Comparing motives, goals and weight training behaviours of competitive and recreational weight trainers: An application of organismic integration theory and goal contents theory

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Abstract

The study purpose was to examine differences between competitive and recreational weight trainers on indices of motivation, goals and behaviour. Data was collected from a purposive sample of competitive (n = 177; M_{age} = 30.86; SD_{age} = 11.35) and recreational (n = 196; M_{age} = 21.97; SD_{age} = 6.05) weight trainers using a cross-sectional, non-experimental design. Participants completed the Behavioural Regulation in Exercise Questionnaire-2R, Exercise Motivations Inventory-2, assessment of weight training behaviour and demographic questions. Multivariate analyses of variance indicated higher endorsement of autonomous motives and mostly intrinsically-oriented goals, while independent samples t-tests indicated higher frequency of weight training behaviour among the competitive weight trainers. Group differences were independent of demographic factors. Findings suggest that autonomous motives and intrinsic goals may not be undermined by competition among competitive weight trainers. This study also provides support for the utility of organismic integration theory and goal contents theory in examining strength-based exercise.

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Comparing motives, goals and weight training behaviours of competitive and recreational weight trainers: An application of organismic integration theory and goal contents theory

There is a wealth of literature to support the numerous health benefits of leisure-time physical activity (LTPA). Warburton, Nicol and Bredin (2006a) outline many of these health benefits including the reduced risk of various cancers, cardiovascular disease, diabetes and osteoporosis. Benefits to psychological health such as reduced symptoms of depression and anxiety, as well as increased well-being are all documented outcomes of LTPA and health-enhancing physical activity (HEPA; Conn, 2010; Mack et al., 2012). Additionally, physical inactivity has been associated with an increased risk of premature mortality when compared with individuals living more physically active lives (Katzmarzyk, Janssen, & Ardern, 2003).

In an attempt to promote these health benefits, recommendations for LTPA in healthy adults have been outlined within the Canadian Physical Activity Guidelines (Canadian Society of Exercise Physiology [CSEP], 2012). A minimum of 150 minutes of moderate-to-vigorous-intensity LTPA over the course of a week is recommended for healthy adults aged 18 to 64 years as the criteria for achieving health benefits (CSEP, 2012). Health promoting guidelines targeting LTPA for the early years (i.e., 0-4 years of age), children (i.e., 5-11 years of age), youth (i.e., 12-17 years of age) and older adults (i.e., 65 years of age and older) have also been forthcoming (CSEP, 2012). Additional LTPA guidelines have been developed for populations living with a disability such as adults with spinal cord injury (SCI Action Canada, 2011).

Exercise and sport are two subsets of LTPA that can promote health outcomes (Bouchard, Blair, & Haskell, 2012). Exercise involves repetitive bodily movements

aimed to achieve a specific goal (e.g., to improve muscular strength), while sport is a form of physical activity involving competition using a defined set of rules (e.g., a tennis match; Bouchard et al., 2012). Strength-based activities such as weight training can then be categorized within the framework of exercise due to the repetitive nature and specific goal of this activity (Bouchard et al., 2012). Additionally, strength-based activities (e.g. powerlifting or weightlifting) can be defined as sport when performed in competition under a standardized set of rules (Bouchard et al., 2012). Current research has outlined the importance of strength-based activities as a component of a healthy lifestyle contributing to factors such as the maintenance of functional independence, musculoskeletal health, and improved quality of life (Warburton et al., 2006a). Further, strength-based exercise is also commonly used by athletes to improve sports performance (e.g., weight training by football players; Ratamess, 2012). General recommendations for health promotion from different sources indicate a minimum of two to three days per week (Garber et al., 2011) and two to four days per week (Warburton, Nicol, & Bredin, 2006b) of resistance training as a form of strength-based exercise to target each of the major muscle groups in the body. Similarly, the Canadian Physical Activity Guidelines (CSEP, 2012) recommend strength-based activities be performed at least three days per week for children and youth, and two days per week for healthy adults and older adults to promote muscle and bone health.

Resistance training is typically the mode of exercise used by individuals engaging in strength-based exercise (Ratamess, 2012). Behm, Faigenbaum, Falk and Klentrou (2008) define resistance training as "a specialized method of conditioning that involves the progressive use of a wide range of resistive loads, including body mass, and a variety

of training modalities designed to enhance health, fitness, and sports performance" (p.548). Although resistance training and weight training are often used synonymously, Behm et al. stress that these terms should not be used interchangeably. While resistance training refers to variety of training modalities, weight training is a specific mode of exercise within this broader framework, involving the use of weights external to the body (e.g., barbells, dumbbells) for the purpose of improving bodily function, fitness level, appearance, or sports performance (Baechle & Groves, 1998; Behm et al., 2008; Macchia, 1985). Many competitive sports (e.g., football, hockey) require weight training for an athlete to be successful, especially competitive forms of resistance training such as bodybuilding, weightlifting, and powerlifting (Ratamess, 2012). Weightlifting and powerlifting are performance-based sports reliant in part on physical strength, where the success of an athlete is dependent upon the amount of weight lifted relative to their respective weight class. Weightlifting involves the sum of weight lifted in two specific movements, the snatch and the clean and jerk, while powerlifting requires the sum of weight lifted in three specific movements, the squat, bench press, and deadlift (Ratamess, 2012). Although both weightlifting (International Weightlifting Federation, IWF) and powerlifting (International Powerlifting Association, IPA) have official governing bodies, weightlifting is the only competitive sport of this nature to be included in the Olympic Games (Ratamess, 2012).

Despite the recommended guidelines and known health benefits of strength-based exercise, data reported from the Canadian Community Health Survey (CCHS; 2000-2001) revealed low participation rates in weight training behaviour over a three month period prior to data collection (Statistics Canada, 2000). The CCHS is a cross-sectional

research initiative aimed toward collecting health information from youth (i.e., 12-19 years of age) and adult (i.e., over 20 years of age) populations across Canada (Beland, 2002; Statistics Canada, 2000). During the 2000-2001 period, only 11 percent of adults and 25 percent of youth participants reported engaging in regular weight training behaviour. For both youth and adult samples, males reported significantly higher weight training behaviour than females (Statistics Canada, 2000). Additionally, trends in the data demonstrated an inverse relationship between weight training behaviour and age, with the highest popularity of weight training among older youth (i.e., aged 15-19 years) and young adults (i.e., aged 20-24 years). A steady decline in weight training behaviour was noted as age increased, with seniors (i.e., 65 years of age and older) reporting the lowest amount of weight training behaviour (Statistics Canada, 2000).

Mack, Wilson, Lightheart, Oster and Gunnell (2009) reported comparable trends in a study of American university students. Mack et al. examined trends in physical activity behaviour among this cohort (i.e., M_{age} = 22.07 years) and reported that participation in strength-based exercise at a level commensurate with health-promoting guidelines improved minimally over a four year period. Despite this, participants reported higher frequency of strength-based exercise than age-matched individuals. However, Mack et al. posit that this could be a function of accessibility to fitness facilities on university campuses compared with individuals in the community. Furthermore, Mack et al. provide evidence for improvements in strength-based exercise when information regarding the benefits of such behaviour is made available to the target population. Considering the importance of strength-based exercises to health promotion (Warburton et al., 2006a; 2006b) and the low adherence levels to weight training (e.g., Mack et al.,

2009; Statistics Canada, 2000) it is necessary to understand factors that impact participation and adherence to different forms of strength-based exercise in order to further promote such behaviours. Understanding the factors that influence health behaviours such as strength-based exercise and weight training can be difficult without the use of a relevant theory to inform the research (Crosby, Kegler, & DiClemente, 2002).

Crosby et al. (2002) outline the importance of theories for health research in providing a framework to guide research. Stated differently, a theory is a structured and scientific examination of a research question (Crosby et al., 2002; Glanz & Bishop, 2010). Furthermore, a theory can predict and describe the factors that regulate human behaviours and the processes (psychological or otherwise) underlying these behaviours (Rothman, 2004). The importance of having a theory to guide research questions and hypotheses stems from the ability to predict outcomes and relationships within research (Glanz & Rimer, 1995). A theory should also predict important variables and the interactions of those variables as they relate to behaviours within different populations (Noar & Zimmerman, 2005). Theories are advantageous as they can be tested in different health contexts, which provide a greater level of confidence in the interpretations of research findings (Van Ryn & Heaney, 1992). Theories also have an important role in conceptualizing the psychological processes underlying behaviours (e.g., motives and goals) and provide a framework to explain the influence of these processes on behavioural outcomes (Rothman, 2004). Additionally, Rimer (2002) advocates the utility of combining different theories in order to provide a more robust understanding of the interactions between different variables (e.g., motives, goals and behaviours). Therefore,

a theory can be used to advance the understanding of motives, goals and behaviours underlying strength-based exercise. One theory that has demonstrated utility for studying these psychological constructs as well as exercise behaviour is self-determination theory (SDT; Deci & Ryan, 2002).

Self-Determination Theory: A macro-level approach

SDT is an organismic approach to studying human motivation and personality (Deci & Ryan, 1985). As a macro-level approach, SDT represents a formal theory for structuring motivational research (Deci & Ryan, 1985; Deci & Ryan, 2000). SDT is comprised of the following five mini-theories (Deci & Ryan, 2000): cognitive evaluation theory (CET), organismic integration theory (OIT), causality orientations theory (COT), basic psychological needs theory (BPNT) and goal contents theory (GCT; Vansteenkiste, Niemiec, & Soenens, 2010). The present study was grounded in OIT and GCT. OIT is a subtheory of SDT that deals with intrinsic motivation, extrinsic motivation and amotivation (Deci & Ryan, 1985). Motivation refers to the 'why' of behaviour or the reasons for conducting certain behaviours (Deci & Ryan, 2000; Ingledew & Markland, 2008). Within OIT, motivation is distributed along a self-determination continuum where each form of motivation is classified with respect to the amount of autonomy or control regulating the motive (Deci & Ryan, 2000; Ryan & Deci, 2000). An autonomous motive is denoted by the perception that one regulates and voluntary performs one's behaviours (deCharms, 1968), whereas a motive is said to be controlling when one perceives one's behaviours to be regulated by external forces or pressures (Deci & Ryan, 2000). There are three main constructs situated on the self-determination continuum within OIT (Deci & Ryan, 2000): (a) Amotivation, (b) Extrinsic motivation, and (c) Intrinsic motivation.

Amotivation is a lack of motivation referring to the absence of intention to perform a task (Deci & Ryan, 2000; Ryan & Deci, 2000).[1] Unlike amotivation, extrinsic motivations vary in their degree of autonomous/controlled regulation and are further delineated into four different forms of regulation within OIT: (a) External regulation, (b) Introjected regulation, (c) Identified regulation, and (d) Integrated regulation (Deci & Ryan, 2000). The most controlling and least self-determined form of extrinsic motivation is external regulation. External regulation refers to behaviours that are regulated by outside rewards or demands (Deci & Ryan, 2000; Ryan & Deci, 2000). Similar to external regulation, introjected regulation refers to behaviours that are regulated by external contingencies; however, these contingencies are self-imposed by the individual themselves in the form of pressures or demands (Deci & Ryan, 2000; Ryan & Deci, 2000). A more self-determined and autonomous form of extrinsic motivation is identified regulation, whereby one is able to identify with the value of a particular behaviour, and carry out such behaviour voluntarily, but there is still an underlying instrumental benefit to participation (Deci & Ryan, 2000; Ryan & Deci, 2000). The most autonomous form of extrinsic motivation is integrated regulation. Integrated regulation occurs when one voluntarily performs and values the importance of a behaviour insofar as the activity itself is aligned with other components of one's identity (Deci & Ryan, 2000; Ryan & Deci, 2000). The final construct along the self-determination continuum of motivation within OIT is intrinsic motivation (Deci & Ryan, 2000). Intrinsic motivation is the most autonomous and self-determined form of motivation posited within OIT (Deci & Ryan, 1985; 2000). Intrinsic motivation involves behaviours that are regulated for reasons such as self-satisfaction and personal enjoyment (Deci & Ryan, 2000; Ryan & Deci, 2000).

Table 1 presents an example of each form of motivation proposed within OIT that was examined in this study.

GCT, another subtheory of SDT, deals with goals and their influence on motivated behaviour and well-being (Deci & Ryan, 2000). Goals represent the 'what' or the desired outcome sought from participation in a behaviour (Deci & Ryan, 2002; Ingledew & Markland, 2008). Unlike autonomous and controlled motives in OIT (Deci & Ryan, 2000; Ryan & Deci, 2000), goals are differentiated within GCT as either: (a) Intrinsic goals or (b) Extrinsic goals (Ryan & Deci, 2000). An intrinsic goal is one that satisfies the basic psychological needs of competence, autonomy and relatedness (Ryan & Deci, 2000; Vansteenkiste, Lens, & Deci, 2006). A goal that does not satisfy these basic psychological needs and is oriented toward external sources of recognition and worth represents an extrinsic goal (Ryan & Deci, 2000; Vansteenkiste et al., 2006). Sheldon and Kasser (1995) note that intrinsic goals are positively associated with autonomous motives while extrinsic goals display positive links with more controlled forms of motivation toward behaviour. Table 2 contains examples of the goal contents that conceptually represent intrinsic and extrinsic goals aligned with GCT that were assessed in this study.

Self-Determination Theory and Exercise Behaviour: A brief synopsis

SDT has been applied to scientific research across numerous domains (Ryan, 1995), including exercise (Wilson, Mack, & Grattan, 2008). Through the application of this theory in these domains, support for the use of SDT to examine and explain different aspects of human motivation and behaviour has been forthcoming (Ryan, 1995). Ryan (1995) emphasizes the importance of continuing to test theories in order to explore their

merit and suitability. More specifically, Ryan (1995) advocates testing theories in different contexts or situations for various behaviours (e.g., strength-based exercise) to examine the robust nature of major arguments or tenets embedded within a theory such as SDT.

Wilson et al. (2008) outline the evolution of SDT research from solely focusing on intrinsic motivation, to developing a broader framework that includes the five mini-theories that examine multiple factors that regulate behaviour. The findings of research grounded in SDT exemplify the important role of this theory in regards to exercise behaviour. Specifically, SDT research using CET first established a relationship between the basic psychological needs and intrinsic motivation (Wilson et al., 2008). For example, Markland (1999) found that individuals demonstrating higher perceived competence and autonomy while exercising reported higher levels of intrinsic motivation toward exercise.

Since then SDT research using OIT has demonstrated the importance of extrinsic motivation in understanding and predicting exercise behaviours (Wilson et al., 2008). More specifically, autonomous forms of extrinsic motivation were linked with greater adherence to exercise behaviour, while controlled motives have been demonstrated to have a negative association or no association with exercise behaviour (Teixeira, Carraca, Markland, Silva, & Ryan, 2012). Of the autonomous motives within OIT, identified regulation and intrinsic motivation appear to be the most significant predictors of exercise behaviour with identified regulation associated with initial or short-term exercise behaviour, while intrinsic motivation has been linked to long-term adherence to exercise behaviours (Teixeira et al., 2012). Teixeira et al. (2012) also clearly state that there has

been no documented positive relationship between controlled forms of motivation and exercise behaviour.

Finally, more recent SDT research has examined the role of goals in predicting exercise behaviour (Sebire, Standage, & Vansteenkiste, 2009). There is an abundance of evidence to support a relationship between intrinsic goals and autonomous motives, and between extrinsic goals and controlled motives within GCT (Sebire, Standage, & Vansteenkiste, 2011; Sheldon & Kasser, 1995; Teixeira et al., 2012). As a result of this relationship, goals have an indirect effect on exercise behaviour, such that intrinsic goals have been found to influence exercise behaviour through autonomous motives (Sebire et al., 2011). Sebire et al. (2009) report that intrinsic exercise goals are not only associated with increased exercise behaviour, but also with increased psychological well-being. However, despite the aforementioned relationship between goals and motives, Teixeira et al. (2012) state that goals are strongly influenced by how they are interpreted by each individual, and therefore intrinsic goals do not necessarily lead to autonomous motives toward exercise.

Within SDT, and more specifically OIT/GCT, the majority of the literature has examined general or cardiovascular-based exercise among either diseased patients, healthy adults or university students with very few studies examining (a) known group differences, or (b) applications of SDT to strength-based exercise (Teixeira et al., 2012). Important research examining group differences has been framed around competition, which is an important variable within the SDT literature, shown to influence motivation among sport and exercise participation. Fortier, Vallerand, Briere and Provencher (1995), and Frederick-Recascino and Schuster-Smith (2003) used CET to assess motives for

LTPA between different groups. These studies examined group differences among sport participants (e.g., Fortier et al., 1995) and exercisers (e.g., Frederick-Recascino & Schuster-Smith, 2003). Fortier et al. and Frederick-Recascino and Schuster-Smith hypothesized that individuals in the competitive groups would demonstrate lower levels of intrinsic motivation when compared with the non-competitive groups. Findings by Fortier et al. supported this hypothesis in sport, while the results of Frederick-Recascino and Schuster-Smith's study did not support this hypothesis when comparing competitive cyclists with non-competitive exercisers.

Despite the contradictory findings, both studies present a unique perspective through their analyses of competitive and recreational groups. Fortier et al. (1995) reported that individuals engaged in a competitive sport structure (i.e., intercollegiate athletes) scored lower than those in a recreational sport structure (i.e., intramural athletes) on intrinsic motivation, implying that competition undermines intrinsic motivation. Conversely, Frederick-Recascino and Schuster-Smith (2003) reported that a group of competitive cyclists scored higher on intrinsic motivation than a group of non-competitive exercisers, demonstrating a positive association between intrinsic motivation and competition. A possible explanation presented by Frederick-Recascino and Schuster-Smith is that experienced athletes competing within a sport such as cycling may have internalized the process of participation in competition, thereby interpreting their motivation as intrinsic. Taken together, the results of the aforementioned studies by Fortier et al. and Frederick-Recascino and Schuster-Smith imply that there are conflicting findings with regard to motivational differences between groups of individuals involved in competition. These results demonstrate the need to further investigate group

differences within different modes of exercise (e.g., strength-based exercise) to determine the effect of competition on intrinsic/extrinsic forms of motivation for exercise.

Psychological Theories and Strength-based Exercise Behaviour: How is self-determination theory different?

SDT is not the only theory that could be used to study strength-based exercise behaviours within the exercise psychology literature. The transtheoretical model (TTM; Prochaska, 1984), theory of planned behaviour (TPB; Ajzen, 1985) and social cognitive theory (SCT; Bandura, 1986) are noteworthy examples of theories that have been used extensively in examining different modes of exercise, such as weight training by exercise psychology researchers. Brief descriptions of these theories are presented below, as well as their utility in the exercise psychology literature and an explanation of how each differs from SDT.

The TTM is conceptualized by the process of behaviour change through a number of stages over time (Prochaska, 1984). These stages include, precontemplation, contemplation, preparation, action and maintenance, which are all influenced by self-efficacy, decision making and cognitive process of change (Prochaska, Redding, & Evers, 1997). Initially, TTM was used primarily in the cessation of negative health behaviours (e.g., smoking), but has shown versatility in the promotion of positive health behaviours (e.g., exercise; Burbank, Reibe, Padula, & Nigg, 2002). A specific example of the utility of TTM as applied to weight training is presented through research by Ott et al. (2004), where the authors used TTM to examine adherence to strength-based exercise in a group of female breast cancer survivors at risk for developing osteoporosis. Findings revealed that the female participants maintained high levels of adherence toward

strength-based exercise over a period of six months (action phase) and demonstrated high levels of self-efficacy throughout the study period (Ott et al., 2004).

The TPB focuses on the intentions of an individual to initiate, continue or cease participation in certain behaviours (Ajzen, 1985; 1991). Within this theory, intentions are influenced by attitudes, subjective norms and perceived control towards the behaviour (Ajzen, 1991). The TPB has been used to predict exercise behaviour and adherence pertaining to different modes of exercise, such as adherence to a resistance exercise intervention among prostate cancer survivors (Courneya et al., 2004). Significant findings of research by Courneya et al. (2004) indicated that age, exercise stage of change, and intention were the three independent factors that predicted adherence to the resistance exercise program.

SCT revolves around the central theme of self-efficacy, or the perception of one's ability to successfully perform a task, and how this is influenced by different cognitive processes and social behaviours (Bandura, 1986). Through observation and social interaction, self-efficacy develops and evolves causing an individual to engage in behaviours they believe they can successfully perform or avoid behaviours they believe will result in failure (Bandura, 1986). In the exercise context, SCT has been used to examine the role of incentives on the expectancy outcomes in novice weight trainers (Rodgers & Brawley, 1996). Rodgers and Brawley (1996) found that incentives predicted behavioural intentions independently of self-efficacy and suggest that self-efficacy is an important factor in predicting future intentions once the difficulty of the skill has been determined by the individual.

Despite the utility of the above listed theories, SDT was selected for the present study as it was deemed to be the most appropriate theory to adequately address the research questions. In order to attain a complete understanding of motivation, Vallerand (1997) argues that all three motivational constructs along the self-determination continuum (Deci & Ryan, 2000) must be addressed (i.e., amotivation, extrinsic motivation, and intrinsic motivation) when each construct is relavent to the context examined or the cohort under study. Furthermore, Vallerand, Pelletier and Koestner (2008) state that it is the quality of motivation rather than the quantity that is most important. Within SDT, more specifically OIT, the quality of motivation can be understood through the four extrinsic motives plus intrinsic motivation aligning the self-determination continuum of motivation (Wilson, 2012).

TTM, TPB and SCT address motivation from three unique and different perspectives that do not incorporate the complexity of motivation (or the differentiated quality of behavioural regulation) that is presented within SDT. The TTM lacks a clearly defined motivational construct, while intentions in the TPB and self-efficacy in SCT represent the motivational constructs of these theories. These theories conceptualize motivation in what Vallerand (1997) has termed a ‘binary’ fashion, meaning that motivation is assessed as being either positive (i.e., ‘motivated’) or negative (i.e., ‘unmotivated’) toward the behaviour. Thus, SDT addresses the complexity of motivation by presenting a more encompassing framework to further understand the quality of motivation, or the reasons why an individual engages in a particular behaviour such as strength-based exercise.

Limitations of Previous Research and Justifications for the Present Study

It is important to note that the studies by Fortier et al. (1995) and Frederick-Recascino and Schuster-Smith (2003) are not without limitations. The first limitation pertains to the samples examined in each study. The competitive and non-competitive groups in each study were not comprised of individuals participating in a single mode of sport (i.e., Fortier et al., 1995) or exercise (i.e., Frederick-Recascino & Schuster-Smith, 2003). Fortier et al. recruited participants from four different types of sport (i.e., badminton, basketball, volleyball and soccer), while Frederick-Recascino and Schuster-Smith compared competitive cyclists with non-competitive exercisers (i.e., individuals participating in various modes of exercise ranging from aerobic to strength-based exercise). The use of competitive and non-competitive groups comprised of individuals participating in different modes of sport or exercise in these studies represents a methodological confound in study design that limits the ability to accurately draw comparisons between these groups. The present study attempted to address this limitation by using a sample of individuals performing the same mode of exercise (i.e., weight training) in both the competitive and recreational groups.

The second limitation of the research by Fortier et al. (1995) and Frederick-Recascino and Schuster-Smith (2003) is that both used CET as a framework for their investigations and therefore did not assess the full complement of constructs theorized to impact behaviour based on OIT. Wilson et al. (2008) state that CET primarily functions as a framework for examining behaviour that is intrinsically motivated without regard for the other motivational constructs along the motivation continuum within OIT (Deci & Ryan, 2000). Subsequent research has also shown that self-determined forms of extrinsic

motivation may be particularly important for health behaviours such as exercise promotion (Wilson et al., 2008) and deserve examination alongside intrinsic motivation. Therefore, in order to adequately assess the motivational constructs underlying exercise behaviour, extrinsic forms of motivation must be considered (Wilson et al., 2008). To resolve this limitation, this study was grounded in OIT and assessed all four types of extrinsic motivation in addition to intrinsic motivation.

Thirdly, Fortier et al. (1995) and Frederick-Recascino and Schuster-Smith (2003) only assessed motivation in their research with no measure of goals. Deci and Ryan (2002) outline the importance of understanding goals, or 'what' is being pursued, in addition to motives, or 'why' the individual is pursuing these goals. Additionally, Wilson et al. (2008) advocate that goals provide an important dynamic to further understand motives within different modes of exercise (e.g., strength-based exercise). As such, this study was also grounded in GCT in order to specifically assess intrinsic and extrinsic goals endorsed by individuals engaged in weight training.

The fourth and final limitation is a general lack of replication within SDT research. Schmidt (2009) states that an important aspect of scientific research is the replication of previously conducted studies. Currently, no studies using SDT have attempted to replicate the findings of Fortier et al. (1995) and/or Frederick-Recascino and Schuster-Smith (2003). By means of replication, hypotheses and results can be operationalized outside the parameters of the original study and verified (or refuted) by subsequent research evidence (Schmidt, 2009). Locke, Silverman, and Spirduso (2004) argue that "reliable knowledge…depends on replication" (p.51) and replication provides trust in the results of research. Despite the need for replication there is a general lack of

research replicating previous studies (Locke et al., 2004), especially in the social sciences (Schmidt, 2009). Schmidt also notes that there is a lack of literature addressing the idea of replication and as such proposed two forms of replication: (a) Direct replication, and (b) Conceptual replication. Repeating a study using the same methods and protocol is considered direct replication, while conceptual replication uses different methods to test (and possibly replicate) the hypotheses or findings of previous research (Schmidt, 2009).

This study was mostly aligned with the notion of conceptual replication outlined by Schmidt (2009), as the hypotheses were drawn from existing research but the methods were unique to this study. In other words, this study replicated and extended previous research reported within the SDT literature that preceded the development of OIT and GCT. Building upon SDT and previous literature (e.g., Fortier et al., 1995; Frederick-Recascino & Schuster-Smith, 2003), this study represented an attempt to conduct a conceptual replication (Schmidt, 2009) to advance our understanding of motives and goals related to strength-based exercise participation.

This study examined the hypotheses tested by Fortier et al. (1995) and Frederick-Recascino and Schuster-Smith (2003) using a specific cohort of adults engaged in weight training. Differences in motivation between groups of competitive and non-competitive (recreational) weight trainers represent the conceptual component replicated during this study. As a consequence this study replicated the hypotheses posited in the literature stating that individuals within the group classified as competitive would demonstrate lower levels of intrinsic motivation than individuals in the non-competitive, or recreational, group (e.g., Fortier et al., 1995; Frederick-Recascino & Schuster-Smith, 2003).

However, in line with the idea of conceptual replication, this study differed from that used by Fortier et al. (1995) and Frederick-Recascino and Schuster-Smith (2003) in that the motivational hypothesis was grounded within OIT (Deci & Ryan, 2000), while this study extended the previous research by also assessing the goals of adults engaged in weight training using GCT (Deci & Ryan, 2000) in order to further understand more facets of the psychological differences between two groups of individuals involved in weight training exercise participation. Conceptually, this study replicated the work of Fortier et al. and Frederick-Recascino and Schuster-Smith and extended upon this research to examine a unique cohort.

Study Purpose, Research Questions and Study Hypotheses

The purpose of this study was to examine differences between a group of competitive weight trainers and a group of recreational weight trainers in terms of their behaviour, motivation and goals. The following research questions and corresponding hypotheses (H_n) were developed from previous research and relevant theory (e.g., Deci & Ryan, 2002; Fortier et al., 1995; Frederick-Recascino & Schuster-Smith, 2003; Ryan, 1995; Sheldon & Kasser, 1995; Vansteenkiste et al., 2010):

1. Are there differences in weight training behaviour during a typical week between competitive and recreational weight trainers?
    - H_1: Competitive weight trainers would report a greater number of (a) weight training sessions per week and (b) days per week of weight training compared with the recreational weight trainers. This hypothesis was aligned with the findings of Frederick-Recascino and Schuster-Smith (2003) that demonstrated greater number of days and hours per week of

exercise by the competitive cyclists compared to the non-competitive exercisers.

2. What differences in motivation toward weight training are reported between competitive and recreational weight trainers?
    - H_2: Competitive weight trainers would display a less self-determined motivational profile in comparison to recreational weight trainers. This hypothesis was derived from research by Fortier et al. (1995) demonstrating that athletes within a competitive sport structure showed lower levels of intrinsic motivation than athletes in the recreational sport structure.
3. What differences in weight training goals are reported between competitive and recreational weight trainers?
    - H_3: Competitive weight trainers would endorse more extrinsic weight training goals in comparison to the recreational weight trainers. This hypothesis was derived from the findings of both Sheldon and Kasser (1995), and Sebire et al. (2009) that demonstrated a positive association between less self-determined (controlled) motives and extrinsically-oriented goals.

Methods

Participants

Participants over the age of 17 years were recruited from weightlifting clubs, powerlifting clubs and recreational fitness facilities. An a priori target sample size of 786 participants was determined using a mean differences approach based on a small effect

size (d = .20), fixed power estimate (β = .80) and a conventional alpha level (α = 0.05; Cohen, 1992). The participants were allocated to one of the following groups based upon pre-determined inclusion criteria; competitive weight trainers (n = 393) or recreational weight trainers (n = 393). The relevant inclusion and exclusion criteria for each of the groups at the time of data collection were defined as follows.

Competitive weight trainers (CWT) included participants who (a) weight trained for the purpose of competing in either a weightlifting or powerlifting competition, not a bodybuilding competition, (b) had competed in either a weightlifting or powerlifting competition within the past year and planned to compete again in the forthcoming year, (c) had weight trained for a minimum of three days per week over the past six months, (d) were members of a powerlifting or weightlifting club, and (e) had no ambulatory injuries restricting their ability to weight train at the time of data collection. Bodybuilders were excluded from this study in order to assess competitive forms of performance-based weight training (i.e., maximal strength) as opposed to aesthetically-driven or appearance-based weight trainers.

Recreational weight trainers (RWT) included participants who (a) weight trained for the purpose of maintaining or improving their general health and fitness (i.e., not a weightlifter, powerlifter or bodybuilder), (b) had never participated in weightlifting, powerlifting or bodybuilding competitions within the past year and had no future plans to compete, (c) weight trained for a minimum of three days per week over the past six months, (d) were members of a commercial health or fitness club, and (e) had no ambulatory injuries restricting their ability to weight train at the time of data collection.

General health and fitness was defined as possessing the ability to perform physical tasks (i.e., muscular work) satisfactorily within different environments (Bouchard et al., 2012).

The inclusion criteria for both the CWT and RWT was adapted from various published sources (i.e., CSEP, 2012; Marcus, Selby, Niaura, & Rossi, 1992; Munroe-Chandler, Kim, & Gammage, 2004; Pickett, Lewis, & Cash, 2005; Warburton et al., 2006b). The inclusion criterion requiring a minimum weight training frequency of three days per week over the past six months warrants justification. Despite the fact that the Canadian Physical Activity Guidelines recommends two days per week of strength-based exercise (CSEP, 2012), a minimum weight training frequency of three days per week was determined for this study. The reason for this discrepancy is that the Canadian Physical Activities Guidelines represents the minimum requirement of strength-based exercise to achieve health benefits, whereas this study examined groups of individuals actively and consistently participating in weight training for the purpose of competitive sport (i.e., powerlifting or weightlifting) or reasons of health and fitness beyond the minimum requirements of this mode of exercise.

Furthermore, Warburton et al. (2006b) provides another guideline suggesting that two to four days per week of strength-based exercise is necessary for health and fitness. Therefore, three days per week of weight training behaviour was determined as this reflects more than the minimum requirements of strength-based exercise to achieve health benefits, ensuring that individuals in both groups were engaged in frequent weight training as a fundamental component of their exercise routines. Additionally, six months was selected as the minimum timeframe based upon the stages of change in exercise behaviour (Marcus et al., 1992). Marcus et al. (1992) state that six months or more of

exercise behaviour is commensurate with the ‘maintenance phase’ of exercise behaviour change, meaning that the behaviour is sustained. This criterion was utilized to ensure that individuals in both groups have achieved the maintenance phase and were therefore engaged in sustained weight training behaviour.

Instrumentation

Demographics. Descriptive information pertaining to the demographic composition of the groups was obtained through self-report questions such as age, sex, height and weight. For a complete list of the demographic questions used in this study see Appendix A.

Weight training behaviour. Two items were used to assess weight training behaviour during a typical week. The first item was adapted from research by Litt and Dodge (2008), while the second item was adapted from a study by Mack et al. (2009). The first item was phrased as follows to generate open-ended responses: “During a typical week, how many times do you weight train?” while the second item “On how many of the past 7 days have you performed weight training exercises?” was restricted to eight possible responses (i.e. 0-7 days per week). Higher scores on each behaviour item are indicative of greater frequency of weight training behaviour in a week.

Motives for weight training. A modified version of the Behavioural Regulation in Exercise Questionnaire-2R (BREQ-2R; Markland & Tobin, 2004; Wilson, Rodgers, Loitz, & Scime, 2006) was administered to the participants. The original BREQ-2 assesses (a) amotivation, (b) external, (c) introjected, (d) identified and (e) intrinsic motivation toward exercise behaviour using a 19-item scale (Markland & Tobin, 2004). The amotivation subscale (n_{items} = 4) was not included in this research as these items were

not applicable to the target sample (sample original BREQ-2 item, “I think exercising is a waste of time.”). Participants responded using a 5-point Likert scale ranging from 0 (*not true for me*) to 4 (*very true for me*). For the purpose of this research, the wording of the items was modified from the general term “exercise” to “weight training” in accordance with the research question (sample original BREQ-2 item, “I exercise because it is fun.”; sample modified item, “I weight train because it is fun.”; Markland & Tobin, 2004).

Participants also completed a 4-item subscale assessing integrated regulation developed by Wilson et al. (2006) utilizing the same 5-point Likert scale as the BREQ-2 (sample original item, “I exercise because it is consistent with my life goals.”; sample modified item, “I weight train because it is consistent with my life goals.”). See Appendix A for the complete modified BREQ-2R including the integrated regulation subscale used in this study. Evidence of construct validity has been presented in previous research using the BREQ-2 (Markland & Tobin, 2004; Wilson & Rodgers, 2004) supporting a simplex relationship with strong positive correlations between subscales representing adjacent motivational constructs along the self-determination continuum, consistent with OIT and SDT. Furthermore, previous research has reported internal consistency score reliability ranging from 0.73 to 0.86 (Markland & Tobin, 2004) for the BREQ-2 subscales and 0.83 to 0.93 with the inclusion of the integrated regulation items (Wilson et al., 2006). Higher scores on the modified BREQ-2R items reflect greater endorsement of each type of motivation assessed with this instrument.

Weight training goals. A modified version of the Exercise Motivations Inventory-2 (EMI-2; Markland & Ingledew, 1997) was used to assess participant goals associated with weight training. The current study included the items from the enjoyment,

challenge, competition, strength and endurance, weight management, appearance, and muscular development subscales (Loze & Collins, 1998; Markland & Ingledew, 1997). Using a 6-point Likert scale, participants were asked to select the most appropriate response to each item ranging from 0 (*not at all true for me*) to 5 (*very true for me*). The items were modified from "exercise" to read "weight training" for the purpose of this study (sample original item, "Personally, I exercise because I find exercise satisfying in and of itself."; sample modified item, "Personally, I weight train because I find weight training satisfying in and of itself."; Markland & Ingledew, 1997). Appendix A contains the complete modified EMI-2 that was used in this study. Previous research using the EMI-2 has been validated using different populations (e.g., across gender) within SDT with internal consistency score reliability estimates ranging from 0.69 to 0.95 having been previously reported for the EMI-2 subscales (Markland & Ingledew, 1997).[2] Higher scores on the modified EMI-2 items reflect greater endorsement of intrinsic or extrinsic goals for weight training.

Data Collection Procedures

This study utilized a non-experimental, cross-sectional design. Participants were recruited using non-probability, purposive sampling (Trochim, 2006) into either the group of CWT or the group of RWT based on the aforementioned inclusion criteria. In order to facilitate the recruitment process, recruitment posters (see Appendix B), verbal presentations (see Appendix C), and electronic scripts (see Appendix D and Appendix E) were used. The CWT consisted of participants recruited from weightlifting and powerlifting clubs within Southern Ontario, as well as various other locations within Canada and the United States of America (USA). Competitive lifting clubs that were

willing to be involved in the study were asked permission to (a) advertise the study verbally to their members, (b) forward a copy of the electronic script (see Appendix D) to their members and/or (c) display recruitment posters (see Appendix B) in their facilities, or (d) all of the above depending upon the location of the club.

The RWT were recruited from graduate and undergraduate courses at Brock University, and from the surrounding Niagara community. A similar protocol for participant recruitment was used involving recruitment posters (see Appendix B) displayed around the University campus, verbal presentations (see Appendix C) to classes where the course instructor had permitted access, electronic scripts (see Appendix D) distributed via email to Brock University faculty and staff using the publically accessible directory, and internet-based advertising (see Appendix F) of the study using the Brock Portal. Snowball sampling was also used to maximize participant recruitment. This multi-method approach to sampling was adapted from recommendations by Dillman (2007). To further enhance the recruitment process, participant incentives were made available in the form of a prize draw for one of ten $50 (CAD) pre-paid gift cards.

Individuals interested in participating in the study read the letter of invitation (see Appendix G) outlining the intent of the research, issues of confidentially and anonymity, and the requirements of participating on the study website (i.e., http://projectreps.weebly.com/) or before completing the questionnaire package. Prior to completing the study questionnaires (see Appendix A) the participants were first asked to provide informed consent (see Appendix H). Those participants who choose not to provide their consent were redirected away from the study webpage and thanked for their time and consideration of the study.

If consent was granted by the participant, the study questionnaire was completed using a secure website approved by the Brock University Research Ethics Board (i.e., https://www.surveymonkey.com/s/ProjectREPS). Participants were informed through the letter of invitation and informed consent documents that their participation was voluntary and they had the option to withdraw from the study at any time by terminating their completion of the questionnaire (e.g., closing their web browser).

Data Analysis

Preliminary data analysis involved examining the data for missing values and determining if the assumptions of subsequent statistical tests were met. Missing values were replaced using an expectation maximization algorithm in order to produce more realistic estimates of variance (Tabachnick & Fidell, 2001). The following assumptions were tested for the multivariate analyses of variance (MANOVA): (a) independence, (b) absence of outliers, (c) linearity of the dependent variables, (d) univariate normality, and (f) homogeneity of variance-covariance matrices (Tabachnick & Fidell, 2001). Assumptions of, (a) normal distribution, and (b) homogeneity of variance were tested for the independent samples *t*-tests (Pagano, 2007). Cronbach's alpha (Cronbach, 1951) was used as an estimate of score reliability for both weight training motives and goals (Leary, 2008).

The main analysis was conducted using two separate MANOVAs and two separate independent samples *t*-tests. MANOVA was used to examine mean differences among groups on multiple dependent variables (Tabachnick & Fidell, 2001). In this study, group status (i.e., CWT or RWT) was the independent variable, or grouping

variable, for the first and second MANOVA. Mean differences between the grouping variable and the dependent variable of motives for weight training were examined in the first MANOVA. The second MANOVA examined mean differences between the grouping variable and the dependent variable of weight training goals. Independent samples *t*-tests were then used to examine mean differences between the grouping variable and the dependent variable of weight training behaviour. Two respective *t*-tests were used to examine weight training behaviour as reported through each of the separate behaviour items (Litt & Dodge, 2008; Mack et al., 2009).

Results

Preliminary Data Analysis

A total of 468 individuals provided informed consent to participate in this study. Non-responders were defined as those individuals who provided consent but failed to provide responses to any of the demographic items, behaviour items, or the instruments assessing motives and goals toward weight training. All 25 non-responders were removed from the sample. Five cases were removed as current weight training status was not identified (i.e., CWT or RWT) making it impossible to include these cases in the main analyses. Examination of the instruments assessing motives and goals prompted the removal of 29 cases due to the failure to provide any responses to both the BREQ-2R and EMI-2 (n = 27) and for only the EMI-2 (n = 2). Additional cases were removed as a result of not meeting the minimum inclusion criteria according to the first item (n = 27) and second item (n = 9) assessing weight training behaviour. Usable data was determined to include responses from 373 individuals (CWT, n = 177; RWT, n = 196).

Partial responders were defined as those individuals who provided consent and completed the questionnaire package but failed to respond to one or more items in the sample of 373 participants that gave usable data. The sample contained no missing data from partial responders for either of the behaviour items. Some participants (n = 20; 5.36%) provided a range (e.g., 3-4 times) in response to the first behaviour item (i.e., "During a typical week, how many times do you weight train?"). The upper limit of the range was used to replace the reported values as it included the lower limit of the range. Missing data from partial responders was minimal for both the BREQ-2R (1.07%) and the EMI-2 (1.07%). Little's (1988) tests for the BREQ-2R ($\chi^2_{\text{BREQ-2R}} = 502.07$, $df = 283$, $p < .01$) and EMI-2 ($\chi^2_{\text{EMI-2}} = 571.29$, $df = 441$, $p < .01$) revealed that patterns of missing data in this sample could not be considered missing completely at random. An expectation maximization algorithm was then used to replace missing data from those participants classified as partial responders.

Participant Characteristics

The CWT (n = 177; M_{age} = 30.86 years; SD_{age} = 11.35 years) were primarily male (73.40%), either single (48.60%) or in a married/common law relationship (46.90%), university or college educated (46.30%), employed full-time (67.80%) and mostly Caucasian (83.10%). Body Mass Index (BMI) values ranged from 17.85 to 41.35 kg/m^2 (M_{BMI} = 27.43 kg/m^2; SD_{BMI} = 4.38 kg/m^2; M_{height} = 1.73 m; SD_{height} = 0.10 m; M_{weight} = 83.40 kg; SD_{weight} = 19.24 kg). All demographic information for the CWT is reported in Table 3.

The majority of the RWT (n = 196; M_{age} = 21.97 years; SD_{age} = 6.05 years) were male (56.10%), claiming to be single (91.80%), with a high school education (77.0%),

part-time employed (49.00%), and mostly Caucasian (89.30%). BMI spanned a range from 17.94 to 42.97 kg/m^2 (M_{BMI} = 24.54 kg/m^2; SD_{BMI} = 3.51 kg/m^2; M_{height} = 1.74 m; SD_{height} = 0.10 m; M_{weight} = 74.88 kg; SD_{weight} = 14.58 kg). See Table 3 for all demographics information pertaining to the RWT.

Independent samples *t*-tests were used to examine differences between the CWT and RWT across the demographic variables of age, height, weight and BMI. Equality of variances were assessed using Levene's *F* test. Statistical differences between the CWT and RWT were revealed on age (F = 55.25, p < .01; t(370) = 9.56, p < .01, *95% CI* = 7.06 – 10.72, Cohen's d = 0.98), weight (F = 12.86, p < .01; t(370) = 4.84, p < .01, *95% CI* = 5.06 – 11.98, Cohen's d = 0.50) and BMI (F = 9.78, p < .01; t(367) = 7.03, p < .01, *95% CI* = 2.08 – 3.70, Cohen's d = 0.73), but not on height (F = 0.08, p = .78; t(367) = -0.54, p = .59, *95% CI* = -0.03 – .02, Cohen's d = -0.06). Pearson's chi-square analyses were conducted to examine differences between the CWT and RWT on the remaining demographic variables of sex, marital status, level of education, employment status and ethnicity. Marital status, level of education, employment status and ethnicity were each recoded as follows: (a) married/common law vs. not married/not common-law; (b) high school educated vs. university/college educated; (c) part-time/unemployed vs. full-time employed; (d) non-white/non-Caucasian vs. white/Caucasian. Through examination of the chi-square results, significant differences between the CWT and RWT were observed on sex (χ^2 = 84.98, p < .01), marital status (χ^2 = 84.98, p < .01), level of education (χ^2 = 107.33, p < .01) and employment status (χ^2 = 138.06, p < .01). With regard to participant sex, the CWT were composed of more male participants than the RWT (74.3% and 56.4%), while the RWT had a greater proportion of female participants than the CWT

(43.6% and 25.7%). Both the CWT and RWT consisted primarily of participants who reported being not married (52.6% and 94.4%) however the RWT consisted of far less participants who reported being married than the CWT (5.6% and 47.4%). Level of education was contrasted between the groups with 77.4% of the CWT having a university degree, college degree or higher level of education compared with 23.0% of the RWT reporting the same. Full-time employment status constituted 69.0% of the CWT, while only 9.7% of the RWT reported having full-time employment. The CWT and RWT did not differ on ethnicity ($\chi^2 = 2.70$, $p = .10$).

Reliability Analysis: Internal consistency

Reliability coefficients were estimated using Cronbach's coefficient alpha (Cronbach's α; Cronbach, 1951) and are reported in Table 4. For the constructs of the BREQ-2R, Cronbach's α ranged from 0.28 to 0.86 for the CWT ($M_\alpha = 0.67$; $SD_\alpha = 0.22$) and from 0.76 to 0.88 for the RWT ($M_\alpha = 0.82$; $SD_\alpha = 0.05$). Cronbach's α for the constructs of the EMI-2 ranged from 0.46 to 0.89 ($M_\alpha = 0.72$; $SD_\alpha = 0.17$) for the CWT and for the RWT from 0.68 to 0.89 ($M_\alpha = 0.80$; $SD_\alpha = 0.08$). Pearson's bivariate correlations were calculated to examine the association between the two items assessing weight training behaviour for the CWT ($r = .51$, $p < .01$) and the RWT ($r = .72$, $p < .01$).

Problematic items contributing to low Cronbach's α were systematically removed on an item-by-item basis to re-evaluate the score reliability in this sample. A single item from the identified regulation subscale of the BREQ-2R was removed from the CWT (item: "I get restless if I don't weight train regularly"). The standard deviation for the item ($SD = 1.00$) was more than double the size of all standard deviations for the other items in the identified regulation subscale ($SD_{\text{Range}} = 0.25 – 0.30$). The inter-item

correlation matrix revealed that the item had very low correlation with the other items in the subscale (r_{Range} = .02 – .13). Removal of the item increased the reliability estimate for the remaining three items comprising the identified regulation subscale (α = 0.64). Deletion of further items from the identified regulation subscale could not further improve the reliability estimates. Appendix I contains the correlation matrix of all BREQ-2R subscales examined in this study.

Items were also removed from the challenge, strength and endurance, and muscular development subscales of the EMI-2 from the CWT. The first challenge item (item: "Personally, I weight train to develop personal skills") was removed due to a low mean score and large standard deviation (M = 3.57; SD = 1.68) compared with the remaining items in the subscale (M_{Range} = 4.39 – 4.59; SD_{Range} = 0.82 – 1.06). Removal of this item improved the reliability estimate (α = 0.68) however, the removal of an additional item (item: "Personally, I weight train to measure myself against personal standards") further increased the score reliability (α = 0.85) of the challenge subscale items. Similarly, two items were removed from the strength and endurance subscale ($item_1$: "Personally, I weight train to increase my endurance."; $item_2$: "Personally, I weight train to develop my muscles.") due to large standard deviations in the responses (SD_1 = 1.75; SD_2 = 1.10) compared with the other items (SD_{Range} = 0.43 – 0.51). Subsequent improvements in the reliability estimates followed the removal of each item (α = 0.55 to α = 0.85). Lastly, a single item from the muscular development subscale (item: "Personally, I weight train to become strong and powerful.") was removed as the mean of this item (M = 4.80; SD = 0.57) was much larger than the other items in the

subscale (M_{Range} = 2.77 – 3.85; SD_{Range} = 1.29 – 1.80). Following the removal of this item, the score reliability estimate increased (α = 0.70).

Descriptive Statistics

Descriptive statistics for the two items assessing weight training behaviour are presented in Table 5. On average, the CWT reported weight training more than four times during a typical week and on more than five of the past seven days. Variability within these responses spanned over one session and one day respectively. The RWT reported more than four sessions during a typical week and more than four days over the past week of weight training. Variability within these responses spanned over one session during a typical week and one day during the past week. Skewness and kurtosis values for both groups were less than |1.00| for behaviour item 2. On behaviour item 1, there was some departure from normality for the CWT, while the RWT demonstrated a less pronounced departure from normality. To further analyze normality of the data for behaviour item 1 *z*-scores were calculated. Examination of the *z*-scores revealed that one of the CWT had a *z*-score of 10.84 (99.04% of *z*-scores in this subsample for this item were < |3.00|), while three of the RWT had a *z*-score greater than |3.00| standard deviations from the mean (98.50% of *z*-scores in this subsample for this item were < |3.00|). Removal of these cases resulted in data that approximated normality: (a) CWT (*n* = 176; *M* = 4.62; *SD* = 1.34; *Skewness* = 1.54; *Kurtosis* = 4.25); (b) RWT (*n* = 193; *M* = 4.17; *SD* = 1.06; *Skewness* = 0.69; *Kurtosis* = 0.10).

Descriptive statistics for weight training motives are reported in Table 6. On average, the CWT reported higher autonomous motives than controlled motives. There was a similar pattern seen with the RWT although integrated regulation was not as

strongly endorsed. Variability among motives in the CWT and the RWT were similar with the largest standard deviation for both groups occurring on participant responses to the introjected regulation subscale and the smallest on the identified regulation subscale. Four of the five motivational subscales approximated a normal distribution in the (a) CWT ($M_{Skewness}$ = -0.45; $M_{Kurtosis}$ = 0.79); and (b) RWT ($M_{Skewness}$ = -0.02; $M_{Kurtosis}$ = -0.38). However, the CWT scores on the identified regulation subscale departed markedly from normality given the observed skewness and kurtosis values. Through examination of the *z*-scores for the identified regulation subscale for the CWT, five cases with *z*-scores greater than |3.00| standard deviations from the mean were noted (97.20% of *z*-scores in this subsample were < |3.00|). Upon removal of these aberrant cases, the data approximated a more normal distribution (*M* = 3.94; *SD* = 0.16; *Skewness* = -2.71; *Kurtosis* = 6.59).

Descriptive statistics for weight training goals are reported in Table 7. On average, the CWT reported more intrinsically-oriented goals than extrinsic goals, with the exception of the strength and endurance subscale, while the RWT reported slightly higher endorsement of extrinsic goals over intrinsic goals. Both the CWT and RWT were similar with regard to response variability with standard deviations spanning less than two. Skewness and kurtosis values indicated five of the goal subscales approximated a normal distribution for the CWT ($M_{Skewness}$ = -0.91; $M_{Kurtosis}$ = 1.16), while all seven goal subscales for the RWT approximated a normal distribution ($M_{Skewness}$ = -0.84; $M_{Kurtosis}$ = 0.51). The scores for the CWT on the challenge plus strength and endurance subscales departed from normality. Examination of *z*-scores for the CWT revealed that four cases had *z*-scores greater than |3.00| standard deviations from the mean on the challenge

subscale (97.70% of *z*-scores in this subsample were < |3.00|) and six cases greater than |3.00| standard deviations from the mean on the strength and endurance subscale (96.60% of *z*-scores in this subsample were < |3.00|). These cases were removed for both the challenge (*M* = 4.64; *SD* = 0.57; *Skewness* = -1.63; *Kurtosis* = 1.92) and strength and endurance (*M* = 4.90; *SD* = 0.27; *Skewness* = -2.72; *Kurtosis* = 5.99) subscales resulting in data that approximated a more normal distribution for subsequent analyses.

Main Analysis: Weight training behaviour

Statistical assumptions of the *t*-test were examined prior to the main analysis focused on weight training behaviour. First, histograms were used to examine the distribution of the dependent variables. This assumption was not met as the dependent variables did not conform to a normal distribution. However, Gravetter and Wallnau (2000) suggest that analysis may proceed despite failure to meet this assumption if the sample sizes are large enough (e.g., $n > 30$). The second assumption of the *t*-test was homogeneity of variance, which was tested using Levene's Test for equality of variances. This assumption was met for both behaviour item 1 ($F = 3.27$, $p > .05$) and behaviour item 2 ($F = 0.40$, $p > .05$).

Independent samples *t*-tests were used to examine differences between the groups on each of the two separate items assessing weight training behaviour. The CWT and RWT acted as the independent variables with each behaviour item representing the dependent variable for each respective *t*-test. The CWT reported significantly more weight training sessions during a typical week when compared with the RWT ($t(367) = 3.58$, $p < .01$, *95% CI* = 0.20 – 0.69; Cohen's $d = 0.37$). In addition, the CWT reported

significantly more days of weight training over the past seven days when compared with the RWT ($t(371) = 3.85$, $p < .01$, 95% $CI = 0.23 – 0.70$; Cohen's $d = 0.40$).

Main Analysis: Motives for weight training

Prior to analyzing group differences in weight training motives and goals, the statistical assumptions of MANOVA were examined. The following assumptions were either tested or addressed during the design of this research. First, the assumption of independence was met on the basis of study design, whereby a participant indicated their weight training group status (e.g., CWT) which by definition excluded them from the other group (i.e., RWT).

Second, the data was checked for statistical outliers per MANOVA using a criterion of greater than or equal to |3.00| standard deviations from the mean score on any dependent variable. Such cases were removed prior to conducting each MANOVA, meeting the assumption of absence of outliers.

Third, the assumption of linearity among the dependent variables was tested using Bartlett's Test of Sphericity. Linearity between the dependent variables for both weight training motives (Bartlett's chi square = 717.38, $p < .01$) and goals (Bartlett's chi square = 1049.84, $p < .01$) was evident. Therefore, this assumption was met.

The fourth assumption that was tested was univariate normality of the data. Skewness and kurtosis values demonstrated some departure from univariate normality in the data and as such, departure from multivariate normality can be assumed. Despite not meeting these assumptions, Mardia (1971) indicates that robustness to departures from multivariate normality is often reasonable with few dependent variables even when the study uses unequal sample sizes within groups, as long as the smallest group consists of

at least 20 participants. Furthermore, Monte Carlo simulation data indicates that MANOVA can be robust to departures from multivariate normality when the ratio of sample size to groups is at least 4:1 (Seo, Kanda, & Fujikoshi, 1995) which is satisfied in this study.

The final assumption of homogeneity of variance-covariance matrices (i.e., homoscedasticity) was tested using Box's M Test of Equality of Covariance Matrices. This assumption was not met for the MANOVA assessing weight training motives (Box's M = 353.28, $p < .01$) or goals (Box's M = 258.40, $p < .01$), however the results of Box's M Test should be interpreted with caution as this is a sensitive test whereby significant results can occur even when the departures from homoscedasticity between groups are minimal (Hair et al., 2006; Tabachnick & Fidell, 2007). Hair et al. (2006) also noted that a significant Box's M Test is rarely a concern if sample sizes are approximately equal between groups and adhere to the following formula: largest group sample size / smallest group sample size < 1.5. Data for weight training motives (196 / 172 = 1.14) and goals (196 / 168 = 1.17) both adhere to this formula suggesting that MANOVA can be conducted despite failure to meet this assumption.

Differences between the groups on motives for weight training were investigated using MANOVA. For the analysis, the independent variable was group status (CWT or RWT) and the dependent variables were motives (BREQ-2R subscales). Results indicated statistical differences between the CWT and RWT on the combined dependent variables (F (5, 362) = 43.58, $p < .01$, Wilks' Lambda = 0.62, $\eta_p^2 = 0.38$). Statistical differences were found between groups on all motivational subscales (all p's < .01; external, $\eta_p^2 = 0.09$; identified, $\eta_p^2 = 0.34$; integrated, $\eta_p^2 = 0.24$; intrinsic, $\eta_p^2 = 0.18$)

except introjected regulation (F (1, 366) = 2.33, p = .13; η_p^2 = 0.01). The CWT reported greater mean differences than the RWT on identified regulation (M_{CWT} = 3.94; SD_{CWT} = 0.16; M_{RWT} = 3.27; SD_{RWT} = 0.62), integrated regulation (M_{CWT} = 3.56; SD_{CWT} = 0.59; M_{RWT} = 2.66; SD_{RWT} = 0.94), intrinsic motivation (M_{CWT} = 3.80; SD_{CWT} = 0.38; M_{RWT} = 3.27; SD_{RWT} = 0.69), while the RWT reported greater mean scores on external regulation (M_{CWT} = 0.38; SD_{CWT} = 0.56; M_{RWT} = 0.80; SD_{RWT} = 0.76).

Main Analysis: Weight training goals

MANOVA was used to examine differences between the groups on weight training goals. Group status (CWT or RWT) acted as the independent variable and weight training goals (EMI-2 subscales) represented the dependent variables. A significant multivariate effect was evident between the CWT and RWT on the combined dependent variables (F (7, 356) = 60.98, p < .01, Wilks' Lambda = 0.46, η_p^2 = 0.55). Examination of the data revealed that the CWT reported higher means than the RWT on enjoyment (M_{CWT} = 4.62; SD_{CWT} = 0.52; M_{RWT} = 4.15; SD_{RWT} = 0.83), challenge (M_{CWT} = 4.65; SD_{CWT} = 0.57; M_{RWT} = 3.93; SD_{RWT} = 0.92), competition (M_{CWT} = 4.54; SD_{CWT} = 0.76; M_{RWT} = 2.90; SD_{RWT} = 1.39) and strength and endurance (M_{CWT} = 4.87; SD_{CWT} = 0.35; M_{RWT} = 4.45; SD_{RWT} = 0.61), while displaying lower means on weight management (M_{CWT} = 2.19; SD_{CWT} = 1.47; M_{RWT} = 3.27; SD_{RWT} = 1.46), appearance (M_{CWT} = 2.93; SD_{CWT} = 1.29; M_{RWT} = 3.64; SD_{RWT} = 0.91) and muscular development (M_{CWT} = 3.18; SD_{CWT} = 1.27; M_{RWT} = 3.95; SD_{RWT} = 0.90). All mean differences for each subscale were statistically significant (all p's < .01): (a) enjoyment (η_p^2 = 0.10); (b) challenge (η_p^2 = 0.18); (c) competition (η_p^2 = 0.34); (d) strength and endurance (η_p^2 = 0.15); (e) weight

management ($\eta_p^2 = 0.12$); (f) appearance ($\eta_p^2 = 0.10$); and (g) muscular development ($\eta_p^2 = 0.11$).

Supplemental Analyses: Testing for effects of potential demographic confounders

In order to determine the influence of demographic variables on the differences noted between the CWT and RWT on weight training behaviours, two separate analyses of covariance (ANCOVA) were conducted. For the first ANCOVA, group status remained the independent variable, behaviour item 1 was the dependent variable and demographic variables of age, BMI, sex, marital status, level of education and employment status were used as covariates. Results of the ANCOVA demonstrated that statistical differences between the CWT and RWT on behaviour item 1 were retained while controlling for the above stated demographic variables (F (1, 348) = 10.89, $p < .01$, $\eta_p^2 = 0.03$). Sex was also significantly related to behaviour item 1 (F (1, 348) = 4.74, p = .03), but exhibited a smaller effect size ($\eta_p^2 = 0.01$) than group status. A second ANCOVA was conducted with the independent variable of group status, the dependent variable as behaviour item 2 and the same demographic variables as covariates. Differences between the samples on behaviour item 2 were retained also when controlling for select demographic variables (F (1, 349) = 20.18, $p < .01$, $\eta_p^2 = 0.06$). Marital status was significantly related to behaviour item 2 (F (1, 349) = 5.12, p = .02), but exhibited a smaller effect size ($\eta_p^2 = 0.01$) than group status.

Two multivariate analyses of covariance (MANCOVA) were used to examine the influence of the aforementioned demographic variables on differences between the CWT and RWT with respect to weight training motives and goals. The first MANCOVA consisted of group status as the independent variable and motives for weight training as

the dependent variable with the same demographic variables as covariates. Significant differences were retained between the CWT and RWT on motives for weight training while controlling for the demographic variables (F (5, 342) = 12.68, $p < .01$, Wilks' Lambda = 0.84, $\eta_p^2 = 0.16$). More specifically, significant differences between groups were retained on external regulation (F (1, 346) = 5.85, $p = .02$, $\eta_p^2 = 0.02$), identified regulation (F (1, 346) = 55.02, $p < .01$, $\eta_p^2 = 0.14$), integrated regulation (F (1, 346) = 31.63, $p < .01$, $\eta_p^2 = 0.08$) and intrinsic motivation (F (1, 346) = 15.56, $p < .01$, $\eta_p^2 = 0.04$) when controlling for the demographic variables using MANCOVA. Further examination of the results demonstrated that age was significantly related to external (F (1, 346) = 9.01, $p < .01$, $\eta_p^2 = 0.03$) and introjected regulation (F (1, 346) = 15.23, $p < .01$, $\eta_p^2 = 0.04$). Sex was significantly related to identified (F (1, 346) = 7.62, $p < .01$, $\eta_p^2 = 0.02$) and integrated regulation (F (1, 346) = 4.67, $p = .03$, $\eta_p^2 = 0.01$). Finally, level of education was significantly related to identified (F (1, 346) = 10.26, $p < .01$, $\eta_p^2 = 0.03$), integrated (F (1, 346) = 5.92, $p = .02$, $\eta_p^2 = 0.02$) and intrinsic (F (1, 346) = 4.97, $p = .03$, $\eta_p^2 = 0.01$) forms of motivation.

The second MANCOVA was used to examine the independent and dependent variables of group status and weight training goals with the same demographic variables as covariates. Results of the MANCOVA revealed that significant differences were retained between the CWT and RWT on weight training goals when controlling for the demographic variables (F (7, 335) = 24.91, $p < .01$, Wilks' Lambda = 0.66, $\eta_p^2 = 0.34$). Significant differences between the groups were retained across all weight training goals including, enjoyment (F (1, 341) = 13.85, $p < .01$, $\eta_p^2 = 0.04$), challenge (F (1, 341) = 24.60, $p < .01$, $\eta_p^2 = 0.07$), competition (F (1, 341) = 80.35, $p < .01$, $\eta_p^2 = 0.19$), strength

and endurance (F (1, 341) = 21.88, $p < .01$, $\eta_p^2 = 0.06$), weight management (F (1, 341) = 28.87, $p < .01$, $\eta_p^2 = 0.08$), appearance (F (1, 341) = 15.15, $p < .01$, $\eta_p^2 = 0.04$) and muscular development (F (1, 341) = 20.46, $p < .01$, $\eta_p^2 = 0.06$). Of the demographic variables, BMI was significantly related to the weight management subscale (F (1, 341) = 7.55, $p = .01$, $\eta_p^2 = 0.02$). Sex was also significantly related to the weight management subscale (F (1, 341) = 48.58, $p < .01$, $\eta_p^2 = 0.13$), as well as the competition (F (1, 341) = 4.50, $p = .04$, $\eta_p^2 = 0.01$) and muscular development subscales (F (1, 341) = 32.48, $p < .01$, $\eta_p^2 = 0.09$).

Discussion

The purpose of this study was to examine differences between a group of CWT and a group of RWT on indices of behaviour, motivation and goals. The following three hypotheses were derived from previous research and tested in this study: (a) CWT would report greater frequency of weight training behaviour when compared to the RWT; (b) CWT would demonstrate a less self-determined motivational profile toward weight training when compared with the RWT; and (c) CWT would report more extrinsically oriented goals related to weight training than the RWT. Joint consideration of univariate and multivariate analyses revealed significant differences between these groups, with the CWT demonstrating higher frequency of weight training behaviour, as well as a greater endorsement of autonomous motives and intrinsic goals than the RWT. However, CWT also reported higher endorsement of the strength and endurance subscale of the EMI-2 than the RWT, which was classified as an extrinsic goal. These findings contribute an interesting dynamic within the SDT literature in at least two ways: (a) The results of this study provides evidence to suggest that intrinsic motivation and self-determined forms of

extrinsic motivation may not necessarily be undermined by competition; and (b) Effects attributable to competitive group status do not appear reducible to demographic factors that may have confounded the role of group differences on motives and goals.

Weight Training Behaviour: Links with the literature

The first hypothesis tested in this study stated that the CWT would report greater frequency of weight training behaviour than the RWT (Frederick-Recascino & Schuster-Smith, 2003). In accordance with this hypothesis, the CWT reported significantly greater frequency of weight training behaviour in terms of the overall number of sessions during a typical week and in the total number of days of weight training over the past week compared to the RWT. Small-to-medium effect sizes were noted in this study based on Cohen's (1988) guidelines suggesting that the CWT and RWT may not be vastly different with regard to their weight training behaviour.

In order to interpret the observed differences in weight training behaviour, it is important to first examine previous research in the SDT literature. This study corroborates the findings of Frederick-Recascino and Schuster-Smith (2003) insofar as the competitive cyclists studied in their investigation reported significantly more hours and days per week of exercise behaviour than the recreational exercisers. Similar to the current study, a small-to-medium effect size (Cohen, 1988) was reported for both of the behaviour items used by Frederick-Recascino and Schuster-Smith. These findings support the notion that individuals participating in some form of competitive exercise (or sport) typically engage in these behaviours more frequently than those who simply engage in such behaviour at their leisure or for purposes other than competition per se. Fortier et al. (1995) did not include an assessment of behaviour in their research

examining athletes involved in competitive and recreational sport structures and as such, provide no evidence to support or contradict the findings of this study.

In this study, there are a number of potential explanations for the reported findings pertaining to weight training behaviour in the CWT and RWT. First, the higher frequency of weight training behaviour reported by the CWT could be due to the nature of competition. In order to compete in either weightlifting or powerlifting competitions, one must extensively prepare through specific training regimes (Kraemer & Ratamess, 2004). As with any competitive sport, preparation is essential for success and optimizing performance. Elite level competitive weight trainers have demonstrated a high frequency of weight training behaviour (e.g., as high as 18 training sessions per week) in order to be adequately prepared for competition in previous research (Kraemer & Ratamess, 2004). Neglecting to weight train or missing scheduled sessions could have devastating effects on the performance of a powerlifter or weightlifter during competition. Conversely, the RWT have no direct need to perform weight training behaviour as they are not in preparation for competition where their performance must peak. Therefore, RWT may be more likely to miss weight training sessions or have less reason to consistently engage in weight training behaviour on a weekly basis without competition to ensure frequent training.

Second, this study included a set of specific inclusion criteria of which both the CWT and RWT were asked to adhere to in order to participate. The minimum frequency of weight training behaviour was the same for both groups (i.e., at least 3 days per week for the past 6 months), despite the inherent difference in their purpose for weight training. Due to these inclusion criteria, it is hardly surprising that the calculated effect size was

small-to-medium in magnitude since the target sample for both the CWT and RWT engaged in frequent weight training behaviour. Requiring the RWT to have weight trained a minimum of three days per week reflects a sample of individuals who weight train on a regular basis, similar to the CWT. Therefore, it seems reasonable to contend that both groups would report similar frequency of weight training behaviour.

Finally, the small-to-medium differences observed in weight training behaviour between groups could also be explained by the recruitment strategy for the group of RWT, which relied almost exclusively on verbal advertisement in a university setting of which most participants were likely kinesiology students. Assuming that the bulk of the RWT were kinesiology students, it seems feasible that they may participate in weight training behaviour more frequently than the general population due to their educational background relating to the health benefits derived from strength-based exercise (Thome & Espelage, 2004). Many of these students may also wish to pursue careers in the field of strength and conditioning (e.g., kinesiologist, strength and conditioning coach, personal trainer) which requires knowledge and experience in this mode of exercise. Lastly, sport involvement among the RWT was not assessed in this study, whereby weight training could be a functional component of regular training routines used by these individuals.

Motives for Weight Training: Links with the literature

The second hypothesis tested in this study stated that the CWT would display a less self-determined motivational profile in comparison to the RWT (Fortier et al., 1995). Contrary to this hypothesis, the CWT reported significantly higher self-determined (or autonomous) motives when compared with the RWT. The introjected regulation motive was endorsed to a greater extent by the CWT, but was not significantly different from the

scores of the RWT. Based on Cohen's (1988) guidelines for interpreting effect sizes, the differences noted between the groups with respect to weight training motives were small-to-medium in this study.

By examining the SDT literature (Deci & Ryan, 2002), the results of this study can be interpreted and explained. Within the framework of OIT (Deci & Ryan, 2002), such results suggest that the CWT regulate their own weight training behaviour in a more self-determined manner than the RWT. These findings contradict the findings of Fortier et al. (1995), but support the findings of Frederick-Recascino and Schuster-Smith (2003). Fortier et al. reported significant differences between the competitive and recreational athletes on measures of intrinsic motivation, with the recreational athletes reporting higher endorsement of intrinsic motives. These findings are not wholly consistent with those of the present study where the CWT reported higher levels of intrinsic regulation than the RWT.

However, Fortier et al. (1995) did note that the competitive athletes reported significantly higher levels of identified regulation, which is a self-determined form of extrinsic motivation, providing some support for the results of the present study. Fortier et al. found non-significant differences on introjected and external regulation, unlike the present study where the RWT reported significantly higher endorsement of external regulation. Fortier et al. also reported higher levels of amotivation among the competitive athletes, a construct within OIT that was not assessed in this study. On the other hand, Frederick-Recascino and Schuster-Smith (2003) found that the competitive cyclists reported higher interest/enjoyment and competence motivation, reflecting more intrinsically-oriented motives, while the recreational exercisers reported higher

endorsement of appearance motivation, an extrinsically-oriented motive. These results are supported by the findings noted in the present study. However, it is important to reiterate that both Fortier et al. and Frederick-Recascino and Schuster-Smith grounded their research in CET, a sub-theory of SDT, which is a different theoretical approach than OIT. Due to the discrepancy in the theories used between the present study and those reported in previous SDT-based research (Fortier et al., 1995; Frederick-Recascino & Schuster-Smith, 2003), comparisons must be made with a suitable degree of caution. With this in mind, the findings of the present study replicate the findings of Frederick-Recascino and Schuster-Smith in that the CWT demonstrated higher endorsement of autonomous motives than the RWT.

Frederick-Recascino and Schuster-Smith (2003) posited that since competition is inherent to the nature of sport, athletes may experience a shift in their motivational profiles allowing them to adapt to competition differently as they become more experienced with competition. Perhaps this rationale is applicable to the present study insofar as the CWT may have adapted to the nature of competition as they become more experienced in their sport. This could then alter their motivational profiles from a greater reliance on controlling extrinsic reasons for engaging in weight training, to more autonomous motives toward this behaviour. However, this interpretation is speculative since weight training experience was not directly assessed in this study to determine whether the CWT were in fact more experienced in weight training than the RWT. Since this hypothesized explanation originally presented by Frederick-Recascino and Schuster-Smith was not tested by the present study, it cannot be supported or denied, but is an important consideration that warrants attention in future studies.

Unfortunately, there is limited research within SDT, and more specifically within OIT, examining motives for weight training in either competitive or recreational individuals that permit direct comparisons with the present investigation. Gilson, Chow and Ewing (2008) examined motivation for weight training among competitive athletes of different sports using the construct of goal orientations within achievement goal theory. Their findings indicate that a sample of athletes reported high levels of task orientation, which can be aligned with autonomous motives within OIT (Deci & Ryan, 2002), and social approval, which is a form of ego orientation or extrinsic motivation within OIT (Deci & Ryan, 2002). Gilson et al. also note that when an elite athlete is high in task and ego orientation, these opposing effects can optimize their performance. Once again the use of different theories makes any comparisons with the present study challenging and as such, the following interpretation must be considered with caution.

In the present study, the CWT demonstrated higher mean scores on identified regulation representing the least self-determined form of extrinsic motivation and on introjected regulation, which is a controlling form of extrinsic motivation. Additionally, the CWT reported higher endorsement of integrated and intrinsic motivation than the RWT. Gilson et al. (2008) also state that a balance between ego and task-orientation provides a buffering effect against the negative aspects of these goal orientations leading to optimal performance in competitive athletes. Therefore, in the present study it is possible that among the CWT the negative effects of introjected regulation are buffered by the more autonomous forms of extrinsic motivation and by intrinsic motivation that this group endorsed. Unfortunately, no measure of performance was used in this study

and therefore this motivation-performance relationship outlined by Gilson et al. cannot be supported nor refuted by these findings.

Competition within the SDT literature has been often depicted as having negative effects on intrinsic motivation and self-determined behaviour (Deci, Betley, Kahle, Abrams, & Porac, 1981; Vallerand, Gauvin, & Halliwell, 1986). These findings have been documented primarily from research using an experimental design conducted in a laboratory setting. For example, Deci et al. (1981) assessed intrinsic motivation among individuals who were instructed to solve a puzzle either faster than an opponent, or simply as quickly as possible without the aspect of competition. Those individuals in direct competition with an opponent reported lower levels of intrinsic motivation compared with those who were not asked to complete the task faster than an opponent. Deci et al. concluded that attempting to win is an extrinsic form of motivation because it is external to the competition, and that competition appears to undermine intrinsic motivation. Similarly, research by Vallerand et al. (1986) assessed intrinsic motivation among young boys performing a balance task either competing against the scores of other individuals, or without the aspect of competition. Much like the research by Deci et al., those who were told to compete against the scores of other individuals on the balance task reported lower levels of intrinsic motivation. As such, competition is then perceived as a controlling mechanism or situational cue, which can decrease or undermine intrinsic motivation (Deci et al., 1981; Fortier et al., 1995; Vallerand et al., 1986).

However, Reeve and Deci (1996) demonstrated that the negative effect of competition on intrinsic motivation is mediated by perceived competence and self-determination. In other words, intrinsic motivation is undermined when winning is

emphasized, whereas competition can enhance intrinsic motivation if attention is drawn toward the positive aspects of performance during competition (Reeve & Deci, 1996). The findings of the present study contradict the negative connotations ascribed to competition (Deci et al., 1981; Vallerand et al., 1986), demonstrating that intrinsic motivation is in fact endorsed to a greater extent by a group of CWT compared to a group of RWT. Considering the findings by Reeve and Deci, it is possible that the CWT place greater emphasis on the positive aspects of competition in their respective sports (e.g., being strong) rather than solely on winning, which in turn enhances rather than undermines intrinsic motivation.

It is important to reiterate that this study did not use an experimental design and all measures of motivation were self report, unlike those in both the aforementioned studies by Deci et al. and Vallerand et al. where intrinsic motivation was assessed as the amount of time the individual spent practicing the task during a period of free time. Due to these differences, the interpretations presented should be considered with caution. The current findings also provide support for the utility of OIT in the context of understanding motivation among individuals involved in competition. Further research should be conducted to examine the effect of competition (and/or competitive group status) on motivation using OIT in order to determine whether the findings of this study can be replicated in other cohorts of exercisers.

Weight Training Goals: Links with the literature

The third hypothesis tested in this study stated that the CWT would demonstrate more extrinsic weight training goals in comparison to the RWT. This hypothesis was based upon the documented association between controlled motives and extrinsic goals

within SDT (Sheldon & Kasser, 1995). Contrary to the third hypothesis, the CWT demonstrated higher endorsement of the intrinsic goals of enjoyment, challenge and competition than the RWT. However, the CWT also reported higher mean scores than the RWT on the extrinsic goal of strength and endurance. The RWT demonstrated higher endorsement of the remaining extrinsic goals of appearance, weight management and muscular development than the CWT. The differences observed between the CWT and RWT for all of the weight training goals can be classified as small using Cohen's (1988) guidelines for interpreting effects sizes.

To date, there have been few studies examining the differences in goals between competitive and recreational groups using the theoretical framework of GCT (Deci & Ryan, 2002). Neither Fortier et al. (1995) nor Frederick-Recascino and Schuster-Smith (2003) assessed goals, making comparisons with these studies impossible. However, research by Kilpatrick, Hebert and Bartholomew (2005) examining differences in goals for exercise and sport in college students provides some support for the findings of the present study. Comparisons can be drawn between the goals of the CWT and goals for participation in sport, and between the goals of the RWT and goals for participation in exercise. In the present study, the CWT reported higher scores than the RWT on the intrinsic goals of enjoyment, challenge and competition, which corroborates the findings of Kilpatrick et al. whereby the goals for participation in sport were scored higher than exercise on these intrinsic goals. Furthermore, the RWT reported higher scores on the extrinsic goals of weight management and appearance, as did the goals for participation in exercise. Discrepancies occur with regard to the extrinsic goal of strength and endurance, which was endorsed to a greater extent by the CWT in the present study but

not by the goals for participation in sport. Kilpatrick et al. did not include the muscular development subscale (Loze & Collins, 1998) in their analysis of goals, thus no comparisons can be drawn with regard to this extrinsic goal.

As previously mentioned, there was an anomalous finding with regard to the CWT reporting higher mean scores than the RWT on the extrinsic goal of strength and endurance. One would assume from the trends in the data and based on GCT (Deci & Ryan, 2002) that the RWT would report higher mean scores than the CWT on this extrinsic goal. With this in mind, it is important to note that Markland and Ingledew (1997) do not explicitly classify the subscales of the EMI-2 as either intrinsic or extrinsic. Therefore, the classifications presented in this study represent an attempt to categorize these subscales in the intrinsic-extrinsic dichotomy of goal contents within GCT (Deci & Ryan, 2000). However, Sebire, Standage and Vansteenkiste (2008) argue that not all goals will fit into the intrinsic-extrinsic classification, while other goals could be classified as either intrinsic or extrinsic depending upon the context of the behaviour. Due to this, caution should be taken when interpreting the results of this study with respect to the intrinsic or extrinsic nature of the goals.

Examination of the correlation matrix between the original EMI-2 subscales (Markland & Ingledew, 1997) allows for an understanding of how these goals were classified as either intrinsic or extrinsic in the present study. Markland and Ingledew state that despite the difficulty in classifying goals as intrinsic or extrinsic some goals within SDT are inherently intrinsic such as enjoyment, while others are inherently extrinsic such as appearance (e.g., Frederick & Ryan, 1993; 1995). Therefore, by examining the correlations between the original EMI-2 subscales and these known intrinsic and extrinsic

goals, classifications were made prior to conducting this study (see Table 2). The strength and endurance subscale was strongly correlated with the appearance subscale (r_{12} = .71), leading to the classification of strength and endurance as an extrinsic goal as presented in this study. However, the strength and endurance subscale was also strongly correlated with the enjoyment subscale (r_{12} = .67), which is clearly an intrinsic goal (Markland & Ingledew, 1997). This presents a clear example of the argument made by Sebire et al. that not all goals can be specifically classified as either intrinsic or extrinsic.

Furthermore, correlations in the present study for both the CWT and RWT contradicted the extrinsic classification made from the original EMI-2 subscales, with strength and endurance being more strongly correlated with enjoyment (r_{CWT} = .28; r_{RWT} = .52) than appearance (r_{CWT} = .10; r_{RWT} = .47). Considering this evidence, it appears that the CWT and RWT in this study perceived strength and endurance to be representative of an intrinsic goal rather than an extrinsic goal. Therefore, a more appropriate statement may be that the group of CWT endorsed more intrinsically-oriented goals than the group of RWT in this study.

Further interpretation of the findings regarding weight training goals can be made through examination of the item content relevance of the EMI-2 subscales. Dunn, Bouffard, and Rogers (1999) define item content relevance as the degree to which a questionnaire item accurately represents the construct that it was designed to measure. Additionally, Messick (1995) emphasizes that item representation is an important part of content validity. At this time it should be reiterated that due to reliability concerns with the CWT, two items were removed from the strength and endurance and challenge

subscales and a single item was removed from the muscular development subscale for this group.

Upon examination of the two items removed from the strength and endurance subscale ($item_1$: “Personally, I weight train to increase my endurance.”; $item_2$: “Personally, I weight train to develop my muscles.”) there is reason to question the item content relevance of both items with regard to measuring the goal of strength and endurance. The first item states only endurance with no mention of strength, which is not representative of the strength and endurance goal as a whole. Similarly, the second item is phrased in such a way that it does not clearly reflect the strength and endurance goal as developed muscles do not necessarily pertain to being strong or having endurance. Therefore, it is understandable that these items were not well received by the CWT due to the fact that the sports of powerlifting and weightlifting do not require muscular endurance or muscle hypertrophy to garner success.

On the other hand, the two items that were retained for the analysis ($item_3$: “Personally, I weight train to build up my strength."; $item_4$: “Personally, I weight train to get stronger.”) clearly represent a necessity for success within either of these sports. However, it should be noted that both these items only reflect the strength portion of this goal and therefore, are once again not representative of the entire strength and endurance goal. This presents the larger issue of content validity within the strength and endurance subscale of the EMI-2, which could provide another possible explanation as to why the CWT reported higher mean scores than the RWT on this goal.

The results of this study provide support for the utility of GCT for examining weight training goals in a sample of individuals engaged in weight training behaviours.

The CWT reported greater endorsement of mostly intrinsically-oriented goals when compared to the RWT. With the exception of the nebulous strength and endurance subscale of the EMI-2, these findings conform to the relationship between autonomous motives and intrinsic goals noted by Sheldon and Kasser (1995). However, it is important to note that this relationship was not examined in this study and this is simply an observational conclusion. Within GCT, the orientation of goals has important implications on the basic psychological needs of competence, autonomy and relatedness, and ultimately on well-being. As previously noted an intrinsic goal is one that satisfies these basic psychological needs and in doing so leads to the promotion of greater positive well-being (Deci & Ryan, 2000). Therefore, the endorsement of mostly intrinsic goals by the CWT suggests that these individuals may be predisposed to ascertain higher levels of well-being when compared with the RWT. These findings also provide support for the idea that pursuing a sport where competition is involved does not necessarily foster extrinsically-oriented goals. This is once again important when attempting to promote adherence to strength-based exercises such as weight training. However, these implications should be interpreted cautiously given that (a) the items of the EMI-2 were modified for the purpose of this study, and (b) that a number of items were removed from the three aforementioned subscales of the EMI-2 due to concerns with reliability.

Limitations

Scientific research is not without limitations and this research is no exception. As such, there are six main limitations of this research that warrant consideration: (1) A cross-sectional research design was utilized; (2) Data collection occurred completely via the internet; (3) All data collected was self-reported; (4) Sample size; (5) Violation of

statistical assumptions; and 6) Modification of instruments from their original format to correspond with the target population. Each limitation will be discussed in further detail along with potential avenues for additional research that could build upon the findings of this research.

In regards to the first limitation, the research design was non-experimental in nature and was implemented to assess participants at only one time point (i.e., cross-sectional design). Trochim (2006) outlines two issues pertaining to the use of cross-sectional designs in research that warrant consideration in regards to this study, namely (a) prohibiting the ability to make claims of cause and effect, and (b) decreasing the generalizability of findings to the larger population. Due to the fact that the purpose of this research was to examine differences between a group of CWT and a group of RWT rather than establish causal inferences attributable to group status, a cross-sectional design was deemed appropriate. However, this limitation could be addressed in future studies through the use of a longitudinal research design whereby multiple assessments are made to track patterns of change in weight training behaviours, motives and/or goals over time.

A second limitation is that all data were collected through an internet-based questionnaire using a commercial website (i.e., www.surveymonkey.com). Online research has become more prominent, but is not without limitations. Samples derived from internet-based research comprise a small demographic of individuals who have access to the internet (Couper, 2000). This presents the issue of generalizing results to a larger population based upon those individuals who responded to the online questionnaire. However, support from the exercise psychology literature attests that there

are no differences in responses between paper and pencil questionnaires and online questionnaires administered to the same group of individuals (Lonsdale, Hodge, & Rose, 2006). Despite this evidence presented by Lonsdale et al. (2006), future research may wish to use an in-person paper and pencil method of collecting data in an attempt to avoid any limitations associated with internet-based questionnaires.

The third limitation pertains to reliance upon self-report data from participants. Crocker and Algina (1986) list a number of issues with self-report data such as, (a) participants answering questions in the way that they believe to be socially accepted or the way in which the researcher wants them to respond, (b) a general misunderstanding of what the researcher is asking of the participant, and (c) recall bias, or the fact that participants are asked to draw upon previous experiences and report personal, sometimes sensitive information, that has to be retrieved from memory. Self-report data relies on the integrity of the participants to answer each question as accurately as possible in order to provide meaningful results representing the sample investigated. Weight training behaviour is the only variable that could be assessed using a form of instrumentation other than self-report in future research studies. Unfortunately, the majority of electronic devices used to assess exercise behaviour only account for the number of steps (i.e., pedometer) or similar patterns of movement linked mainly to cardiovascular forms of exercise. An alternative may be to use an indirect assessment of weight training behaviour like a typical strength assessment metric (e.g., one-repetition maximum test) to assess improvements in physical strength over a period of time. This form of instrumentation could perhaps serve as a proxy marker of weight training behaviour in future studies.

The fourth limitation pertains to the sample size used in this research. Using Cohen's (1992) recommendations, a target sample size of 786 participants was determined a priori ($n_{competitive}$ = 393; $n_{recreational}$ = 393), while the overall sample size retained for the statistical analysis performed in this investigation was 373 participants ($n_{competitive}$ = 177; $n_{recreational}$ = 196). In addition to the overall sample size, there were unequal sample sizes between the group of CWT and the group of RWT. Despite the sample size, results demonstrated adequate statistical power to detect group-based differences based on the observed probability values noted in the results, however it remains difficult to generalize these results to competitive and recreational populations of weight trainers as this sample may not be representative of larger populations. To improve the generalizability of future research, cluster random sampling could be used whereby powerlifting and weightlifting clubs (i.e., the clusters) from a larger geographical area could each be randomly sampled (Trochim, 2006). Similarly, RWT could be recruited through cluster random sampling from the same geographical areas as the powerlifting and weightlifting clubs to provide more appropriate representations and/or comparisons of these populations. Random sampling within these clustered groups will improve the generalizability of any findings reported (Trochim, 2006).

The fifth limitation of this study is the violation of statistical assumptions during analyses. A prime example of such a violation is the comparison of groups using unequal sample sizes in the univariate and multivariate analyses, which can cause a decrease in the viability of the results (Tabachnick & Fidell, 2001). Additional statistical violations evident in this study are reported in detail in the results section. It is important to note that statistical assumptions represent the ideal configuration of the data, which can be difficult

to obtain in any form of scientific research. Evidence also suggests that many tests of statistical assumptions are overly sensitive (Hair et al., 2006; Tabachnick & Fidell, 2007) and do not always accurately depict the normality of the data. These statistical assumption issues could be resolved in future research by obtaining a larger sample size and ensuring that sample sizes between groups are equal upon removal of unusable cases and outliers.

The final limitation of this study is the modification of instruments used to assess weight training motives, goals and behaviours. All the instruments utilized were modified from their original format assessing exercise to investigate a specific mode of exercise, namely weight training, which brings to question their utility in these cohorts. However, comparable approaches to instrument modification have been used in prior SDT-based research (e.g., Wilson, Grattan, Mack, Blanchard, & Gilchrist, 2012) without undue concern. Additionally, the EMI-2 was originally created to assess participation motives for exercise within SDT, but was instead used to assess goal contents within Deci and Ryan's (2002) framework of GCT in the present study. Wilson et al. (2008) elicit caution toward altering the intended purpose of an instrument, without additional evidence of construct validity for the modified test items or scores. However, Ingledew and Markland (2008) state that the EMI-2 assesses participatory motives, which they define as being congruent with Deci and Ryan's (2002) definition of goal contents. Future research should further utilize these modified instruments to examine different cohorts of individuals involved in weight training behaviour to provide support for their continued use in different modes of exercise (Gunnell, Wilson, Zumbo, Mack, & Crocker, 2012).

Summary

The purpose of this research was to examine differences in weight training behaviours, motives and goals between a group of CWT and a group of RWT. Significant differences between these groups were noted on each of the three constructs assessed. The CWT reported higher autonomous motives and mostly higher intrinsic goals than the RWT, with the notable exception of goals specific to strength and endurance. The CWT also demonstrated greater frequency of weight training behaviour than the RWT both over the course of a typical week and over the past seven days. Implications of these findings include understanding that competition does not appear to negatively impact adaptive forms of motivation or goals with regard to weight training behaviour. Additionally, evidence from this research suggests that adherence to weight training behaviour may be increased by emulating the motivational profiles demonstrated by this group of CWT. Overall, it appears that OIT and GCT can be used as frameworks to advance our understanding of factors that motivate weight training exercise and continued use of these approaches seems justified.

Footnotes

[1]This study did not measure amotivation because the target samples examined were currently engaged in weight training behaviour. The following is a sample item adapted from the BREQ-2R aligned with this research to demonstrate amotivated behaviour: "I don't see the point in weight training" (Markland & Tobin, 2004).

[2]Despite the original intended purpose of assessing participation motives, the EMI-2 (Markland & Ingledew, 1997) was used to assess weight training goals in the present study over other possible instruments designed to assess goals such as the Goal Content for Exercise Questionnaire (GCEQ; Sebire et al., 2009) for two main reasons. First, Ingledew and Markland (2008) define a participation motive as "the content of individuals' goals for participating in a particular domain of behaviour" (p.808), or in other words, the EMI-2 can be used to assess the goals of exercise behaviour. Secondly, the GCEQ contains five subscales assessing goals related to (1) social affiliation, (2) image, (3) health management, (4) social recognition, and (5) skill development (Sebire et al., 2009). These goals are very general and hold little relevance toward the target populations of competitive and recreational weight trainers, while the subscales of the EMI-2 were deemed to be more applicable to this sample for testing the study hypothesis pertaining to weight training goals (e.g., strength and endurance).

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Table 1

Motives assessed in this study within OIT

Construct	Type of motivation	Sample Items
External regulation	Controlled	I weight train because other people say I should
Introjected regulation	Controlled	I feel guilty when I don't weight train
Identified regulation	Autonomous	I value the benefits of weight training
Integrated regulation	Autonomous	I weight train because it is consistent with my life goals
Intrinsic motivation	Autonomous	I weight train because it's fun

Note. The sample items are modified from the Behavioural Regulation in Exercise Questionnaire-2R (BREQ-2R; Markland and Tobin, 2004; Wilson et al., 2006).

Table 2

Goals assessed in this study within GCT

Construct	Type of goal	Sample Items
Enjoyment	Intrinsic	Personally, I weight train because I enjoy the feeling of exerting myself
Challenge	Intrinsic	Personally, I weight train to give me goals to work towards
Competition	Intrinsic	Personally, I weight train because I like competing
Strength and endurance	Extrinsic	Personally, I weight train to build up my strength
Weight management	Extrinsic	Personally, I weight train to stay slim
Appearance	Extrinsic	Personally, I weight train to have a good body
Muscular development	Extrinsic	Personally, I weight train to achieve greater muscle mass

Note. The sample items are modified from the Exercise Motivations Inventory-2 (EMI-2; Markland & Ingledew, 1997).

Table 3

Descriptive statistics for demographic items assessed in the CWT and RWT

	CWT		RWT	
Variable	*M*	*SD*	*M*	*SD*
Age (years)	30.86	11.35	21.97	6.05
Height (m)	1.73	0.10	1.74	0.10
Weight (kg)	83.40	19.24	74.88	14.58
BMI (kg/m^2)	27.43	4.38	24.54	3.51
	%		%	
Sex				
Male	73.40		56.10	
Female	25.4		43.40	
Marital status				
Married/common law	46.90		5.60	
Divorced	1.70		1.50	
Separated/widowed	1.70		0.50	
Single	48.60		91.80	
Education				
High school diploma	21.50		77.00	
University/college degree	46.30		19.90	
Graduate degree	27.10		3.10	
Employment status				
Full-time employed	67.80		9.70	
Part-time employed	15.80		49.00	
Unemployed	14.70		41.30	
Ethnic origin				
Aboriginal	0.60		0.50	
Caucasian/white	83.10		89.30	
Asian	7.30		2.60	
Other	7.90		7.10	

Note. Demographics presented in the table represent information from all participants included in the initial analyses prior to the removal of any outliers (N = 373).

Table 4

Reliability estimates for scores assessing weight training motives and goals

	CWT	RWT
Construct	α	α
Subscale		
Motives		
External regulation	0.72	0.80
Introjected regulation	0.86	0.81
Identified regulation	0.28	0.76
Integrated regulation	0.77	0.86
Intrinsic regulation	0.71	0.88
Goals		
Enjoyment	0.74	0.83
Challenge	0.56	0.77
Competition	0.88	0.88
Strength and endurance	0.46	0.79
Weight management	0.89	0.89
Appearance	0.84	0.74
Muscular development	0.65	0.68

Note. The reliability estimates reported (Cronbach's α; Cronbach, 1951) include all items from each construct used to assess motives (i.e. from the BREQ-2R) and goals (i.e. from the EMI-2) for CWT (competitive weight trainers) and RWT (recreational weight trainers).

Table 5

Descriptive statistics for variables assessing weight training behaviour

	CWT				RWT			
Construct	*M*	*SD*	Skewness	Kurtosis	*M*	*SD*	Skewness	Kurtosis
Behaviour Item 1	4.76	2.33	7.55	78.84	4.27	1.33	2.07	7.94
Behaviour Item 2	5.32	1.14	-0.01	-0.60	4.86	1.16	0.77	0.21

Note. Behaviour Item 1 = "During a typical week, how many times do you weight train?" (Litt & Dodge, 2008); Behaviour Item 2 = "On how many of the past 7 days have you performed weight training exercise?" (Mack et al., 2009). CWT = Competitive weight trainers; RWT = Recreational weight trainers.

Table 6

Descriptive statistics for variables assessing motives for weight training

	CWT				RWT			
Construct	*M*	*SD*	Skewness	Kurtosis	*M*	*SD*	Skewness	Kurtosis
External regulation	0.40	.57	1.50	1.39	0.80	0.76	0.88	0.28
Introjected regulation	2.29	1.23	-0.34	-0.97	2.12	1.00	0.00	-0.51
Identified regulation	3.91	0.23	-3.01	9.37	3.27	0.62	-0.73	-0.12
Integrated regulation	3.54	0.60	-1.22	0.70	2.66	0.94	-0.33	-0.66
Intrinsic regulation	3.77	0.41	-1.75	2.04	3.27	0.69	-0.63	-0.62

Note. The values presented in the table represent the average scores on each variable prior to removal of outliers. Motives were assessed using the BREQ-2R = Behavioural Regulation in Exercise Questionnaire-2R (Markland and Tobin, 2004; Wilson et al., 2006). CWT = Competitive weight trainers; RWT = Recreational weight trainers. Modified BREQ-2R items ranged in value from 0 (*Not true for me*) to 4 (*Very true for me*) in this study.

Table 7

Descriptive statistics for variables assessing weight training goals

	CWT				RWT			
Construct	*M*	*SD*	Skewness	Kurtosis	*M*	*SD*	Skewness	Kurtosis
Intrinsic								
Enjoyment	4.61	0.57	-1.91	4.10	4.15	0.83	-1.24	1.65
Challenge	4.56	0.78	-2.71	9.63	3.93	0.92	-0.91	0.60
Competition	4.50	0.80	-1.95	3.40	2.89	1.39	-0.28	-0.95
Extrinsic								
Strength and endurance	4.84	0.44	-3.42	13.78	4.45	0.61	-1.29	1.87
Weight management	2.17	1.47	0.17	-0.90	3.27	1.46	-0.60	-0.67
Appearance	2.92	1.29	-0.44	-0.35	3.64	0.91	-0.76	0.91
Muscular development	3.15	1.27	-0.41	-0.46	3.95	0.90	-0.80	0.19

Note. The values presented in the table represent the average scores on each variable prior to removal of outliers. Goals were assessed using the EMI-2 = Exercise Motivations Inventory-2 (Markland & Ingledew, 1997). CWT = Competitive weight trainers; RWT = Recreational weight trainers. Modified EMI-2 items ranged in value from 0 (*Not at all true for me*) to 5 (*Very true for me*) in this study.

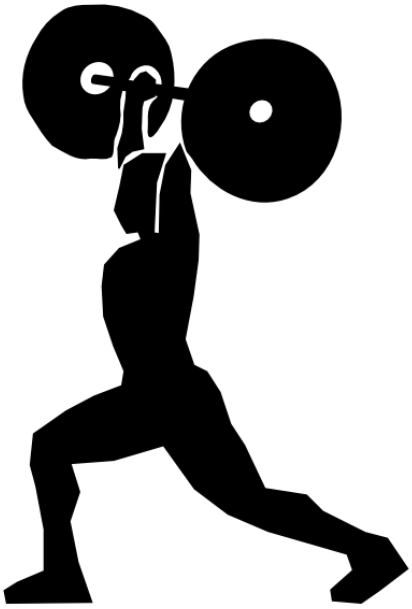
Appendices

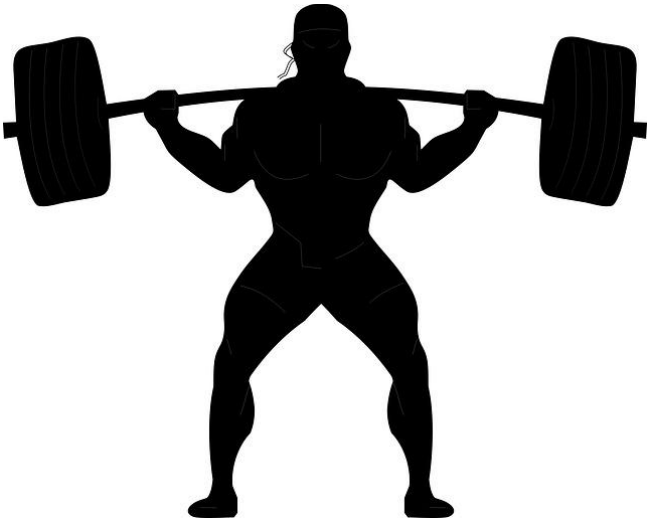
Appendix A: Study Questionnaire

Project R.E.P.S.
Resistance Exercise & Performance Study

INSTRUCTIONS

The following survey is comprised of questions that ask you about your weight training behaviours. We also ask questions about the reasons why you engage (or would engage) in regular weight training activities. There are no right or wrong answers to these questions so please respond openly and honestly to each question. All of your responses will remain confidential and shall not be disclosed to others in any way such that you can be identified personally. Thank you for participating in this research study. Your information is important to us.





Section 1: Demographics

This first part of the questionnaire is designed to describe the people who participate in this study. All information received is held in confidence. Please provide your…

Age ____ YEARS

Height ____ Feet/inches OR ____ Metres

Weight ____ Pounds (lbs.) OR ____ Kilogram (Kgs)

Please check one of the following…

What is your sex?

❑ Male ❑ Female

What is your current marital status?

❑ Married/Common Law ❑ Widowed ❑ Separated/Divorced ❑ Single

What is the highest educational qualification you currently hold?

❑ High School Diploma ❑ University/College Degree ❑ Graduate Degree

What is your current employment status?

❑ Full-Time Employed ❑ Part-Time Employed ❑ Unemployed

How would you describe your ethnic origin?

❑ Aboriginal ❑ Caucasian/White ❑ Asian ❑ Other

Section 2: Resistance Exercise & Weight Training Participation History

The questions in this section ask about your participation in resistance training and/or weight training activity as a part of your current exercise routine. For the purposes of these questions, please consider the following two classifications that will be useful for describing the people who participate in our study:

Competitive Weight Trainers: People who use resistance exercise and weight training for the purposes of competition include exercisers who meet the following criteria:

a) Have trained a minimum of 3 days per week for the past 6 months (or more) with resistance exercises or weight training activities

b) Have competed in either a weightlifting or powerlifting competition within the past year and plan to do so again with the next year

c) Currently belong to a powerlifting or weightlifting club but do not compete in bodybuilding contests

d) Currently train with weights for the purposes of competing in either weightlifting or powerlifting competitions

Recreational Weight Trainers: People who use resistance exercise and weight training for the purposes of enhancing or maintaining general health and fitness but not for competition include exercisers who meet the following criteria:

a) Have trained a minimum of 3 days per week for the past 6 months (or more) with resistance exercises or weight training activities

b) Have not competed in either a weightlifting, powerlifting or bodybuilding competition within the past year and have no future plans to do so

c) Currently do not belong to a powerlifting or weightlifting club

d) Currently train with weights for the purposes of enhancing or maintaining general health and fitness

e) Currently belong to a commercial health or fitness club

Keeping these definitions in mind, which of the two categories do you feel currently best describes your status as a person who uses weight training activities (please select only one of the following two options):

I am a competitive weight trainer ❑

I am a recreational weight trainer ❑

Section 2a: Current Weight Training Participation

This question pertains to your participation in weight training. Please read the question and indicate how many times you TYPICALLY engage in weight training during a week (i.e., 7 day training cycle). Please report only weight training sessions lasting 10 minutes (or more) in duration. If you complete more than one weight training session per day that lasts for least 10 minutes in duration then please count these workouts as separate times for this question. For example, if you typically complete 2 vigorous weight training workouts per day on Monday, Wednesday, and Friday, followed by 1 light weight training workout on Tuesday and Thursday, then you would type 8 in the column labelled 'Times per Week'. Please do not include any workouts where you might only complete flexibility (e.g., stretching) or cardiovascular-related (e.g., biking, jogging) exercises (only workouts involving weights).

Question	**Number of Times per Week**
During a typical week, how many times do you weight train?	

This question also pertains to your participation in weight training. Please read the question and indicate the number of days you engaged in weight training during THE PAST week (i.e., the last 7 days) by clicking on one of the following response options. Please report only weight training sessions lasting 10 minutes (or more) in duration. For example, if you completed 1 vigorous weight training workout per day on Monday, Wednesday, and Friday, followed by 1 light weight training workout on Tuesday and Thursday, then you would click 5 in the column labelled 'Times per Week'. Please do not include any workouts where you might only complete flexibility (e.g., stretching) or cardiovascular-related (e.g., biking, jogging) exercises (only workouts involving weights).

Question	**Number of Days in the Past Week**
On how many of the past 7 days did you perform weight training exercises?	0 1 2 3 4 5 6 7

Section 3: Reasons for Participation in Weight Training Exercises

The following questions ask about the reasons why you currently engage in regular weight training activities and the goals that you currently pursue by engaging in weight training exercises.

Section 3a: Why do you currently engage in weight training as part of your exercise routine?

The following list identifies reasons why people engage in weight training. Please indicate on the scale provided how true each statement is for YOU with (0) = Not true for me and (4) = Very true for me.

	Not true for me		Sometimes true for me		Very true for me
I feel like a failure when I haven't weight trained in a while.	0	1	2	3	4
I don't see the point in weight training.	0	1	2	3	4
I get restless if I don't weight train regularly.	0	1	2	3	4
I think it is important to make the effort to weight train regularly.	0	1	2	3	4
I find my weight training a pleasurable activity.	0	1	2	3	4
It's important to me to weight train regularly.	0	1	2	3	4
I get pleasure and satisfaction from participating in weight training.	0	1	2	3	4
I weight train because it is consistent with my life goals.	0	1	2	3	4
I feel under pressure from my friends/family to weight train.	0	1	2	3	4
I weight train because it is fun.	0	1	2	3	4
I weight train because other people say I should.	0	1	2	3	4
I feel ashamed when I miss a weight training session.	0	1	2	3	4
I weight train because others will not be pleased with me if I don't.	0	1	2	3	4
I don't see why I should have to weight train.	0	1	2	3	4
I consider weight training to be a part of my identity.	0	1	2	3	4
I enjoy my weight training sessions.	0	1	2	3	4
I think weight training is a waste of time.	0	1	2	3	4
I consider weight training a fundamental part of who I am.	0	1	2	3	4

I feel guilty when I don't weight train.	0	1	2	3	4
I take part in weight training because my friends/family/spouse say I should.	0	1	2	3	4
I can't see why I should bother to weight train.	0	1	2	3	4
I consider weight training consistent with my values.	0	1	2	3	4
I value the benefits of weight training.	0	1	2	3	4

Section 3b: What are your current weight training goals?

People have a number of different goals that they endorse when engaging in weight training as part of their exercise training. We would like to know a little more about YOUR weight training goals. Please indicate on the scale provided how important each goal is for you with reference to your current involvement in weight training.

Personally, I weight train…	Not at all true for me					Very true for me
to help control my weight.	0	1	2	3	4	5
because I find weight training fun, especially when competition is involved.	0	1	2	3	4	5
to develop my muscles.	0	1	2	3	4	5
because I find weight training satisfying in and of itself.	0	1	2	3	4	5
to look more attractive.	0	1	2	3	4	5
because weight training helps me burn calories.	0	1	2	3	4	5
to give me goals to work towards.	0	1	2	3	4	5
to get stronger.	0	1	2	3	4	5
to stay slim.	0	1	2	3	4	5
to build up my strength.	0	1	2	3	4	5
because I enjoy the feeling of exerting myself.	0	1	2	3	4	5

to become strong and powerful.	0	1	2	3	4	5
to give me personal challenges to face.	0	1	2	3	4	5
because I enjoy competing.	0	1	2	3	4	5
because I like trying to win in weight training activities.	0	1	2	3	4	5
to improve my appearance.	0	1	2	3	4	5
for enjoyment of the experience of weight training.	0	1	2	3	4	5
to achieve greater muscle mass.	0	1	2	3	4	5
to increase my endurance.	0	1	2	3	4	5
to tone and define my muscles.	0	1	2	3	4	5
to measure myself against personal standards.	0	1	2	3	4	5
to increase my body size.	0	1	2	3	4	5
to help me look younger.	0	1	2	3	4	5
because I feel at my best when exercising.	0	1	2	3	4	5
because I enjoy physical competition.	0	1	2	3	4	5
to have a good body.	0	1	2	3	4	5
to develop personal skills.	0	1	2	3	4	5
to lose weight.	0	1	2	3	4	5

Thank You

Thank you for taking time to participate in our research study. If you have any questions pertaining to the study or the data you have provided then please do not hesitate to ask a member of our research team at any time.

Appendix B: Recruitment Poster

Project R.E.P.S.

Resistance Exercise and Performance Study

Purpose: To examine the differences in motivational processes between competitive and recreational weight trainers.

Study Requirements: Complete a short questionnaire (20-25 minutes) assessing motives for weight training, weight training goals and weight training behaviour.

For more information, interested students can contact:
Principal Investigator: Dr. Philip M. Wilson
Research Associate: Mr. Matthew Burns (BSc Kin)
mb07ey@brocku.ca
(905) 688 5550 Ext 556
Faculty of Applied Health Sciences,
Brock University
OR visit http://projectreps.weebly.com/

This project has been reviewed and received ethics clearance through the REB at Brock University (File #12-099). If you have questions pertaining to this study, or would like a copy of the study's major findings, please feel free to contact the investigators using the information provided above. If you have questions pertaining to the nature of this study or your rights as a participant please contact Brock University's Research Ethics Officer at (905) 688 5550 Ext. 3035.

Thank you for your interest in our research project.

Dr. Philip M. Wilson/Matt Burns (905) 688-5550 ext. 5564 mb07ey@brocku.ca @brocku.ca

Dr. Philip M. Wilson/Matt Burns (905) 688-5550 ext. 5564 mb07ey@brocku.ca @brocku.ca

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Dr. Philip M. Wilson/Matt Burns (905) 688-5550 ext. 5564 mb07ey@brocku.ca @brocku.ca

Appendix C: Verbal Presentation Script

Hello, my name is ***Matthew Burns*** and I am a Research Associate in the Faculty of Applied Health Sciences at Brock University. I am currently working in the Behavioural Health Sciences Research Lab at Brock University ***with Dr. Philip M. Wilson*** and doing my master's thesis. I am here today to discuss with you a project that we are currently recruiting participants for entitled "Resistance Exercise and Performance Study".

I am studying the amount of weight training people engage in on a regular basis and the factors that might be associated with those activities. This research is designed to help us understand more about how people weight train, and possibly be used to identify factors that can help people sustain healthy exercise habits that involve weight training over the long haul.

If you volunteer as a participant in this study, you will be asked to complete a series of questions in a survey designed specifically for this research project. The questions contained within the survey will ask about the frequency of your weight training behaviours, your goals and reasons for engaging in weight training, and some demographic questions like age, gender, and height. Your involvement should take no longer than 20-25 minutes and we ask that you provide us with information on a single occasion. Participants will have the opportunity to be entered into a random prize draw for one of ten $50 (CAD) VISA gift cards.

I would like to assure you that this study has been reviewed and received ethics clearance through the Office of Research Services at Brock University. However, the final decision about participation is yours and you can change your mind at any time throughout the duration of the project without any repercussion.

If you are interested in participating, please take and read one of the information letters and then we can discuss the next steps if you are interested in further involvement.

Appendix D: Electronic Presentation Script

Good Morning/Evening [*insert name of coach/owner*],

My name is Matthew Burns and I am graduate student at Brock University in St. Catharines, Ontario, Canada. I am emailing you today in the hopes that your club members may be interested in participating in my thesis research. If it would be possible for you to forward the information below to your members that would be greatly appreciated. Please don't hesitate to contact me if you have any questions.

Thank you very much for your time.

Matthew Burns

[*Insert club name*] members:

My name is Matthew Burns and I am graduate student at Brock University in St. Catharines, Ontario, Canada. We are conducting a research study entitled Project R.E.P.S. (Resistance Exercise and Performance Study) designed to further our understanding of motivation for engaging in regular weight training by comparing two groups: competitive and recreational weight trainers. We would like to invite all competitive weight trainers who are interested to participate in this study. For the purpose of this study, competitive weight trainers are defined as either powerlifters or Olympic weightlifters (not bodybuilders) who weight train for the purposes of competition.

Your participation in this study will involve completing a series of questions on a survey designed specifically for this study that will take approximately 20-25 minutes of your time. Your participation is voluntary and all of the information that you provide will remain confidential. This means that we will not be sharing your personal information with any other person or party in such a manner that you could be identified as a consequence of participating in this study. As a participant, you will have the opportunity to be entered into a random prize draw for one of ten $50 (CD) VISA gift cards.

If you would like more information about the research study please visit the study website:

http://projectreps.weebly.com/

If you wish to participate in the study please click on the following link:

https://www.surveymonkey.com/s/ProjectREPS

Please direct any questions or concerns about this study to either Matthew Burns (mb07ey@brocku.ca) or Dr. Wilson (pwilson4@brocku.ca) both with the Faculty of Applied Health Sciences at Brock University using the email addresses provided. This study has been reviewed and received ethics clearance through Brock University's Research Ethics Board (File 12-099).

Thank you very much for your time and effort, it is greatly appreciated.

Respectfully submitted,

Matthew Burns, BSc Kin
Philip M. Wilson, PhD

Appendix E: Electronic Presentation Script 2

Good Morning/Evening:

I am contacting you on behalf of Dr. Philip M. Wilson and Matthew Burns who are both with the Faculty of Applied Health Sciences at Brock University. You are being invited to participate in a research project entitled "Resistance Exercise and Performance Study". The project is designed to further our understanding of why people engage in regular weight training activities as part of their exercise routine by examining two groups of individuals actively engaged in weight training: competitive and recreational weight trainers. For the purpose of this study, competitive weight trainers are defined as either powerlifters or Olympic weightlifters (not bodybuilders) who weight train for the purposes of competition, while recreational weight trainers are those individuals who train with weights in order to be fit and healthy with no previous experiences or future intentions of competing in powerlifting, Olympic weightlifting, or bodybuilding competitions.

Should you choose to participate, the information that you provide will help us understand the role of different goals and motives considered to be important for participating in weight training. Your participation in this study will involve completing a series of questions on a survey designed specifically for this study that will take approximately 20-25 minutes of your time. Your participation is voluntary and all of the information that you provide will remain confidential. This means that we will not be sharing your personal information with any other person or party in such a manner that you could be identified as a consequence of participating in this study. Participants will have the opportunity to be entered into a random prize draw for one of ten $50 (CD) VISA gift cards.

If you would like more information about the research project please visit the study website:

http://projectreps.weebly.com/

If you wish to participate in the study now please click on the following link:

https://www.surveymonkey.com/s/ProjectREPS

Please direct any questions or concerns about this study to either Dr. Wilson (pwilson4@brocku.ca) or Matthew Burns (mb07ey@brocku.ca) using the email addresses provided. This study has been reviewed and received ethics clearance through Brock University's Research Ethics Board (File 12-099).

Thank you for your time and effort, it is greatly appreciated.

Respectfully submitted,

Matthew Burns, BSc Kin
Philip M. Wilson, PhD

Appendix F: Portal/Listserv Recruitment Script

Good Morning/Evening:

I am contacting you on behalf of Dr. Philip M. Wilson and Mr. Matthew Burns who are both with the Faculty of Applied Health Sciences at Brock University. You are being invited to participate in this project entitled "Resistance Exercise and Performance Study". The project is designed to enhance our understanding about the amount of weight training activity people engage in during a typical week, as well as, their motives and goals for engaging in weight training exercises. Should you choose to participate, the information that you provide will help us gain a greater understanding of the role weight training has in the promotion of healthy exercise habits which may have key implications for health promotion and sport training initiatives. Your participation in this study will involve completing a series of questions on a survey designed specifically for this study that will take approximately 20-25 minutes of your time. Your participation is voluntary and all of the information that you provide will remain confidential which means that we will not be sharing your personal information with any other person or party in such a manner that you could be identified as a consequence of participating in this project. Participants will have the opportunity to be entered into a random prize draw for one of ten $50 (CD) VISA gift cards.

If you would like more information about the research project please visit the study website:

http://projectreps.weebly.com/

If you wish to participate in the study now please click on the following link:

https://www.surveymonkey.com/s/ProjectREPS

Please direct any questions or concerns about this study to either Dr. Wilson (pwilson4@brocku.ca) or Matthew Burns (mb07ey@brocku.ca) using the email addresses provided. This study has been reviewed and received ethics clearance through Brock University's Research Ethics Board (File 12-099).

Thank you for your time and effort, it is greatly appreciated.

Respectfully submitted,

Matthew Burns, BSc Kin
Philip M. Wilson, PhD

Appendix G: Letter of Invitation

Date: January 1st, 2013

Letter of Invitation

Title of Study: Project R.E.P.S. (Resistance Exercise & Performance Study)

Principal Investigator: Dr. Philip Wilson, Associate Professor, Dept. of Kinesiology
Principal Student Investigator: Mr. Matthew Burns, BSc Kin, Graduate Student, Faculty of Applied Health Sciences

Dear Participant,

Introduction: This project is being conducted to determine the importance of different motivational reasons for strength-based exercise that pertain to training behaviours with resistance exercises (e.g., weight training). The investigators work in the Behavioural Health Sciences Research Lab (BHSRL) which is located in the Faculty of Applied Health Sciences (Welch Hall, Room 141).

Purpose: The main purpose of this study is to determine the role of individual factors such as personal goals and motives in promoting training with strength-based exercises in adults who weight train as a part of their regular exercise routine. The secondary aim of this study is to determine the utility of different instruments for measuring exercise-related thoughts and feelings specific to resistance-training exercises. The importance of resistance-training exercises is well established in the health promotion literature for optimizing growth and development and reducing the burden of disease. Identifying the factors that can optimize participation in these strength-based exercises is an important research agenda. This study will provide insight into the role of personal factors in relation to participation in strength-based exercise.

Involvement: Your involvement would be greatly appreciated and will help to further our understanding of the role played by different factors that contribute to decisions made around exercise behaviour. If you choose to participate, we will ask that you complete a questionnaire on a single occasion. The questionnaire is expected to take approximately 20-25 minutes to complete. One sample question is: "During a typical week, how many times do you weight train?" Select demographic questions will also be queried such as age, height, and weight to determine that the individuals who participate in this research study are representative of different populations of interest to the investigators. If you choose to participate, you will be asked to complete this questionnaire using an electronic interface housed on a password protected and encrypted website (www.surveymonkey.com).

Benefits: There are a number of benefits associated with participating in this study. Everyone who participates in this study has the option to (a) receive feedback regarding the overall findings of this investigation and (b) enter their name and contact details into a random prize draw for a pre-paid VISA card valued at $50 (Canadian Dollars). Withdrawal from the study at any point in time does not preclude you from being entered into the random prize draw for one of the VISA gift cards. Feedback will be in the form of a detailed summary report of aggregate-level data pertaining to the key study questions and findings obtained from those who participated once the study is complete. Additional indirect benefits may include, but are not limited to, the following: (a) Greater awareness of your weight training habits that may be useful to you; (b) Contribution to improved assessment of weight training-related thoughts and feelings that provides information

which can be used to promote healthy living in Canadian adults; and (c) Opportunities to be involved in the research being conducted within the Behavioural Health Sciences Research Lab at Brock University. The study findings will be disseminated in academic journals and conference presentations in such a way that no participant is identified as a function of their involvement in this study. Any information that is provided from participants will be treated with confidentiality and access to all information provided in this study is restricted only to members of the research team listed in this Letter of Invitation. All recorded data will be kept on a secured internet site accessible only to members of the research team. Consistent with guidelines that control the collection and storage of scientific information in Canada, all data collected for this study will be destroyed five years following the completion of the investigation.

Participation: Participation in this study is voluntary and individuals may decline answering any question(s) that they find invasive, offensive, or inappropriate. There are no known social or physical risks associated with participation. You may choose to decline or withdraw your participation at any time throughout the course of the study and will not experience any negative consequences as a result of your decision. Once data that any participant submits as a function of their involvement in this study is received by the study investigators, the data cannot be removed from the data base upon request because the data will be anonymous and include no personal identifiers. However, your participation is needed and would be appreciated as it will improve the conclusions derived from this investigation. All data requested are anonymous in nature and will be treated with the utmost confidentiality. All summary reports emanating from this study will use data that does not identify any participant in any way or form. The following inclusion/exclusion criteria will be used to guide initial participant recruitment for this study: (a) Adults (aged 17 years or older at the time of data collection) with no current ambulatory restrictions that would impair regular strength-based exercise (i.e., weight training); (b) Willing to commit to the length of the study; and (c) Able to read and write in English. It is important to note that a portion of the data that will be requested if you participate in this study may be collected and stored on an electronic interface (www.surveymonkey.com) that is based in the United States of America and therefore is subject to American Homeland Security laws such as the Patriot Act.

Thank you for your interest and involvement in this study.

Sincerely,

Philip M. Wilson, PhD
Associate Professor
Email: pwilson4@brocku.ca
Tel: 905 688 5550 Ext. 4997

Matthew Burns, BSc Kin
Principal Student Investigator
Email: mb07ey@brocku.ca
Tel: 905 688 5550 Ext. 5564

Appendix H: Informed Consent

INFORMED CONSENT

Date: January 1st, 2013
Project Title: Project R.E.P.S. (Resistance Exercise & Performance Study)

Principal Investigator (PI): Dr. Philip Wilson, Associate Professor
Department of Kinesiology
Brock University
(905) 688-5550 Ext. 4997; pwilson4@brocku.ca

Student Principal Investigator (SPI): Matthew Burns, BSc Kin, Graduate Student
Faculty of Applied Health Sciences
Brock University
(905) 688-5550 Ext. 5564; mb07ey@brocku.ca

INVITATION
You are invited to participate in a study that involves research. The purpose of this study is to examine the role of individual factors such as motives, goals and behaviour surrounding strength-based exercise between a group of competitive and a group of recreational weight trainers. The secondary purpose of this study is to determine whether instruments assessing exercise-related thoughts and feelings can be applied specifically to weight training behaviour.

WHAT'S INVOLVED
As a participant, you will be asked to complete a series of questionnaires pertaining to your weight training behaviour, motives and goals. Demographic questions such as age, gender, height, weight, etc. will asked to determine the representation of the sample. Questions pertaining to participant's thoughts and feeling about weight training will also be asked such as "During a typical week, how many times do you weight train?" If you choose to participate, you will be asked to complete this questionnaire using an electronic interface housed on a password protected and encrypted website (www.surveymonkey.com).
Participation will take approximately 20-25 of your time on a single occasion.

POTENTIAL BENEFITS AND RISKS
Possible benefits of participation include (a) receiving aggregate feedback regarding the overall findings of this investigation and (b) entering a random prize draw for one of ten pre-paid VISA gift cards valued at $50 (Canadian Dollars). Additional indirect benefits may include, but are not limited to, the following: (a) Greater awareness of your weight training habits that may be useful to you; (b) Contribution to improved assessment of weight training-related thoughts and feelings that provides information which can be used to promote healthy living in Canadian adults; and (c) Opportunities to be involved in the research being conducted within the Behavioural Health Sciences Research Lab (BHSRL) at Brock University. There also may be risks associated with participation including questions that solicit information about health-related activities (i.e., weight training), which may invoke feelings of discomfort or anxiety in some participants upon self-reflection because they are being asked to disclose personal information.

CONFIDENTIALITY
All data collected in this study will be anonymous. Participants will not have any personal identifiers linked to data collected as a function of the study. Names and contact information may

be provided if participants wish to receive aggregate feedback pertaining to the results of the study or to be considered eligible for the random prize draw.

Data collected during this study will be stored on a password protected server or in a locked filing cabinet in the BHSRL (Welch Hall 141) for the duration of the study. All data will be secured for a period of 5-years post publication as determined by the guidelines set forth by the Tri-Council Policy Statement: Ethical Conduct for Research Involving Humans (2010) document, after which time all electronic files will be erased from any and all hard drives. Any printed materials (e.g., the list of participants requesting feedback and/or entered to win the prize draw) will be destroyed using a paper shredder upon completion of the study and announcement of the prize winners.

Access to this data will be restricted to those involved in the study, exclusively the principal investigator (Dr. Philip M. Wilson) and the principal student investigator (Matthew Burns).

VOLUNTARY PARTICIPATION

Participation in this study is voluntary. If you wish, you may decline to answer any questions or participate in any component of the study. Further, you may decide to withdraw from this study at any time and may do so without any penalty or loss of benefits to which you are entitled. However, once any participant submits their responses to the questionnaire to the study investigators, their data cannot be removed from the study because the data are anonymous and unidentifiable.

PUBLICATION OF RESULTS

Results of this study may be published in professional journals and presented at conferences. Feedback about this study regarding the motivational processes across competitive and recreational weight trainers will be available once all data has been collected and analyzed for the study. It is anticipated that this may take between 1-2 months to complete after the final set of participants have completed their involvement in the research study. For feedback summary of the results of this study please contact either Dr. Philip M. Wilson or Matthew Burns using the contact information above.

CONTACT INFORMATION AND ETHICS CLEARANCE

If you have any questions about this study or require further information, please contact Dr. Philip Wilson or Matthew Burns using the contact information provided above. This study has been reviewed and received ethics clearance through the Research Ethics Board at Brock University (File 12-099). If you have any comments or concerns about your rights as a research participant, please contact the Research Ethics Office at (905) 688-5550 Ext. 3035, reb@brocku.ca.

Thank you for your assistance in this project. Please keep a copy of this form for your records.

CONSENT FORM

I agree to participate in this study described above. I have made this decision based on the information I have read in the Information-Consent Letter. I have had the opportunity to receive any additional details I wanted about the study and understand that I may ask questions in the future. I understand that I may withdraw this consent at any time. Please click the box below stating that you agree with the information stated above and consent to participate in the study

❑ I hereby agree to participate in this research study

Appendix I: Correlations between BREQ-2R Subscales and Behaviour Items

The following correlation analysis was performed to check for simplex structure among the BREQ-2R subscales (Wilson, Rodgers & Fraser, 2002; Markland & Tobin, 2004). Since one item from the identified regulation subscale was removed from CWT (competitive weight training group) due to reliability issues, this can effect the validity of inferences made from the resultant items retained in the subsequent analyses.

Simplex Correlation Structure between BREQ-2R Subscales

	CWT						
Construct	1	2	3	4	5	6	7
1. External regulation	-						
2. Introjected regulation	.18*	-					
3. Identified regulation	-.05	.14	-				
4. Integrated regulation	.06	.41**	.42**	-			
5. Intrinsic regulation	.03	.13	.24**	.35**	-		
6. Behaviour Item 1	.07	-.04	.17*	.11	.10	-	
7. Behaviour Item 2	.12	.11	.20**	.27**	.17*	.75**	-
	RWT						
Construct	1	2	3	4	5	6	7
1. External regulation	-						
2. Introjected regulation	.18*	-					
3. Identified regulation	-.17*	.56**	-				
4. Integrated regulation	-.18*	.37**	.73**	-			
5. Intrinsic regulation	-.24*	.27**	.70**	.66**	-		
6. Behaviour Item 1	-.12	.16*	.25**	.23**	.15*	-	
7. Behaviour Item 2	-.13	.14	.33**	.30**	.22**	.75**	-

Note. * $p < .05$; ** $p < .01$; $N_{CWT} = 171$; $N_{RWT} = 193$; The identified regulation subscale contained 3 items in the CWT and 4 items in the RWT; BREQ-2R = Behavioural Regulation in Exercise Questionnaire-2R (Markland & Tobin, 2004; Wilson et al., 2006); Behaviour Item 1 = "During a typical week, how many times do you weight train?"; Behaviour Item 2 = "On how many of the past 7 days have you performed weight training exercises?"

Appendix J: Correlations between EMI-2 Subscales and Behaviour Items

The following correlation analysis was performed to check the association among the EMI-2 subscales (Markland & Ingledew, 1997). Since two items from the challenge subscale, two items from the strength and endurance subscale and one item from the muscular development subscale were removed from CWT (competitive weight trainers) due to reliability issues, this can effect the validity of inferences made from the resultant items retained in the subsequent analyses.

Correlation Matrix of EMI-2 Subscales

	CWT								
Construct	1	2	3	4	5	6	7	8	9
1. Enjoyment	-								
2. Challenge	.60**	-							
3. Competition	.55**	.45**	-						
4. Strength and Endurance	.28**	.32**	.26**	-					
5. Weight Management	.14	.14	-.05	-.05	-				
6. Appearance	.29**	.18*	.10	.11	.60**	-			
7. Muscular Development	.20**	.12	.08	.19*	.24**	.63**	-		
8. Behaviour Item 1	.19*	.10	.24**	.09	-.15	-.04	-.04	-	
9. Behaviour Item 2	.31**	.17	.26**	.12	.00	.11	.06	.73**	-
	RWT								
Construct	1	2	3	4	5	6	7	8	9
1. Enjoyment	-								
2. Challenge	.70**	-							
3. Competition	.55**	.55**	-						
4. Strength and Endurance	.52**	.55**	.32**	-					
5. Weight Management	.16*	.28**	.10	.21**	-				
6. Appearance	.38**	.46**	.27**	.48**	.58**	-			
7. Muscular Development	.43**	.36**	.40**	.57**	-.07	.38**	-		
8. Behaviour Item 1	.15*	.05	.09	.07	-.20	-.06	.29**	-	
9. Behaviour Item 2	.20**	.12	.21**	.13	-.10	.00	.23**	.75**	-

Note. * $p < .05$; ** $p < .01$; $N_{CWT} = 167$; $N_{RWT} = 193$; The challenge subscale contained 2 items in the CWT and 4 items in the RWT; The strength and endurance subscale contained 2 items in the CWT and 4 items in the RWT; The muscular development subscale contained 3 items in the CWT and 4 items in the RWT; EMI-2 = Exercise Motivations Inventory 2 (Markland & Ingledew, 1997) ; Behaviour Item 1 = "During a typical week, how many times do you weight train?"; Behaviour Item 2 = "On how many of the past 7 days have you performed weight training exercises?"

Appendix K: Multivariate Analyses of Variance using all Subscale Items

Main Analysis using all Subscale Items: Motives for weight training

Differences between the groups on motives for weight training were investigated using a one-way MANOVA for a second time to include all subscale items of the BREQ-2R that were removed from the initial analyses due to reliability issues. This second analysis provides an assurance that the resultant differences between the groups were not due to the omission of any BREQ-2R items. Group status (CWT or RWT) remained the independent variable and motives (all items of the BREQ-2R subscales) the dependent variables. The results of this analysis revealed statistically significant multivariate differences between the CWT and RWT (F (5, 367) = 30.87, $p < .01$, Wilks' Lambda = 0.70, $\eta_p^2 = 0.30$). Statistically significant differences occurred between the groups on all motivational subscales ($p < .01$, $\eta_p^2{}_{Range} = 0.08 – 0.23$) with the exception of introjected regulation (F (1, 371) = 2.20, $p = .14$; $\eta_p^2 = 0.01$). In congruence with the prior MANOVA, the CWT reported greater mean differences on identified regulation, integrated regulation, intrinsic motivation and introjected regulation and the RWT reported greater mean scores on external regulation.

Main Analysis using all Subscale Items: Weight training goals

An additional one-way MANOVA was conducted for weight training goals to again ensure that the removal of multiple items from the EMI-2 was not contributing to the differences between groups. Group status (CWT or RWT) and weight training goals (all items from the EMI-2 subscales) remained the independent and dependent variables respectively. Significant differences between the CWT and RWT on the combined dependent variables were determined (F (7, 365) = 44.59, $p < .01$, Wilks' Lambda = 0.54, $\eta_p^2 = 0.46$). The CWT reported higher means than the RWT on the enjoyment, challenge and competition goals, but not on the strength and endurance goal as observed in the prior analysis. The RWT displayed higher means on the strength and endurance, weight management, appearance and muscular development goals. Mean

differences for each subscale were statistically significant ($p < .01$) with partial eta squared values ranging from 0.04 to 0.33.