walk Test Protocol

Purpose: This test measures aerobic fitness

Equipment required: measuring tape to mark out the track distances, stopwatch, chairs positioned for resting.

Procedure: The walking course is laid out in a 50 yard (45.72m) rectangular area (dimensions 45 x 5 yards), with cones placed at regular intervals to indicate distance walked. The aim of this test is to walk as quickly as possible for six minutes to cover as much ground as possible. Subjects are set their own pace (a preliminary trail is useful to practice pacing), and are able to stop for a rest if they desire.

Appendix J: RPE Scale

Rating of Perceived Exertion (RPE)	
6	No exertion at all
7	
	Extremely light
8	
9	Very light
10	
11	Light
12	
13	Somewhat hard
14	
15	Hard (heavy)
16	
17	Vey hard
18	
19	Extremely hard
20	Maximal exertion

(Borg, 1982)