The Effect of Gender-Role Stereotyping on Motivation for and Participation in Exercise

by

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Abstract

This document examines how gender role stereotypes influence men and women’s motivation for, participation in and performance during resistance and aerobic training. In study one, moderated multiple mediation models examined how participants’ \( n = 225 \) implicit perceptions of resistance and aerobic training influenced their motivation for and participation in these activities. In study two, performance and self-handicapping were measured as participants \( (n_{Part \, A} = 210; \, n_{Part \, B} = 26) \) completed a resistance exercise task following a stereotype threat manipulation. In men, implicit perceptions of the masculinity of resistance training were associated with lower self-determined motivation for and participation in resistance training, but masculine stereotypes did not influence performance on resistance training tasks. In women, masculine gender-role stereotypes did not affect resistance training motivation, participation, or performance. Findings indicate that masculinity poses a significant barrier to men’s persistence in resistance training but has little effect on women.
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Chapter 1: Introduction

Most women are not meeting physical activity guidelines for resistance training (Centers for Disease Control and Prevention, 2011). This inactivity puts them at risk for mental and physical health problems including cardiovascular disease, osteoporosis, depression and anxiety (Dunn, Trivedi, & O’Neal, 2001; Winett & Carpinelli, 2001). As such, researchers are focused on understanding why women avoid resistance training (e.g. Dworkin, 2001; Salvatore & Marecek, 2010). It has been proposed that the masculine culture of resistance training may deter women (Dworkin, 2001; Salvatore & Marecek, 2010). However, these authors have only studied masculinity as it pertains to muscularity (e.g. Dworkin, 2001; Salvatore & Marecek, 2010).

Based on social role theory, masculinity may pose a barrier independent of muscularity, but little work has been done to study the phenomenon further (Eagly, Wood, & Diekman, 2000; Matteo, 1986).

Researchers endorsing social role theory (Eagly & Steffen, 1984) propose that the traditional separation of men and women into breadwinner and homemaker causes individuals to develop expectations of appropriate behaviour for men and women by observing these roles (Eagly et al., 2000). Individuals integrate these expectations, called gender roles, into their self-concept and regulate their behaviour to correspond to these identities (Eagly et al., 2000). Social roles have been shown to affect helping behaviours, aggression, and non-verbal communication (Eagly, 1987) and may also explain exercise behaviour (Koivula, 1995, 2001; Matteo, 1986). For example, individuals consistently rate some exercises as appropriate for men (e.g., weightlifting), appropriate for women (e.g., aerobic dance, yoga), or gender neutral (e.g., running, cycling; Matteo, 1986) and individuals participate more often in gender role-congruent
versus incongruent physical activities (Koivula, 1995). As such, women who perceive activities such as resistance training as appropriate for men might avoid resistance training. This proposition has not been tested empirically.

One of the mechanisms that link avoidance behaviour to gendered activities may be domain disidentification. Highly gender-identified individuals often anticipate performing poorly in domains where their gender stereotypically performs poorly (Steele, Spencer, & Aronson, 2002; van Laar & Derks, 2003). In order to protect their social identity in case of failure, these individuals pre-emptively discount the value of high performance in the incongruent domain (van Laar & Derks, 2003). This process is called domain disidentification (van Laar & Derks, 2003). Disidentified individuals rate gender-incongruent domains as less important (Woodcock, Hernandez, & Schultz, 2013), indicate less interest in these domains (Davies, Spencer, Quinn, & Gerhardstein, 2002; Davies, Spencer, & Steele, 2005), and report lower intentions to pursue these domains (Woodcock et al., 2013). In many cases, disidentification leads to avoidance of the incongruent domain altogether (Steele et al., 2002; Woodcock et al., 2013). Given the masculine culture of resistance training (Salvatore & Marecek, 2010), domain disengagement likely influences women’s motivation and participation for resistance training. However, this phenomenon has not been examined directly.

Domain disidentification represents an important consequence of gender-role stereotypes. However, exposure to these stereotypes can also have acute effects. For example, women who are primed with gender-role stereotypes often perform worse on subsequent tasks than women who were not primed (Chalabaev et al., 2013; Hively & El-Alayli, 2014). These performance detriments may be explained by stereotype threat (Steele & Aronson, 1995). In instances of stereotype threat, individuals feel apprehensive about confirming a negative stereotype about
their social group (i.e., women are weak; Steele & Aronson, 1995). This apprehension may cause individuals to engage in self-handicapping (Steele et al., 2002; Stone, 2002), which worsens their performance (Steele & Aronson, 1995). Self-handicapping is a process whereby individuals erect barriers to their own success (e.g., not practicing enough) in order to attribute failure to external (e.g., not enough practice) rather than internal (e.g., not athletic) causes. Stereotype threat, and its associated mechanisms, have been demonstrated in athletic tasks: Individuals exposed to negative stereotypes about their social groups perform worse (e.g., less accurate shots in golf and basketball, slowed speed in soccer) than individuals not exposed to stereotypes (Beilock, Jellison, Rydell, McConnell, & Carr, 2006; Chalabaev, Sarrazin, Stone, & Cury, 2008; Chalabaev et al., 2013; Hively & El-Alayli, 2014; Stone, 2002). However, stereotype threat has not been explored in resistance training.

To fill the gaps in the literature, the present research was designed to examine the association between gender-role stereotyping and men and women’s disidentification and experience of stereotype threat in exercise, primarily resistance training. It was hypothesized that perceiving resistance training as gender-incongruent would lead women to report lower motivation, and less frequency of training. Furthermore, women were expected to underperform in resistance training tasks after being confronted with negative stereotypes about women’s strength. To examine the purpose, two studies were performed. In study one, the influence of exercise-related gender role endorsement was associated with motivation for and participation in exercise. Specifically, men and women’s implicit perceptions of the masculinity and pleasantness of resistance and aerobic training were used as a proxy for gender-role endorsement and associated with their motivation for and participation in aerobic and resistance exercise. In study two, participants completed a resistance-training task under conditions of blatant and
subtle stereotype threat. Performance and self-handicapping were measured. Determining the
effect of gender role stereotypes on women’s resistance training contributes to the growing
literature of social role stereotypes in exercise. But more importantly, this research provides an
explanation for women’s avoidance of resistance training and a target for future interventions.

Definitions

_Aerobic exercise training:_ Any voluntary training of the cardiovascular system, such that heart
rate and breathing rate increase (e.g., running, swimming, cycling).

_Disidentification:_ Detaching one’s self-worth from performance in a certain domain, such that
success or failure on domain-specific tasks does not influence self-perceptions.

_Domain identification:_ the degree to which a domain is important to the actor’s self-concept.

_Gender-role stereotyping:_ Expecting someone to act in a certain way because of his/her gender

_Group identification:_ The degree to which a person values his/her membership in a social group

_Resistance exercise training:_ Any voluntary training of skeletal muscles against some form of
external resistance (e.g., body weight, bands, weights)

_Self-handicapping:_ Creating barriers to one’s own success as to influence attributions for failure
and success.

_Stereotype threat:_ Poor performance resulting from the fear of confirming negative stereotypes
about one’s in-group

_Stigma consciousness:_ the degree to which an individual is concerned about being judged
stereotypically
Chapter 2: Literature Review

Women and Resistance Training

Resistance training is any voluntary activation of specific skeletal muscles against some form of external resistance (e.g., body mass, free weights, exercise bands, machines; Winett & Carpinelli, 2001). Regular resistance training increases the strength and functional fitness of participants, and decreases their risk of developing a multitude of physical and mental illnesses (Deschenes & Kraemer, 2002; Dunn et al., 2001; Winett & Carpinelli, 2001). The Canadian Society for Exercise Physiology recommends two sessions of resistance training per week, using all major muscle groups for at least one set (Canadian Society for Exercise Physiology, 2011). Despite these recommendations and the benefits, few men (26%) and even fewer women (18%) self-report meeting physical activity guidelines for strength training (Centers for Disease Control and Prevention, 2011). Furthermore, approximately 50% of Canadian women, compared to 30% of men, aged 20 – 39, are not meeting Canadian standards for musculoskeletal health (Shields et al., 2010). Given the numerous health benefits of resistance training, it is pertinent to increase levels of resistance training in Canadians, particularly young and middle-aged women.

Some authors suggest that resistance training’s masculine culture may deter women (Dworkin, 2001; Salvatore & Marecek, 2010). However, these authors have primarily studied masculinity as it relates to a muscular body (i.e., large muscles are masculine; Dworkin, 2001; Salvatore & Marecek, 2010). For example, Dworkin (2001) suggests that building large muscles is a transgression against femininity, and Salvatore and Marecek (2010) suggest that building muscle is a distinctly masculine activity. This research is valuable in that demonstrates a role for of gender stereotypes in determining exercise behaviour. Nevertheless, as suggested by social
role theory, women’s perceptions of resistance training masculinity may affect training
independent of muscularity (Eagly & Steffen, 1984; Matteo, 1986; Steele et al., 2002).

An Introduction to Social Role Theory

Social role theory (Eagly & Steffen, 1984) proposes that differences in the behaviour of
men and women originate from the division of men and women into the workforce; women
usually possessing a homemaker role and men adopting the role of the breadwinner (Eagly &
Steffen, 1984). Although more women are entering the workforce, these gender differences in
labour still emerge; men’s occupations yield higher levels of authority and income and women’s
occupations are generally supportive (Eagly et al., 2000). By observing these differences,
individuals come to believe that the homemaker and breadwinner roles reflect inherent
characteristics of men and women and develop expectations of men and women based on these
roles (Eagly & Steffen, 1984). Generally, men are expected to be agentic (i.e., masterful,
assertive, competitive and dominant), while women are expected to be communal (i.e., friendly,
unselfish, emotionally expressive; Eagly & Steffen, 1984). In addition to affecting how men and
women are perceived, gender roles also influence the behaviour of the individuals who hold
them.

Individuals integrate their gender role into their personal gender identity and regulate
their behaviour to correspond to these identities (Eagly et al., 2000). Individuals report more
interest in pursuing activities congruent with their gender role (Davies et al., 2002, 2005), and
report more positive emotions when performing role-congruent versus role-incongruent
behaviour (Witt & Wood, 2010). Individuals may also perform better on gender-congruent
versus incongruent activities (Spencer, Steele, & Quinn, 1999), and engage more often in
gender-congruent activities (Matteo, 1986; van Laar & Derks, 2003). The motivational,
behavioural, and performance consequences of gender roles in physical activity will be the focus of this thesis.

**Social Roles in Exercise.** There is considerable evidence that gender roles influence the exercise behaviour of men and women (Koivula, 1995, 2001; Matteo, 1986). Exercises can be divided into those that are appropriate for men (e.g., weightlifting, wrestling, football), appropriate for women (e.g., aerobic dance, gymnastics, yoga), and gender neutral (e.g., running, cycling, sailing; Matteo, 1986). Feminine physical activities are those which allow women to participate while fulfilling their communal social role (e.g., aesthetically pleasing, high precision), while masculine sports are associated with the agentic nature of male gender-roles (e.g., danger, high speed; Koivula, 2001). Individuals report more experience with gender-congruent exercises than non-congruent exercises (Matteo, 1986), and perform better when an exercise is gender-congruent (Chalabaev, Sarrazin, et al., 2008; Hively & El-Alayli, 2014). This research provides preliminary evidence that gender roles influence exercise motivation, performance and behaviour.

Given that resistance training is a primarily seen as masculine physical activity, while aerobic training is primarily seen as gender-neutral (Koivula, 1995; Matteo, 1986), the primary purpose of this thesis is to examine how gender roles influence men and women’s resistance and aerobic training motivation, performance and behaviour. A two-study design is used to examine how gender roles and stereotypes influence (1) men and women’s motivation to participate in resistance and aerobic training and their training habits, and; (2) men and women’s performance on an exercise task under conditions of stereotype threat.
The Effect of Gender Roles on Resistance Training Motivation and Participation

Women report that resistance training is not consistent with their fitness goals (Salvatore & Marecek, 2010), and participate in resistance training at a lower rate than men (Centers for Disease Control and Prevention, 2011). This gender gap in motivation and participation may, in part, result from gender role stereotyping. Research in academic and professional domains suggests that women’s motivation to participate in masculine-typed activities is lower than their motivation to participate in feminine-typed activities (Davies et al., 2002, 2005; van Laar & Derks, 2003). This motivational gap is likely due to a psychological phenomenon called disidentification (van Laar & Derks, 2003).

Disidentification most commonly occurs in response to an upward social comparison between one’s ingroup and an outgroup (van Laar & Derks, 2003). This comparison threatens an individual’s social identity because he/she is part of a group that is underperforming (van Laar & Derks, 2003). In order to maintain a positive social identity in the face of upward social comparison, the individual must (a) improve him- or herself, (b) improve how his/her ingroup is perceived, or (c) disidentify (van Laar & Derks, 2003). When organizational or biological barriers prevent individual or group improvement, individuals will discount the value of high performance in the threatening domain (i.e. disidentify; van Laar & Derks, 2003). In doing so, the individual is able to protect his/her social identity by creating a disconnect between performance in the threatening domain and his/her social identity (van Laar & Derks, 2003). Disidentified individuals rate the threatening domain as less important (Woodcock et al., 2013), indicate less interest in the domain (Davies et al., 2002, 2005), and report lower intentions to continue in the domain (Woodcock et al., 2013). In many cases, disidentification leads to avoidance of the threatening activity altogether (Steele et al., 2002; Woodcock et al., 2013).
Despite preliminary evidence that individuals are less motivated (Salvatore & Marecek, 2010), and participate less often in gender-incongruent versus congruent exercise (Matteo, 1986), the effect of gender role congruence on exercise disengagement has yet to be examined directly. Furthermore, data on gender congruence and exercise is dated (Matteo, 1986). Given changes to the modern fitness landscape, including increasing participation levels in women (Centers for Disease Control and Prevention, 2011), it is important to examine whether gender congruence still exerts an effect on exercise performance and motivation.

**Moderators of Disidentification**

The degree to which a social identity threat results in disidentification varies depending on the individual. Certain traits, like high group identification and high stigma consciousness, make individuals more vulnerable to disidentification.

**Group identification.** The degree to which an individual feels committed to a stigmatized group (i.e., group identified) may affect the extent to which he or she disidentifies with socially threatening domains. High identifiers tend to remain loyal to their ingroup when stigmatized, while low identifiers tend to distance themselves from their ingroup in order to enhance their personal identity (van Laar & Derks, 2003). Because low identifiers are willing to distance themselves from their stigmatized ingroup, they are less likely to disidentify with threatening domains (van Laar & Derks, 2003). Conversely, high identifiers are unwilling to distance themselves from their group, and rely on cognitive strategies (i.e., disidentification) to improve their social identity (van Laar & Derks, 2003). Therefore, when examining gender roles in exercise, it is extremely important to understand the degree to which individuals are identified with their gender.
Stigma consciousness. Individuals must first sense a threat to their social identity in order to begin the disidentification process (van Laar & Derks, 2003), and individuals who notice more social identity threats are more apt to disidentify (Woodcock et al., 2013). Stigma consciousness represents individuals’ tendency to notice social identity threat (Pinel, 1999), and individuals with high levels of this trait are more prone to disidentification (Woodcock et al., 2013).

Social roles, stereotype threat, and physical activity performance

In addition to feeling disidentified with gender-incongruent activities, many individuals perform poorly on gender-incongruent tasks. Specifically, women who are primed with negative stereotypes about their gender’s performance on a task perform significantly worse on that task than women who were not stereotyped (Chalabaev, Sarrazin, et al., 2008; Chalabaev et al., 2013; Hively & El-Alayli, 2014). For example, when women are confronted with negative stereotypes about women’s athletic performance, they perform significantly worse on a soccer dribbling task. This effect, called stereotype threat, has been demonstrated in over 100 published experiments (Nguyen & Ryan, 2008), many of which tested athletic skill (Beilock et al., 2006; Chalabaev, Sarrazin, et al., 2008; Hively & El-Alayli, 2014; Stone, Lynch, Sjomeling, & Darley, 1999).

The cognitive mechanisms that underlie stereotype threat have been extensively studied. In essence, stereotype threatened individuals feel apprehensive about confirming a negative stereotype about their ingroup, and this apprehension worsens their performance (Steele & Aronson, 1995). On well-practiced tasks, like sport and exercise, a desire to disconfirm the negative stereotype may lead an individual to explicitly monitor his/her performance (Spencer, Logel, & Davies, 2016). Explicit monitoring focuses the individual’s attention on skill execution, which is usually beneficial, but actually worsens performance on well-practiced tasks (Beilock et
al., 2006; Spencer et al., 2016). Stereotype threat is also evident, albeit more subtly, in simple activities where explicit monitoring is unlikely to influence performance (Chalabaev et al., 2013). In these scenarios, stereotype threat may interfere with the preparatory processes involved in task execution (Chalabaev et al., 2013; Stone, 2002). Preparatory failures are examples of self-handicapping, an ego-protective strategy whereby individuals attempt to influence attributions for poor performance by erecting barriers to their own success. By engaging in self-handicapping, athletes create an external attribution for their poor performance; if they do poorly on a task, they can attribute the failure to poor preparation rather than poor ability (Spencer et al., 2016; Stone, 2002). If they do well on the task, they have overcome obstacles on their way to success, making the performance more commendable (Stone, 2002). Sport and exercise performance are susceptible to performance detriments due to both explicit monitoring and self-handicapping. It is likely that the effects of stereotype threat on sport and exercise performance are due to one or both of these phenomena.

Although the effects of stereotype threat have been measured extensively in sport (Beilock et al., 2006; Chalabaev, Sarrazin, et al., 2008; Hively & El-Alayli, 2014; Stone, 2002), only two exercise-related tasks (i.e., balance and lower body force production) have been studied (Chalabaev et al., 2013; Stone et al., 2009). Despite considerable evidence that resistance training is a masculine domain (Koivula, 1995; Matteo, 1986) where women are likely to experience stereotyping (Dworkin, 2001; Salvatore & Marecek, 2010), the effect of stereotype threat on resistance training performance has yet to be examined. The purpose of the second study was to examine whether stereotype threat influence women’s performance on a resistance task.
Dispositional moderators of stereotype threat.

As with disengagement, there are dispositional moderators of the effect of stereotyping on performance. For example, individuals must be engaged in the domain, identified with their social group, and moderately-to-highly stigma conscious (Spencer et al., 2016).

Domain disengagement. As discussed previously, many individuals disidentify from gender-incongruent activities, especially those in which they expect to be stereotyped (van Laar & Derks, 2003). Domain disidentification and domain disengagement can be conceptualized as separate points on the same ego withdrawal continuum (Steele et al., 2002). Disengagement is the immediate and reversible ego withdrawal response that occurs when individuals are confronted with negative stereotypes. Disidentification characterizes the habitual ego withdrawal response that occurs in response to chronic stereotyping. Both disengaged and disidentified individuals are less vulnerable to the effects of stereotype threat than engaged/identified individuals (Spencer et al., 2016; Steele & Aronson, 1995; Steele et al., 2002). Identified and engaged individuals put more pressure on themselves to do well in threatening situations than disidentified and disengaged individuals (Steele & Aronson, 1995). This pressure subverts their performance (Steele & Aronson, 1995).

Group Identification. As asserted previously, individuals vary in how much they feel committed (i.e., identified) to their stigmatized ingroup (van Laar & Derks, 2003). Highly-identified individuals have strong motivation to maintain a positive image their in-group, because this image reflects onto their self-concept (Schmader, 2002). Conversely, individuals who are not identified with their ingroup feel less pressure to maintain this positive image (Schmader, 2002). The pressure that group-identified individuals feel to maintain a positive
standing may result in explicit monitoring and self-handicapping, therefore worsening their performance (Beilock et al., 2006; Stone, 2002).

**Stigma consciousness.** As discussed previously, stigma consciousness represents the degree to which individuals expect to be stereotyped (Pinel, 1999). Individuals with high stigma consciousness are more vulnerable to stereotype threat because they are more aware of stereotype relevance and/or more concerned about being judged stereotypically than others (Brown & Pinel, 2003; Spencer et al., 2016).

**Situational moderators of stereotype threat.**

**Task Difficulty.** In both athletics and academics, difficult tasks are more vulnerable to threat than simple tasks (Hively & El-Alayli, 2014; Steele et al., 2002). Steele et al. (2002) hypothesize that perceiving difficulty with the task gives credibility to the alleged stereotype.

**Task Diagnostic Ability.** The most threatening tasks are those that are diagnostic of ability (e.g., Steele & Aronson, 1995; Steele et al., 2002). That is, participants must believe that success or failure on the test truly reflects their ability. Steele et al. (2002) assert that diagnostic tests make the negative stereotype salient and motivate the individual to disconfirm it, leading to poor performance.

**Stereotype Relevance.** The perceived threat must also be relevant to the task at hand. For example, when a golf task is framed as diagnostic of “general sports performance,” white men perform better than when the test is framed as diagnostic of “natural athletic ability.” (Stone, 2002). Assuming white men are stereotypically less naturally athletic than black men, framing the task as diagnostic of general sport performance nullifies the effect of negative stereotyping. The negative stereotype surrounding natural athletic ability is no longer relevant, and therefore no longer threatening (Steele et al., 2002).
General Conclusion.

Social role theory proposes that certain social roles have been designated appropriate for women while others are designated for men (Eagly et al., 2000). Exercise is susceptible to gender role classification (Koivula, 1995; Matteo, 1986). Specifically, resistance training is often classified as masculine and incongruent with the feminine social role (Koivula, 2001; Matteo, 1986; Salvatore & Marecek, 2010). This gender-incongruence may worsen women’s motivation, participation and performance in resistance training (Steele et al., 2002; van Laar & Derks, 2003). Given the health benefits of regular resistance training (Winett & Carpinelli, 2001), it is important to examine this possibility. Determining whether gender-role stereotypes influence women’s resistance will contribute to the growing literature of social roles in exercise and sport. But more importantly, this research will provide an explanation for women’s avoidance of resistance training (Salvatore & Marecek, 2010) and a target for future interventions.

Purpose and Hypotheses

Purpose. To examine the effects of gender-role stereotyping on motivation for, participation in, and performance during resistance training and aerobic training exercise.

Research Questions. (1) Do individuals’ implicit attitudes regarding exercise pleasantness and gender-congruence affect their motivation for and participation in exercise? (2) Does stereotype threat influence men and women’s performance and/or self-handicapping on (a) a plyometric task or (b) a strength task?

Hypotheses. Based on the theories of disidentification (van Laar & Derks, 2003) and stereotype threat (Steele & Aronson, 1995) and empirical evidence (Chalabaev, Sarrazin, et al., 2008; Davies et al., 2005; Stone, 2002; Woodcock et al., 2013), (1) Individuals who implicitly
rate an exercise (i.e., resistance or aerobic training) as gender-congruent and/or pleasant will report: (a) higher self-determined motivation for that activity, and; (b) more frequent participation in that activity; (2) Women primed with negative stereotypes about women’s performance on a strength or plyometric task will (a) engage in more self-handicapping, and; (b) perform worse than women who are not exposed to the stereotype.
Chapter 3: The Effect of Gender Appropriateness on Physical Activity Motivation and Participation

Abstract

The purpose of the present study was to examine the association between implicit perceptions of the masculinity and pleasantness of aerobic and resistance training and motivation for and participation in these activities. Participants \((n = 170)\) completed an adapted version of the Affect Misattribution Procedure and measures of motivation for and participation in aerobic and resistance training. Moderated mediation analyses were used to determine whether motivation for exercise mediated the relationship between implicit perceptions of resistance and aerobic training masculinity and participation. The direct and indirect effects of motivation on the association between implicit perceptions of resistance training masculinity and participation were moderated by gender; in men, perceptions of masculinity were associated with fewer weekly minutes of resistance training and this effect was mediated by autonomous motivation, \(95\%CI [-286.29, -44.63]\). In men and women, the association between implicit perceptions of resistance training pleasantness and resistance training was mediated by autonomous motivation \(95\%CI_{\text{women}} [.13, 321.30], 95\%CI_{\text{men}} [.03, 319.86]\). There were no significant relationships between implicit ratings of aerobic training pleasantness and masculinity and motivation or behaviour. These findings provide encouraging evidence that perceptions of masculinity do not affect women’s participation in exercise. However, perceptions of resistance training masculinity may be threatening to men, resulting in lower levels of participation.

Keywords: exercise, physical activity, health, threatened masculinity theory, self-determination theory, affect misattribution procedure
Implicit evaluations of gender influence participation in and motivation for resistance training.

Despite the numerous mental and physical health benefits of regular aerobic and resistance training (Dunn et al., 2001; Winett & Carpinelli, 2001), it is reported that 50 to 85% of North Americans are not active enough to gain health benefits (Colley et al., 2011; Hallal et al., 2012). Understanding the reasons for these low levels of exercise is challenging, especially since current models of exercise behaviour account for only 18 to 45% of the variance in activity (Edmunds, Ntoumanis, & Duda, 2006; Hagger, Chatzisarantis, & Biddle, 2002; Schwarzer et al., 2007). Given that the predominant models of exercise behaviour focus on consciously controlled constructs such as self-efficacy, outcome expectancies, and intentions (Biddle & Mutrie, 2008), the limitations of these models suggest that effortful, conscious processing is not a sufficient predictor of exercise behaviour. Proponents of dual systems models, like the Reflective and Impulse Model (RIM; Strack & Deutsch, 2004) propose that behaviour is affected by the effortful and conscious processing of the reflective system and by an automatic, fast-operating and subconscious impulse system. The impulse system requires very little cognitive effort, relying instead on spreading activation through a variety of cognitive and affective elements (Strack & Deutsch, 2004). The impulse and reflective systems usually work in conjunction; however, when cognitive demand is high the impulse system may be the only determinant of behaviour (Strack & Deutsch, 2004). This model suggests that implicit cognition may exert influence on behaviour that cannot be accounted for by the current socio-perceptual models. The inclusion of implicit processes as a predictor of exercise behaviour may improve scientific understanding of exercise behaviour.

Most researchers who have explored both implicit and explicit perceptions of exercise have found weak or no correlation between implicit and explicit attitudes (Banting, Dimmock, &
Furthermore, implicit attitudes have predicted unique variance in exercise beyond that explained by explicit attitudes (Banting et al., 2009; Brand & Schweizer, 2015; Calitri, Lowe, Eves, & Bennett, 2009; Conroy, Hyde, Doerksen, & Ribeiro, 2010; Forrest, Smith, Fussner, Dodd, & Clerkin, 2015; Keatley et al., 2012). For example, attitudes regarding the valence of exercise (i.e., good/bad) have been shown to influence behaviour beyond the effects of explicit attitudes (e.g., importance, benefit; Calitri et al., 2009), self-efficacy, outcome expectancies, perceived behavioural control, and intentions (Conroy et al., 2010). Implicit attitudes regarding exerciser self-schema (i.e., me/not me implicit associations) also predict variance in exercise behaviour above that predicted by explicit exerciser self-schema (i.e., "I am an exerciser"; Banting et al., 2009). These researchers provide evidence that implicit processes are distinct predictors of exercise behaviour beyond explicit processes. However, these studies do not encompass the full range of potential implicit processes affecting exercise behaviour, and there is limited research on resistance and aerobic training as separate exercise behaviours. It is possible that other implicit attitudes, such as those informed by social stereotypes, may also affect exercise participation.

Implicit perceptions of gender-appropriateness may influence exercise motivation and behaviour. There is strong evidence that individuals consider certain exercises to be gender-congruent or incongruent (Koivula, 1995; Matteo, 1986). For example, weight lifting is an explicitly masculine activity, while aerobic exercise is primarily gender-neutral (Koivula, 1995; Matteo, 1986). These perceptions of gender-appropriateness influence participation; individuals report more experience with gender-neutral and gender-congruent exercise than gender-incongruent exercise (Matteo, 1986). However, the relationship between perceptions of gender-
appropriateness and exercise behaviour has only been examined by asking participants for their explicit ratings of exercise gender-appropriateness. Implicit perceptions regarding masculinity may explain variance above that explained explicitly (e.g., Conroy et al., 2010), partially because these perceptions may not be within conscious control (Strack & Deutsch, 2004) and are not subject to self-presentation bias (Payne et al., 2005). Thus, assessing implicit perceptions of gender biases may aid understanding of the differences in exercise motivation and participation between men and women.

Less is known about the relationship between perceptions of gender appropriateness and motivation for behaviour. It is possible that individuals are less motivated to perform gender-incongruent compared to gender-congruent exercises (Davies et al., 2002, 2005; van Laar & Derks, 2003), but this relationship has not been examined. Drawing from the social identity threat literature, individuals may be less motivated for gender-incongruent activities because they believe they might fail (van Laar & Derks, 2003), or because they find these activities intrinsically less rewarding (Witt & Wood, 2010). As such, motivation might be a mechanism that explains the association between perceptions of gender congruency and participation in target behaviours. Based on self-determination theory, motivation is conceptualized on a continuum from amotivation to extrinsic to intrinsic motivation. Amotivation is lacking any intention to engage in behaviour (Ryan & Deci, 2002). Extrinsic motivation can take several forms including external (i.e., participating for external reward), introjected (i.e., participating to avoid feelings of guilt), identified (i.e., participating because one values the outcomes), and integrated (i.e., feeling the behaviour is a critical component of one’s identity) regulation (Ryan & Deci, 2002). Finally, intrinsic motivation is participating in an activity for the enjoyment and satisfaction inherent in the activity itself (Ryan & Deci, 2002). Amotivation is related to poor
exercise participation, while external and introjected regulations are associated with short-term but not long-term exercise participation (Teixeira, Carraça, Markland, Silva, & Ryan, 2012). Identified, integrated and intrinsic motivation are all related to increased exercise over time, and are often grouped together as autonomous forms of motivation (Teixeira et al., 2012). Drawing from literature on implicit perception, social identity and self-determination theory, the present study examines whether implicit perceptions of the pleasantness and masculinity of aerobic and resistance training influence participants’ motivational regulations for these activities and whether motivation perceptions mediate the association between implicit perceptions and exercise behaviour.

In addition to gender, there are additional important factors that could affect the association between implicit perceptions of gender-appropriateness and motivation for and participation in exercise. For example, some individuals report more sensitivity to being stereotyped than others (Pinel, 1999). Individuals high in this tendency, called stigma consciousness, expect to be stereotyped often and may avoid gender-incongruent activities for fear of being stereotyped (Pinel, 1999). As such, it is important to control for stigma consciousness in the analyses, because gender stereotypes may exert a strong influence on some participants but not others.

Furthermore, individuals vary in the extent to which they process incoming information based on gender, and the extent to which they let assessments of gender appropriateness influence their behaviours (Bem, 1981). An individual’s tendency to process their experience in terms of gender is called their sex-type (Bem, 1981), and the tendency to perform only gender-congruent exercise is stronger in sex-typed individuals (Matteo, 1986). Sex type is not necessarily gender-congruent: a female can have a male sex type and vice versa, and some
individuals exhibit both (androgynous) or neither (un-differentiated) sex type (Bem, 1981). Theoretically, sex-typed individuals are more likely to identify exercise as gender congruent or incongruent, and let this assessment influence their decision to participate (Matteo, 1986). Given that sex type does not necessarily match gender and that cases of mismatch may affect behaviour (Bem, 1981; Matteo, 1986), sex type will be included as a moderator in relevant analyses in the present paper.

The purpose of the present research is to examine the relationship between implicit perceptions of aerobic and resistance training pleasantness and gender-appropriateness on participation in and motivation for these activities. The following hypotheses were tested: (1) Women will implicitly rate resistance training more masculine and less pleasant than men do; (2) there will be no difference on implicit ratings of masculinity and pleasantness for aerobic training; (3) for men, there will be a positive relationship between implicit ratings of masculinity for aerobic and resistance training and self-reported motivation for and participation in these activities, this relationship will significantly differ in direction from the association between masculinity, motivation and participation in women; (4) for women, there will be a negative relationship between implicit ratings of masculinity of aerobic and resistance training and self-reported motivation for and participation in in these activities, this relationship will significantly differ in direction from the association between masculinity, motivation and participation in men; (5) for both genders, implicit ratings of pleasantness will be associated with increased motivation for and participation in these activities; and, (6) the effect of implicit perceptions of pleasantness and masculinity on exercise will be mediated by motivation regulations, and moderated by gender. Specifically, increased self-determined motivation will mediate the positive association between perceptions of masculinity and participation in men, and low self-
determined motivation will mediation this relationship in women. High levels of self-determined motivation are also expected to mediate the relationship between perceptions of pleasantness and participation.

**Method**

**Participants**

Participants \((N = 225)\) were recruited from classes at a large Canadian university and through word-of-mouth. Participants were excluded if they were able to read Chinese characters \((n = 4)\), indicated odd response patterns (i.e., pressing the same button throughout the entire experiment; \(n = 1\)), or did not include a participant number on their post-test survey \((n = 4)\) which precluded data matching. All participants reported normal or corrected-to-normal vision. In the original sample, participants were between ages 18 to 28 \((M = 20.0\) years; SD = 1.8), primarily female (54.2%), Caucasian (48.6%) or Chinese (11.1%), and completing their second year of their undergraduate degrees (82.4%). In the final sample, the participants were on average 19.94 years old (SD = 1.80), primarily female (54.1%), Caucasian (48.2%) or Chinese (12.4%), and completing the second year of their undergraduate degrees (82.9%).

**Measures**

**Demographic Measures.** Participants reported their gender, age, ethnicity, and education.

**Motivation.** The Behavioural Regulation in Exercise Scale III (BREQ-3) is a 24-item measure of participants’ motivations to exercise, including amotivation \((n_{items} = 4)\), extrinsic \((n_{items} = 4)\), introjected \((n_{items} = 4)\), integrated \((n_{items} = 4)\), identified \((n_{items} = 4)\), and intrinsic \((n_{items} = 4)\) motivation (Markland & Tobin, 2004; Wilson, Rodgers, Loitz, & Guilia, 2006). Participants indicate their agreement with statements regarding motivations to exercise on a 0
(not true for me) to 4 (very true for me) scale, and scores within each subscale are averaged. The internal consistency coefficients (Cronbach’s α) for the subscale items ranged from α = .80 to .92.

In this study, participants also completed a modified BREQ-III for resistance training. Specifically, the item stems were modified such that the context was resistance training instead of exercising. The same number of items was used to assess all motivation regulations and the same item Likert-type scale was used. The items from the modified BREQ-III for resistance training showed internal consistency coefficients for each subscale ranging from α = .84 to .94.

**Physical Activity Behaviour.** The short-version International Physical Activity Questionnaire (IPAQ) is a four-item measure of participants’ time (measured in minutes and number of days) spent in vigorous- and moderate-intensity activity over the last seven days (Craig et al., 2003). An additional item was added to assess time spent resistance training. Specifically, participants were asked how many days per week and minutes per day they engaged in resistance training (e.g., weight training, bodyweight exercises, resistance bands). Scores on the original short IPAQ correlate moderately with accelerometer data for the same time period (ρ = 0.30; Craig et al., 2003).

**Sex Role.** The modified short-version Bem Sex Role Inventory (BSRI; Choi, Fuqua, & Newman, 2009) is an 18-item measure of participants’ identification with traditionally masculine (n_items = 9) and feminine (n_items = 9) traits. Two items that fail to load on masculine or feminine factors were removed from the original 30-item scale, and no filler items (n = 10) were used (Choi et al., 2009). Participants rate the degree to which each trait is characteristic of themselves from 1 (never or almost never true for me) to 7 (always or almost always true for me). Consistent with Bem (1977), scores for each subscale are summed and participants who score above the median on one of the two sex roles are categorized as being that role. Participants who
score above or below the median on both feminine and masculine traits are characterized as androgynous and undifferentiated respectively. The item scores of the short-form BSRI have Cronbach’s alpha (α) internal consistency coefficients of $\alpha = .81$ (masculine) and $\alpha = .90$ (feminine).

**Design and Procedure**

_Procedure._ Following ethical approval, participants were recruited for a study examining how men and women “perceive and process images.” Upon providing informed consent, participants completed an adapted Affect Misattribution Procedure (AMP; Payne, Cheng, Govorun, & Stewart, 2005) on a computer and then completed demographic information and measures of exercise (aerobic and resistance training) motivation, current exercise behaviour, gender identification, and stigma consciousness.

_Affect misattribution procedure (AMP)._ This protocol was used to measure implicit perceptions of gender-appropriateness and pleasantness of aerobic and resistance training. In the AMP, participants’ response to a target character is strongly influenced by their semantic associations with a subliminally presented prime (Blaison, Imhoff, Huhnel, Hess, & Banse, 2012). The presentation of the prime increases the accessibility of semantically or experientially related concepts (Blaison et al., 2012). The participant misattributes his/her fluency with these concepts to the target image, resulting in a target rating that is influenced by the prime (Blaison et al., 2012). For example, a participant who associates resistance training with masculinity will be more likely than other participants to rate the target following an resistance training prime as masculine.

Participants were seated at a computer and asked to rate the masculinity and pleasantness of 60 Chinese ideographs (Payne et al., 2005). During each trial, a Chinese ideograph (target)
was presented on the screen for 1000 ms, followed by a visual noise mask, which remained on
the screen until participants indicated a response. In one block, participants were asked to
categorize the target as masculine or feminine by pressing the “s” or “k” keys on a standard
QWERTY keyboard. In another block, participants rated the pleasantness or unpleasantness of
the target in the same manner. Each block was 120 trials long; therefore, the same target was
rated twice per block. Blocks were separated by a mandatory one-minute break. These two
blocks, totaling 240 trials, were presented in random order following five practice trials during
which participants rated the masculinity/femininity of the target.

Unperceivable to the participants, another image (prime) was presented for 33\(^1\) ms on the
screen immediately preceding the target (Fig. 1). The primes were 52 colour photographs
depicting aerobic exercise (e.g., running track, treadmill, bicycle; \(n = 18\)), resistance training
(e.g., dumbbell, barbell rack, Olympic lifting platform; \(n = 16\)), or control environments (e.g.,
city streets, offices, stores; 18 images). None of the primes contained people. Control trials were
used to account for participants’ tendencies to rate all target stimuli in similar ways (e.g., bias to
pushing the right key, bias to rating pleasant, bias to rating masculine). Primes were pre-tested on
an unrelated convenience sample of subjects (\(n = 10\); 5 female). They rated whether the primes
depicted aerobic environments, resistance environments or neither. Exercise environments that
were correctly identified by eight or more participants were used. Control primes (\(n = 48\)) were
also rated in two batches (24 images in each batch) by a convenience sample (\(n_1 = 74, n_2 = 63\)) on
a five-point Likert scale from 1 (masculine) to 5 (feminine) for masculinity/femininity and
pleasantness/unpleasantness. Only neutral (\(M = 2.4 - 3.6\) on both scales) control images were
used. Prime order, target order, and prime-target pairings were randomized, within and between

\(^1\) 33ms was used as a prime length because it is the shortest prime duration that can be reliably
presented on a 60 Hz standard monitor.
subjects. Each prime was repeated a total of four times, twice per block. For ease of explanation, the results section reports ratings of resistance and aerobic training primes. However, it is important to note that the primes were presented subliminally, and participants were actually rating the targets that followed the primes.

Following the procedure, participants completed a funnel-debriefing interview where they were asked if they noticed anything unusual, if they saw anything on the screen that was not a Chinese character or the noise mask and, if so, what they saw. Participants who indicated any awareness, included participants who only reported seeing flashes of colour \((n = 55)\) were removed from further analyses, leaving a final sample of \(n = 170\).

Student MATLAB 2014 and Psychtoolbox 3.0.12 were used for stimulus presentation and logging. All stimuli were presented on either a 13-inch MacBook pro, a 27-inch OSX iMac, or a 21-inch Windows 7 computer, all with a screen refresh rate of 60 Hz. All images were presented in the middle of the screen.

**Statistical Analyses**

AMP scores were calculated as a proportion. Specifically, AMP scores for masculinity were calculated using the following equation:

\[
AMP = \frac{\text{number of control primes rated masculine}}{\text{total number of control primes}} - \frac{\text{number of resistance or aerobic training primes rated masculine}}{\text{total number of resistance or aerobic training primes}}
\]

AMP scores for pleasantness were calculated in a similar manner.

To examine whether implicit perceptions of the masculinity of exercise differed between men and women, 2 (Gender: male female) × 2 (Prime: resistance training, aerobic training) repeated measures ANOVAs compared the proportion of masculinity ratings on the AMP. Similar 2 (Gender: male female) × 2 (Prime: resistance training, aerobic training) repeated
measures ANOVAs compared the proportion of trials where men and women rated each of resistance training and aerobic training primes as pleasant.

The second main research question was to examine the relationships between implicit perceptions, motivation, and exercise behaviour and the role of gender in moderating the associations. In preliminary analyses, the associations among implicit perceptions, motivation, and exercise behaviour were conducted in sex-specific models using zero-order correlations. The motivational variables used in the analyses comprised external, introjected and autonomous motivation. The autonomous motivation regulation was a combined score of integrated, identified and intrinsic motivation given previous research (Teixeira et al., 2012), moderate to strong inter-correlations ($r > .67, p < 0.01$), and high Cronbach’s alpha coefficients with all items from these scales combined ($\alpha_{\text{aerobic training}} = .92; \alpha_{\text{resistance training}} = .96$). Fischer Z was used to compare the relationships between men and women.

For the main analysis, the Preacher and Hayes multiple mediation (PROCESS) macro was used in SPSS to test the regulations as mediators of the relationship between perceptions of resistance and aerobic training masculinity and pleasantness and participation in these activities, and to examine whether gender moderated this relationship. Multiple moderated mediation models with bootstrapping ($k=5000$; Hayes 2009) were used to test whether the association between (Model 1) implicit perceptions of resistance training masculinity and resistance training participation; (Model 2) implicit perceptions of resistance training pleasantness and resistance training participation; (Model 3) implicit perceptions of aerobic training masculinity and aerobic training participation; and, (Model 4) implicit perceptions of aerobic training pleasantness and aerobic training participation were mediated by motivation for physical activity. As per Hayes (2013), raw scores were used rather than centered scores. The index of moderated mediation was
used to examine whether the indirect effect differed between males and females; confidence intervals that do not include zero indicate significant moderation or mediation (Hayes, 2015).

**Results**

Only participants who were unaware of the presentation of the primes were included in statistical analyses \( n = 170 \). Excluded participants did not significantly differ from the final sample on gender, age, ethnicity, education, or any of the variables of interest (i.e., image rating, exercise frequency, stigma consciousness, and sex role). Based on analysis of missing data (0.36%), the missingness was random and missing item scores were computed using expectation maximization. Values greater or less than 3.29 standard deviations from the mean were identified as outliers and truncated based on established criteria (Tabachnick & Fidell, 2013). After truncating outliers, all variables, except amotivation, were normally distributed (Tabachnick & Fidell, 2013). Amotivation for aerobic activity was not normally distributed and no transformation was feasible for normalizing the scores. The scores remained in all calculations because of their theoretical relevance (van Laar & Derks, 2003). However, aerobic amotivation scores should be interpreted with caution in the preliminary analysis. In the main analyses, the bootstrapping procedure used is robust to violations of the assumption of normality (Hayes, 2009). Descriptive statistics are presented in Table 1 and correlations are presented in Table 2.

**Preliminary Analyses**

**Gender differences in implicit cognitions, and relationships among cognitions, motivation, and behaviour.**

*Mean-level differences.* The effect of gender \( (F(1,168) = 2.95, p = .09, \eta_p^2 = .02) \), prime \( (F(1,168) = 1.27, p = .26, \eta_p^2 = .01) \), or interaction effect \( (F(1,168) = 1.11, p = .29, \eta_p^2 = .01) \) on
masculinity ratings was not significant. There were no significant main effects of gender, \( F(1,168) = .28, p = .60, \eta_p^2 = .00 \), prime, \( F(1,168) = 1.65, p = .20, \eta_p^2 = .01 \), or interactions for the effect of gender and prime, \( F(1, 168) = .38, p = .54, \eta_p^2 = .00 \), on perceptions of pleasantness. Means are presented in Table 1.

**Relationships between implicit perceptions and exercise motivation.** Post-hoc sensitivity analyses using G-power revealed sufficient power to detect small-to-moderate effect sizes (\( r_{female} = .36; r_{male} = .38 \)), given \( \alpha = .05 \) and \( Power = .95 \). Results are presented in Table 2.

Perceptions of aerobic training pleasantness were not associated with any of the motivational variables. In women, perceptions of resistance training pleasantness were associated with introjected motivation (\( r = .23 \)) for resistance training. In men, perceptions of resistance training pleasantness were associated with autonomous motivation for resistance training (\( r = .22 \)). A comparison of these coefficients for men and women suggest that these relationships did not differ between genders Fischer \( z > 1.17, p > .05 \).

In men, implicit perceptions of aerobic training masculinity were negatively associated with external regulations for aerobic training (\( r = -.27 \)). Furthermore, men’s perceptions of resistance training masculinity were negatively associated with autonomous motivation for resistance training (\( r = -.27 \)). In women, perceiving aerobic training as masculine was associated with more introjected motivation (\( r = .25 \)), and this relationship differed significantly from the association in men (\( r = -.08 \), Fischer \( z = 2.14 \). The direction of the relationship between resistance training masculinity and autonomous motivation differed between men (\( r = -.27 \)) and women (\( r = .03 \)), Fisher \( z = 1.96 \).

**Relationships between implicit cognition and exercise behaviour.** Results are displayed in Table 2. For men, implicit perceptions of resistance training masculinity were negatively
associated with training time \((r = - .33)\). This correlation was significantly stronger in men than in women \((r = .20)\), Fischer \(z = 2.83, p < .01\). In women, implicit perceptions of resistance training were unrelated to training time (Fig. 2 & 3). There were no significant correlations predicting aerobic training from implicit perceptions of the pleasantness or masculinity of training for either gender (Fig. 4 & 5).

**Main Analysis**

**Do motivation regulations mediate the relationship between implicit perceptions of masculinity, pleasantness, and training frequency?**

**Resistance Training.** There was a significant and moderated direct effect of resistance training masculinity on training time, *Point Estimate* = -309.74, 95% CI [-603.39, -16.10], such that the direct effect was significant for men, *Point Estimate* = -215.09, 95% CI [-419.71, -10.46], but not women. Indirect effects are presented in Table 3. The indirect effect of autonomous motivation on the relationship between perceptions of masculinity and participation was significantly negative for men only, *Point Estimate* = -140.70, 95% CI [-286.29, -44.63], but the index of moderated mediation did not show a difference in the indirect effect of autonomous motivation for men versus women\(^2\). There was no direct effect of implicit perceptions of resistance training pleasantness on resistance training participation, and no evidence of moderation on the direct effect. Autonomous motivation was a significant indirect mediator of the relationship between perceptions of pleasantness and participation for both men, *Point Estimate* = 147.72, 95% CI [.03, 319.86] and women, *Point Estimate* = 122.14, 95% CI [.13, 321.30] (Table 3). This relationship was not moderated by gender\(^2\).

\(^2\) Results were similar using sex role, rather than gender, as a moderator.
Aerobic training. There was no direct effect of implicit perceptions of aerobic training masculinity on participation, and no evidence of moderation on the direct effect. The strength of the indirect effect of autonomous motivation differed significantly between genders, Index of Moderated Mediation = -217.89 [-501.99, -24.88]. Autonomous motivation had a negative indirect effect on the relationship between implicit perceptions of masculinity and participation in men, Point Estimate = -85.47, 95%CI [-239.19, 31.98] and a positive indirect effect in women, Point Estimate = 132.42, 95%CI [-31.76, 348.74] (Table 4). These partial indirect effects were not significant. Also, there was no direct effect of implicit perceptions of aerobic training pleasantness on participation, and no evidence of moderation on the direct effect. There were no significant indirect effects and no significant moderation of indirect effects (Table 4).

The effects of sex role

Given the unexpected finding of the effect of perceived masculinity on participation in resistance training for men, a post-hoc test of sex role as a moderator of the relationship between these variables was conducted in men. Sex role was expected to moderate the relationships as men who identify as feminine or undifferentiated (49% of the present sample) may not be motivated to participate in activities that they deem masculine. A dichotomous BSRI variable was created by combining feminine and undifferentiated men, and by combining masculine and androgynous men. Sex-role (BSRI) was tested as a moderator of the association between implicit perceptions of resistance training masculinity and participation for the males in the sample. Mean-centered predictor variables (i.e., BSRI, masculine response following resistance training primes) were entered in the first step of the regression, followed a BSRI × Masculine response interaction in the third step. The interaction term did not explain significant variance in resistance training time above the other predictors.
**Analyses using aware participants**

To understand whether the implicit nature of the prime affected the findings, the 46 participants (54% female) who reported awareness of the prime were analyzed separately from the rest of the sample. In line with the implicit findings, there were no differences in the pleasantness and masculinity ratings of primes between males and females or aerobic and resistance training. Most of the relationships observed did not reach significance. Autonomous motivation did not mediate the relationship between implicit perceptions of resistance training masculinity and participation. However, introjected motivation mediated the relationship between masculinity and resistance training in men, *Point Estimate* = -172.73, *95%CI* [-691.66, -1.96].

**Discussion**

The purpose of this study was to examine how perceptions of the masculinity and pleasantness of exercise were associated with individuals’ motivation and participation. This objective was examined using the affect misattribution procedure — which addresses calls from Hyde, Doerksen, Ribeiro, and Conroy (2010) to use implicit procedures other than the Implicit Association Task to measure implicit perceptions exercise. Generally, implicit perceptions of resistance and aerobic training masculinity were associated with less self-determined motivation and less participation in men. Furthermore, implicit perceptions of resistance training pleasantness were associated with more self-determined motivation, leading to increased participation, in both men and women. Overall, these data indicate that implicit perceptions beyond pleasantness influence resistance training participation and that masculinity may pose significant barriers to men’s participation.
Gender differences in implicit perceptions

Contrary to the first hypothesis, there was no gender difference on implicit perceptions of the masculinity and pleasantness of resistance and aerobic training. Women were expected to perceive resistance training as more masculine and less pleasant than men because women’s self-reported barriers to resistance training often include muscularity (Dworkin, 2001) and masculinity (Salvatore & Marecek, 2010), and women tend to participate in resistance training at lower rates than men (Centers for Disease Control and Prevention, 2011). As expected, there was no gender difference in implicit masculinity ratings for aerobic training.

These findings may reflect modern fitness trends of bodyweight and strength training among both men and women (Thompson, 2015). Considering the increasing popularity of resistance training (Thompson, 2015), and the unexpected no gender difference between implicit perceptions, it may be that women are beginning to overcome the masculine gender role usually assigned to resistance training and — at least implicitly — see resistance training as pleasant and gender-congruent. Nonetheless, it is also possible that women in this sample were more engaged in resistance training and as such reported this behaviour as more pleasant. Specifically, 73% of the women in this sample reported resistance training and this is much higher than the statistics reported for women in general population studies (18%; Centers for Disease Control and Prevention, 2011). Further research is needed to determine whether women in the general population have the same implicit associations with resistance training as the women sampled in the present study.

Contrary to the hypotheses, neither men nor women perceived resistance training as more masculine or pleasant than aerobic training. This finding may reflect the changing fitness landscape. An increasing number of women are engaging in resistance training (Centers for
Disease Control and Prevention, 2011). As more women are seen participating in resistance training, the masculine stereotype applied to this behaviour may be weakening (Gawronski & Bodenhausen, 2006). However, it is important to note that the present sample was primarily comprised of kinesiology students, and these students may be more exposed to women performing resistance training than the general population (Saville et al., 2014), and may therefore possess fewer gender-role stereotypes about this type of training than the general Canadian population (Gawronski & Bodenhausen, 2006).

**The association between implicit perceptions, motivation, and behaviour**

The second aim of the present study was to determine whether self-determined motivation mediated the relationships between implicit perceptions of exercise masculinity and pleasantness and participation in these activities.

**Masculinity and Resistance Training.** Contrary to the original hypothesis, men’s implicit perceptions of resistance training masculinity were associated with lower autonomous motivation scores, leading to less participation. In follow-up analyses, sex role did not moderate the relationship between men’s perceptions of resistance training masculinity and their participation, indicating that this relationship is not stronger in feminine-typed or undifferentiated men. Although these findings are not consistent with the hypotheses, the findings in men are congruent with threatened masculinity theory (Mishkind, Rodin, Silberstein, & Striegel-moore, 1986). Researchers propose that increasing gender equality has left men with fewer places to assert their dominance over women, resulting in some men developing a compensatory need to publicly display their masculinity (Mishkind et al., 1986). This need may be embodied through a highly muscular body, which differentiates men from the traditionally thin female body (Hunt, Gonsalkorale, & Murray, 2013; Mishkind et al., 1986). This desire for
masculine muscularity can lead to less self-determined motivation and less participation in resistance training in two ways.

First, men who desire a muscular body may become ego-involved in resistance training (McCreary, Saucier, & Courtenay, 2005; Ryan, Koestner, & Deci, 1991). In other words, building a muscular body through resistance training may become central to their self-esteem (Ryan et al., 1991). Ego-involvement is an internally controlling process, which is related to worsened autonomous motivation (Ryan et al., 1991). Furthermore, ego-involved individuals who perceive themselves as above average on target activities (i.e., stronger than average, more muscular than average) show less persistence on these activities than task-oriented individuals (Ryan et al., 1991). In the present study, physical self-perceptions were not measured and so the relationship between perceiving oneself as above average and participation cannot be confirmed. Future research on the associations between masculinity and resistance training should measure participants’ physical self-perceptions to determine if perceiving oneself as meeting the masculine ideal is associated with less persistence in resistance training.

Research on threatened masculinity theory has also demonstrated that men who experience a masculinity threat are less confident in their physical strength, less motivated to pursue resistance training, and self-report engaging in fewer muscle-building activities (Hunt et al., 2013). The researchers hypothesize that when men experience a threat to their masculinity, they experience a decrease in their confidence about their physical strength, but are motivated to deny feeling these concerns (Hunt et al., 2013). This explanation justifies why, although men report less confidence in their strength, they do not report intention to improve strength in response to threat (Hunt et al., 2013). In the present study, participants who implicitly endorsed masculine gender-roles may have activated semantically associated concepts including
hypermasculinity (i.e., excessive displays of masculinity through physicality, or aggression; Hunt et al., 2013) and hypermuscularity (i.e., body type characterized by well-developed upper body tapering to a narrow waist; Mishkind et al., 1986). To the extent that this activation posed a masculinity threat to male participants, they may have reported lower self-determined motivation and participation in resistance training.

In women, there was no significant association between perceptions of resistance training masculinity and participation in or motivation. Although unexpected, this finding agrees with some literature stating that, although muscularity is masculine, it is not necessarily anti-feminine (Gruber, 2007; McCreary et al., 2005). That is, a woman may perceive muscularity and associated behaviours (e.g., resistance training) as masculine without necessarily seeing them as contrary to her feminine identity (McCreary et al., 2005). This finding contrasts findings proposed by researchers who cite muscularity as a transgression against femininity (Dworkin, 2001). However, there is some evidence that the ideal female body is shifting away from the thin-ideal towards a more muscular body ideal (Gruber, 2007). Furthermore, there is some evidence that individuals will engage in counter-stereotypic behaviour if they believe the benefits (e.g., health, a toned body) outweigh the costs (e.g., social rejection, feeling uncomfortable; Eagly et al., 2000). It appears that this might be the case in the female participants in this study, who were not deterred by the masculine culture of resistance training.

**Pleasantness and Resistance Training.** Autonomous regulation was a significant mediator of the relationship between implicit perceptions of resistance training pleasantness and participation for women and men. Furthermore, despite having no indirect effect on participation, implicit perceptions of the pleasantness of resistance training were associated with higher introjected motivation for women. The mediation effect is consistent with the premise of
self-determination theory such that autonomous motivation is characterized by pleasant associations (i.e., enjoyment, value) and increased participation in an activity (Ryan, Williams, Patrick, & Deci, 2009; Teixeira et al., 2012). Given that implicit perceptions of pleasantness are presumably associated with enjoying and valuing an activity, this finding provides basic evidence of implicit-explicit congruence on attitudes towards resistance training, and demonstrates that implicit pleasant perceptions of an activity are related to self-determined motivation and increased participation in that activity. Findings regarding introjected motivation were unexpected, and may be a result of using the Affect Misattribution procedure, which measures semantic association rather than affective reaction (Blaison et al., 2012). This nuance in the test means that women responding “pleasantly” may reflect that women have pleasant associations with the consequences of resistance training (e.g., strength, health) without necessarily enjoying it more. Women who understand the benefits of an activity, but do not engage in it, may experience higher levels of introjected motivation (Markland & Tobin, 2004). Overall, these findings suggest that implicit attitudes are consistent with explicit attitudes regarding the pleasantness of sport and that implicit perception of pleasantness influences resistance training behaviour.

Implicit perceptions of masculinity and pleasantness and participation in aerobic training. Perceiving aerobic training as masculine resulted in less external motivation in men, but did not effect behaviour. The indirect effect of autonomous motivation on the relationship between perceptions of masculinity and moderate-to-vigorous physical activity differed between men and women, such that the indirect effect was negative in men and positive in women. Perceptions of aerobic training pleasantness were unrelated to motivation in both genders, and did not result in changes in participation levels. An interpretation of these findings indicates that
implicit perceptions of masculinity and pleasantness are not the primary motivators of men and women’s engagement in aerobic training but, like resistance training, being ego-involved in aerobic performance is maladaptive for men.

These findings are likely due to the wide range of aerobic activities available to individuals. The primes presented in the present study were of a small subset of traditional aerobic activities (i.e., running, cycling, swimming, aerobics, skipping). These activities do not encompass the full range of aerobic activities, and participants who found these activities unpleasant or gender-incongruent may have participated in other forms of moderate-to-vigorous physical activity (i.e. sport, rowing, cross-fit). For example, a male participant who perceived running and aerobics as feminine and unpleasant might still accrue moderate-to-vigorous physical activity through sport or some other activity (Matteo, 1986). The measure of moderate-to-vigorous physical activity used in the present study did not differentiate active minutes accrued in the primed activities versus other activities (IPAQ, 2004). Therefore, it is not possible to draw conclusions about whether implicit perceptions of the pleasantness and masculinity of the primes are associated with participation in the primed activities. Based on the current study findings, implicit perceptions of running, cycling, swimming and aerobics are not associated with total participation in moderate-to-vigorous activities. In the future, researchers should use more specific measures of moderate-to-vigorous physical activity in order to determine whether implicit perceptions of a specific activity (e.g., running) are associated with participation in that activity.

Limitations and Future Directions

It is important to acknowledge the limitations of this study. First, the cross-sectional nature of this study limits conclusions regarding the causal direction of relationships. This paper
presents the argument that implicit perceptions influence behaviour, but it is possible that physical activity influences implicit perceptions. For example, individuals who participate in physical activity may form associations between the self and activity, leading to more positive implicit evaluations of physical activity (Gawronski & Bodenhausen, 2006). The sample characteristics also limit generalizability of the findings. Specifically, participants were primarily kinesiology students who may have different implicit perceptions of gender-roles than the general population; it is possible that these individuals are more aware of the benefits of resistance training for both genders, and have more exposure to female resistance trainers. If this is the case, the participants in the present study may have possessed fewer gender-role stereotypes surrounding exercise than the general population (Gawronski & Bodenhausen, 2006).

Certainly this sample reported more activity than the general population. Future research should replicate these findings using a broader population and perhaps monitor how implicit associations change in new exercisers.

Overall these findings suggest that implicit perceptions of masculinity are an important predictor of physical activity for men but not women. These results suggest women may have overcome masculine stereotypes regarding resistance training, and may not feel that participation is a violation of their feminine identity. However, the masculine culture of resistance training may be a deterrent for men because it may threaten masculinity and promote internally-controlling motivation. Despite the limitations of the sample and cross-sectional design, these findings contribute to a growing body of literature on implicit perceptions of physical activity, and provide evidence that implicit perceptions beyond traditionally studied valence may partially explain physical activity behaviour. Furthermore, perceptions of masculinity should be further
studied as a barrier to physical activity in men. This finding provides important and interesting future directions that may offer novel ways of promoting resistance training to men.
Chapter 4: Bridging Text

The findings of Chapter 3 do not support on the traditionally held belief that women avoid resistance training because they perceive it as a largely masculine activity (Dworkin, 2001; Salvatore & Marecek, 2010). Rather, they may reflect the modern fitness landscape in which strength training, and associated muscular bodies, are gaining acceptance among women (Centers for Disease Control and Prevention, 2011; Gruber, 2007; Thompson, 2015). This hopeful finding is countered by the negative effect of exercise-related gender role stereotypes on men. For men, implicit endorsement of gender roles led to less self-determined motivation for and participation in resistance training. These findings suggest that men may be ego-oriented in resistance training, participating only to develop their masculine identity and ceasing participation once masculinity (i.e., muscularity) has been established. Furthermore, the masculine culture of resistance training may present a threat to men’s masculinity, resulting in lower intention to engage in resistance training.

In Chapter 3, I explored the motivational and behavioural consequences of gender role and affective stereotypes in resistance training. In Chapter 5, the relationship between gender role stereotypes and resistance training is examined further. However, rather than studying the motivational consequences, the research reported in Chapter 5 examines the acute consequences of exposure to exercise-related gender role stereotypes. More specifically, the research reported in Chapter 5 was designed to examine how stereotype threat affects men and women’s self-handicapping and performance on resistance training tasks.
Chapter 5: Stereotype Threat in Resistance Training

Abstract

The purpose of the present study was to determine whether exposure to stereotypes about women’s strength influenced men and women’s performance and self-handicapping on resistance training tasks. Participants completed a resistance-training task under conditions of blatant (Study 2a; \( n = 230 \)) and subtle (Study 2b; \( n = 30 \)) stereotype threat. Performance (Studies 2a and 2b), claimed self-handicapping (Study 2a), and behavioural self-handicapping (Study 2b) were measured. No differences in performance or self-handicapping were observed between stereotyped and control groups in either study, indicating an absence of stereotype threat. Although these results are consistent with other studies of stereotype threat and its association with muscular strength, it may be that social facilitation overrode any effects of the threat manipulation in Study 2a and/or the subtle threat manipulation was not strong enough to elicit stereotype threat effects in Study 2b. An interpretation of these findings provides encouraging preliminary evidence that women’s performance on resistance training tasks is unaffected by masculine stereotypes surrounding resistance training. However, findings should be replicated with improved experimental design.
Does Stereotype Threat Influence Women’s Performance on Resistance Training Tasks?

Although the popularity of resistance training (e.g., weight training, bodyweight exercises) has increased in recent years (Thompson, 2015), gender differences in motivation for and participation in resistance training still exist (Centers for Disease Control and Prevention, 2011; Salvatore & Marecek, 2010). Several studies have shown that women are less comfortable performing resistance training (Salvatore & Marecek, 2010), see resistance training as less relevant to their fitness goals (Salvatore & Marecek, 2010), and train less often than men (Centers for Disease Control and Prevention, 2011). These gender differences are troubling given the numerous benefits of resistance training for mental (Dunn et al., 2001) and physical health (Winett & Carpinelli, 2001).

To explain these gender differences in participation and motivation, research has emphasized the role of social stereotypes (e.g., Chalabaev, Stone, et al., 2008; Dworkin, 2001; Matteo, 1986; Salvatore & Marecek, 2010), particularly the stereotype that resistance training is masculine (Koivula, 1995). Much of this research has focused on women’s desire to avoid muscularity, leading to undertraining or avoidance of resistance training altogether (Dworkin, 2001; Salvatore & Marecek, 2010). These studies demonstrate that gender stereotypes can influence exercise participation. Nevertheless, fear of muscularity may not be the sole gender-related deterrent to resistance training. Indeed, research on stereotype threat suggests that individuals, regardless of their perceptions of muscularity, may underperform in masculine-typed physical activities (Chalabaev, Sarrazin, et al., 2008; Chalabaev et al., 2013; Davies et al., 2002). According to stereotype threat theory (Steele & Aronson, 1995; Steele et al., 2002), when a stereotype about a group’s ability (e.g., women are weak) is made relevant, target individuals

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3 This statement is made with the full recognition that men’s bodies have a larger skeletal muscle mass than women’s (Janssen, Heymsfield, Wang, & Ross, 2000). However, inherent muscular differences between men and
may fear being evaluated based on the stereotype. This threat increases self-consciousness about performing correctly (Beilock et al., 2006), and promotes self-handicapping (see below; Keller, 2002; Stone, 2002); both of which worsen the performance of the targeted individual.

Stereotype threat has been examined in over one hundred studies (Nguyen & Ryan, 2008), many of which used physical ability as the targeted outcome (Beilock et al., 2006; Chalabaev, Sarrazin, et al., 2008; Chalabaev et al., 2013; Stone et al., 1999; Stone, 2002). However, most of these studies have examined sport performance (Beilock et al., 2006; Chalabaev, Sarrazin, et al., 2008; Hively & El-Alayli, 2014; Stone et al., 1999; Stone, 2002), rather than exercise (Chalabaev, Stone, et al., 2008; Chalabaev et al., 2013). It is therefore unclear whether stereotype threat may affect exercise, in addition to sport, performance. The primary purpose of this study was therefore to examine whether exposure to gender stereotypes, specifically the stereotype that women are weaker than men, influences men and women’s resistance training performance.

The second objective of this study was to examine the mechanisms of stereotype threat in resistance training. Some literature suggests that threatened individuals may turn to self-handicapping to protect their positive self perceptions following stereotype threat (Keller, 2002; Steele et al., 2002; Stone, 2002). During self-handicapping, individuals erect barriers to their own success so that they can excuse their poor performance by attributing failure to situational rather than dispositional shortcomings (Spencer et al., 2016). Both claimed (e.g., “I have been stressed lately”; Keller, 2002) and behavioural (e.g., practicing less; Stone, 2002) self-handicapping have been demonstrated under threat conditions. Within resistance training, women may self handicap by avoiding heavy weights (Dworkin, 2001), and/or avoiding effective

women are not as pronounced as is commonly assumed (33% in the lower body; Janssen et al., 2000) and women’s bodies adapt to progressive training in the same way that men’s do (Deschenes & Kraemer, 2002).
muscle-building exercises (i.e. bench press; Salvatore & Marecek, 2010). Given that progressive overload is essential for increasing muscular strength (Winett & Carpinelli, 2001), it is important to understand whether the masculine stereotypes surrounding resistance training are preventing women from effectively training their muscular strength.

The present study sought to determine how stereotypes about women’s inferior strength influence men and women’s performance on resistance training tasks. As a secondary purpose, we examined how exposure to this stereotype affected self-handicapping in both genders. In Study 2a, participants completed a jump squat task in groups. The task was framed as being a measure of aerobic capacity, strength, or recovery time (control). Participants’ performance was measured in addition to their self-reported self-handicapping. In Study 2b, participants believed they were validating a new fitness test, which was expected to vary based on gender (experimental) or psychological factors (control). Participants completed this task individually, and performance was recorded. Behavioural measures of self-handicapping were measured.

**Study 2a**

**Method.**

**Participants.** Participants ($N = 230$) were recruited from a second year kinesiology course at a large extremely prestigious Canadian university with the most intelligent and handsome professors. Participants were primarily female (61.7%), ranged in age from 18 to 47 ($M = 19.42$) and reported resistance training 2.26 times per week on average.

**Measures.**

**Demographics.** Participants reported their age, sex, weight, height, the number of days they resistance trained per week, and the number of minutes of each training session. Consistent
with exercise guidelines for data truncation (IPAQ, 2004), any session lasting longer than 180 minutes was truncated to 180 minutes.

**The Self-Handicapping in Exercise Questionnaire (SHEQ).** The SHEQ is a 20-item measure of self-handicapping in exercise (Shields, Paskevich, & Brawley, 2003). The SHEQ contains three subscales pertaining to different types of self-handicapping: (1) psychological and scheduling claims ($n_{items} = 10$; getting to the gym is a hassle); (2) training-related claims ($n_{items} = 7$; I feel limited by my exercise capabilities), and; (3) health-related claims ($n_{items} = 3$; sometimes I am afraid I will injure myself while exercising). Participants respond to items on a Likert scale from 1 (never) to 5 (all of the time). The mean of each subscale is taken, and higher scores indicate more self-handicapping. In the present study, the SHEQ displayed acceptable ($\alpha = .73 – .88$) internal consistency.

**Athletic Disengagement Scale (ADS).** The ADS is designed to measure the importance of performance in sport to participants’ perceptions of self-worth. It is an adapted version of the disengagement subscale from the Intellectual Orientation Inventory (Stone et al., 1999). The ADS consists of three items scored from 1 (disagree strongly) to 7 (agree strongly): “No athletic test will ever change my opinion of how athletic I am;” “How I do athletically has little relation to who I really am;” “I really don’t care what tests say about my athletic ability.” (Stone et al., 1999). Items are averaged, with higher scores indicating more disengagement. The internal consistency in the present study was acceptable ($\alpha = .72$).

**Procedure.** Participants were randomly assigned to one of three manipulation conditions: (1) men expected to outperform women ($n = 69$); (2) women expected to outperform men ($n = 81$), or (3) control ($n = 80$). In the condition where men outperform women, participants were told they would be collecting data on, “the gender differences in performance
on an explosive strength test over two trials,” and that men were expected to outperform women because they tend to be stronger. In the women better condition, participants were told the experiment was measuring gender differences on a cardiovascular test, and that women were expected to outperform men given that they tend to have better cardiovascular health. In the control condition, participants were told the experiment measured how a rest period between sets influences performance, and that experimenters expected performance to be similar between sets when a one-minute break was taken.

Following the verbal explanation, participants completed the SHEQ, the ADS, and a measure of their current activity levels. Once participants completed the measures, they were invited into a separate room. They were given a description of the task they would complete: two minutes of jump squats, followed by a one minute break, and a second set of jump squats. Each description was accompanied by a photographic depiction of the task; in the men better condition a man was used as the model, in the women better condition, a woman was pictured, in the control condition a non-gendered stick figure was used. Participants completed the jump squat task in pairs, with one partner counting the number of squats the other completed. The researcher timed the two-minute sets and the one-minute break. After completing the task, participants were given adequate time to cool down and were dismissed. One week later, participants were debriefed regarding the true purpose of the study and given an opportunity to withdraw their data.

**Statistical Analyses.** To test the main purpose, a 2 (gender) by 3 (condition: men better, women better, control) ANCOVA, controlling for BMI, and athletic disengagement compared total performance (set one + set two) across conditions. To examine the second research
question, a 2 (gender) by 3 (condition) MANCOVA compared self-handicapping in psychological, health and training domains across conditions.

**Results**

Participants \((n = 20)\) who did not complete the squatting task due to injury or illness were removed from analyses \((n = 210)\). Missing data (2.90\%) was missing completely at random \((\chi^2(2076) = 1960.52, p = .97)\), and imputed using expectation maximization. Outliers falling greater than 3.29 standard deviations above or below the mean were truncated one point above the next most extreme data point (Tabachnick & Fidell, 2013), resulting in the modification of two BMI outliers, one performance outlier, and two weekly minutes of resistance training outliers. All data were normally distributed. Post hoc sensitivity analyses indicated significant power to detect small effect sizes in ANCOVAs \((\eta^2_p = .07)\), and MANCOVAs \((\eta^2_p = .01)\) with \(\alpha = .05\) and \(\text{Power} = .95\). Descriptive statistics are presented in Table 5.

**Performance.** A 2 (gender) by 3 (condition) ANCOVA, controlling for BMI, and athletic disengagement compared the total number of repetitions completed on both sets of jump squats combined (Fig. 7). There was no main effect of gender, \(F(1, 202) = .02, p = .88, \eta = .00\). There was a main effect of condition \(F(2, 202) = 5.91, p < .01, \eta^2_p = .06\). Post-hoc Tukey HSD comparisons revealed a significant difference between the “women better” condition \((M = 166.86)\) and the control condition \((M = 152.68)\), \(p = .05\) and between the “women better” condition and the “men better” condition \((M = 149.64)\), \(p = .02\). There was no different between the “men better” and control condition, \(p = .79\). The gender by condition interaction term was not conventionally significant, \(F(2, 202) = 2.45, p = .06, \eta^2_p = .03\). Due to the a priori hypothesis that women would perform worse in the “men better” condition than the other conditions, sex-stratified ANCOVAs compared performance across conditions. Contrary to the hypotheses, there
were no significant effects of condition for women. Men performed significantly better in the “women better” condition (M = 175.00) than the “males better” condition (M = 137.58), p < .01. Similar results were found for sets one and two when analyzed separately.

**Self-Handicapping.** A 2 (gender) by 3 (condition) MANOVA compared self-handicapping in the psychological, training, and health domains across groups, controlling for BMI and athletic disengagement (Fig. 8). There was no significant effect of group, $F(6, 400) = 1.38, p = .22, \eta^2_p = .02$. There was an overall effect of gender, $F(3, 200) = 6.73, p < .01, \eta^2_p = .09$. Men reported significantly less psychological, $F(1, 202) = 8.13, p < 0.01, \eta^2_p = .06$, and training, $F(1, 202) = 11.66, p < .01, \eta^2_p = .08$, self-handicapping than women. There was no significant interaction, $F(6, 400) = 1.00, p = .43, \eta^2_p = .02$.

**Discussion**

The purpose of the Study 2a was to determine whether men and women’s performance and self-reported self-handicapping on an exercise task was affected by stereotype threat. Contrary to the hypotheses, self-handicapping and performance did not differ --- the interaction of gender and condition was not significant. However, there was a trend towards men performing better in the “women better” condition, compared to the “men better” conditions, and consistent with the literature (Shields et al., 2003), women exhibited more self-handicapping than men.

The absence of a stereotype threat effect provides preliminary evidence that women’s performance in resistance training may not be affected my masculine stereotypes. However, it is also possible that this effect is attributable to the methods of Study 2a. For example, when a negative stereotype is made blatantly obvious, as in the current study, the stereotyped group may react by engaging in counter-stereotypic behaviours, a phenomenon called **stereotype reactance**.
(Kray, Thompson, & Galinsky, 2001; Nguyen & Ryan, 2008). Both the women and the men in this study, therefore, may have exerted extra effort in the gender-incongruent condition in order to counteract the stereotype presented to them (Nguyen & Ryan, 2008). It is also possible that performing the task in groups led to social facilitation, which may have overpowered the effects of stereotype threat. Researchers have demonstrated that performing a simple task, like a jump squat, in the presence of others is associated with improved performance on that task (Bond & Titus, 1983). Furthermore, the questionnaires (ADS, SHEQ) were given before the test, potentially priming participants towards failure regardless of group. Finally, the participants in this study were kinesiology students, who may not have found the manipulation believable. Stereotype reactance, social facilitation, priming, and the expert population may therefore explain the absence of an effect of stereotype threat on performance.

Similar to performance, there were no effects of threat condition on self-reported self-handicapping. However, the present study measured only claimed self-handicaps (e.g., self-reported illness, fear of injury) rather than behavioural self-handicaps (e.g., reduced practice, effort withdrawal). Although there is evidence that claimed self-handicaps are higher under academic stereotype threat (Keller, 2002), in studies of athletic tasks claimed self-handicapping has not responded to stereotype threat (Stone et al., 1999). However, there is evidence for increased behavioural self-handicapping in response to threat in sport (Stone, 2002). In order to be confident that stereotype threat does not lead women to self-handicap during resistance training, it is important to examine behavioural measures of self-handicapping in addition to claimed self-handicaps.

Study 2b pilots the effects of subtle threat, and individually completed stereotype threat manipulations in non-expert samples. Participants were recruited from the general university
population and completed a resistance-training task individually under conditions of threat or no threat. A behavioural measure of self-handicapping was included (i.e., practice time), in addition to several manipulation checks. Based on the findings of Study 2a, it was hypothesized that women would not display more self-handicapping or worsened performance in response to stereotype threat.

**Study 2b**

**Method**

**Participants.** Following approval from the Research Ethics Board, 30 participants (70% female) were recruited from posters and online advertisements. Participants ranged in age from 18 to 33 ($M = 23.59$), and were primarily of Asian descent (53.3%). Approximately half (43%) of participants reported having trained with weights in the past month and 63% reported training with weights in their lifetime. Participants received financial compensation for their participation.

**Measures.**

**Demographics.** Participants reported their age, gender, ethnicity, marital status, and employment. They also indicated if they currently resistance train (yes, no), and have ever resistance trained (yes, no). None of the participants were enrolled in the Kinesiology program.

**Semantic Association.** Participants performed a word completion task to measure the accessibility of gender and self-doubt related mental concepts after reading the manipulation (Stone, 2002). Specifically, participants who were primed with gender were expected to complete word stems (i.e., B __ Y) in a gendered way (i.e., BOY) rather than a non-gendered way (i.e., BAY, BUY), and participants primed to fail were expected to complete more self-doubt items. Six word fragments were used to measure the activation of thoughts associated with
gender: __ __ R L (GIRL), __ O M __ (WOMAN), B __ Y (BOY), __ __ N (SON/MEN/MAN), __ __ T E R (SISTER), and B R __ __ __ __ (BROTHER). A further five word fragments were used to measure activation of self-doubt: W E __ (WEAK), S T __ O __ (STRONG), __ __ E R I O R (INFERIOR/SUPERIOR), H A __ (HARD), S H A __ __ (SHAME). Five filler stems were also included. To complete the task, participants were asked to fill in the blanks with the first word that came to mind. When stems were completed using gendered or self-doubtful words, participants were assigned one point. A total score for the activation of gender and self-doubt was calculated by summing the relevant word stem completions. Scores ranged from zero to four (gender) and zero to three (self-doubt).

**Athletic Disengagement Scale (ADS).** See description in Study 2a.

**Procedure.** Participants were recruited for a study validating a new submaximal fitness assessment. A female research assistant randomly assigned participants to either a “Males Better” or “No Difference” condition. This research assistant met participants and led them through the consent forms, which differed depending on condition.

In the *Males Better* condition, the participant read that the study’s purpose was to understand how gender influences individuals’ scores on a resistance-training task. In the *No Difference* condition, the consent form stated the purpose was to understand whether psychological variables influence individuals’ scores on a relatively new fitness test. A basic description of the test was also included in the consent package. In the *Males Better* condition, a male model was shown demonstrating the task and the task description stated, “Given the well established differences in strength and muscle mass, fitness standards for men and women differ.” In the *No Difference* condition, a stick figure was shown demonstrating the exercise, and the task description stated, “This test is preferable to other strength assessments because it relies
on lower body strength, which is less likely than upper body tasks to show gender differences. This feature makes administering and scoring the test easier, because fitness standards for men and women do not differ.” The last page of the consent package was a demographics questionnaire, including a question that asked participants to indicate their gender. These differences were intended to induct subtle stereotype threat in women in the Males Better condition.

Following completion of the consent package, participants were asked if they would be willing to complete a pilot study. Participants were told they would complete one word association task, and additional measures not reported in the present study. All participants agreed to complete the pilot study.

After completing the word association test, participants were led to the experimental testing room. All interactions in the testing room were filmed. In the testing room, participants were introduced to the first author, who was blinded to condition. The first author described and demonstrated how to perform a dumbbell-weighted squat, including that participants’ knees should reach at least a 90° angle during each repetition. Participants were told they would be completing two minutes of weighted squats, followed by a two-minute break, and another two minutes of weighted squats. They were asked to select a weight that they believed they could maintain for the duration of the experiment. PowerBlock dumbbells (with weight indicators masked) were used, rather than traditional dumbbells, so that participants could not estimate the weight they were carrying by the appearance of the dumbbell. Participants were given unlimited time to choose the weight they would like to use. Time spent choosing a weight became the critical measure of self-handicapping. Specifically, participants who are self-handicapping were
expected to spend less time choosing a weight in order to blame failure on an inappropriate choice later on.

When a participant indicated readiness to begin the task, the experimenter informed the participant that she would tell him/her when there was one minute, thirty seconds and five seconds remaining on the task. They were also informed that they would receive feedback on their performance after the first set. After completion of the first set, all participants were informed that they performed slightly below average on the first set. During the inter-set rest, participants were asked to complete the remaining measures from the pilot test (not reported here). The majority of participants (93.3%) took more than two minutes to complete the remaining measures. Therefore, the time participants took to complete the remaining questionnaires became the duration of their break. Following the break, participants completed a second set of squats in the same manner as the first. They were given adequate time to cool down following the final set.

After cooling down, participants completed the athletic disengagement scale. They were debriefed regarding the true purpose of the experiment, and given an opportunity to provide informed consent. Participants were also asked to indicate if they became suspicious at any point in the experiment. Participants were thanked and compensated for their time.

A blinded research assistant analyzed testing-room recordings from each participant. The time it took participants to choose a weight, weight chosen, number of repetitions in each set, and duration of the break were recorded for each video. Squatting repetitions that (1) did not reach a 90° angle in the participant’s knees, (2) were completed outside the two minute time limit, or (3) were not completed as demonstrated (e.g., dropped weight, squatting down but not returning to standing) were not counted.
Statistical Tests. Despite Steele et al. (2002)’s assertion that stereotype threat is stronger in domain and gender identified participants, the sample size of the present study was too small to remove participants who reported high athletic disidentification (ADS>4; n = 7) or participants who reported undifferentiated (n = 8) or androgynous (n = 10) gender roles. Participants who were suspicious of the experiment examining gender (n = 4) were removed from further analyses, but participants who indicated suspicion in the bogus feedback they received (n = 14) remained in the analyses, as this should not affect most measures. Outliers falling more than 3.29 standard deviations from the mean were truncated to one unit higher or lower than the next extreme outlier (Tabachnick & Fidell, 2013). To examine the influence of stereotype threat on performance, a (gender) by 2 (condition) design compared semantic activation, performance, and behavioural self-handicapping between groups. Because of the small sample size, any effects larger than $\eta^2_p = 0.1$ are reported.

Results

Missing values (2.25%) were missing completely at random ($\chi^2(1579) = 319.00, p = 1.00$) and were imputed using expectation maximization. Two outlier points (time taken to choose weight and break time between sets) were truncated. All variables were normally distributed. Post-hoc sensitivity calculations indicated sufficient power to detect strong ($\eta^2_p = .41 - .42$) effect sizes. Descriptive statistics are reported in Table 5.

Manipulation Check. To determine whether the manipulation was effective, a 2 (gender) × 2 (condition) MANOVA was conducted on the manipulation check variables. Independent variables comprised self-doubt and gender activation based on the word fragment task and participants’ responses to the question, “to what extent would you expect a gender difference on the fitness test” from 1 (women will perform better than men) to 7 (men will
perform better than women). The main effect of condition was not significant. There was a significant effect of gender, $F(3,20)=3.16, p = .05, \eta_p^2 = .32$. The interaction of gender and condition was not statistically significant with a small-to-moderate effect size, $F(3, 20) = 2.03, p = .14, \eta_p^2 = .23$. Post-hoc tests of main effect of gender revealed that men ($M = 2.50$) completed significantly more self-doubt stems than women ($M = 1.33$), $F(1,22) = 7.06, p = .01, \eta_p^2 = .31^4$. Furthermore, women ($M = 1.83$) reported higher yet not statistically significant gender activation than men ($M = .75$), $F(1, 22) = 3.29, p = .08, \eta_p^2 = .13$. There was no effect of gender on participants’ expectation of gender differences on the fitness test. An analysis of the interaction term revealed a significant interaction for expectation of gender differences, $F(1, 22) = 5.54, p = .03, \eta_p^2 = .20$. Males in the “males better” condition reported significantly more expectation of gender equality ($M = 4.00$) than females in the same condition ($M = 5.56$), $t(11) = 2.28, p = 0.04$.

Performance. To examine whether stereotype threat influenced performance on the resistance training task, a 2 (gender) by 2 (condition) ANCOVA, controlling for body mass, examined workload (weight lifted by repetitions) on the first set of the task (Fig. 9). There was a significant effect of gender, such that men ($M = 717.75$) performed more work than women ($M = 440.37$), $F(1,21) = 14.00, p < .01, \eta_p^2 = .40$ (Fig 8). A similar ANCOVA, controlling for body mass, rest time, and workload on the first set, compared workload on the second set between gender and condition. Overall, performance was better in the no difference condition ($M = 579.50$) than the males better condition ($M = 418.63$), $F(1, 19) = 5.80, p = .03, \eta_p^2 = .23$. The gender by condition interaction was not significant, $F(1,19) = 2.91, p = .10, \eta_p^2 = .13$.

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4 Given that beliefs of self-competence are higher in individualistic versus collectivist culture (Schmitt & Allik, 2005), the effect of culture (proxied by race) on this relationship was examined. A 2(culture: collectivist, individualistic) × 2(Gender) ANOVA compared self-doubt scores. There was a main effect of gender, but no effect of culture and no interaction.
Self-handicapping. Time spent choosing weight was used as a behavioural measure of self-handicapping. A 2(gender) by 2(condition) ANOVA compared the number of seconds participants spent choosing a weight. There were no significant main effects and no significant interactions (Fig. 10).

Discussion

Similar to Study 2a the purpose of the second study was to determine whether performance and self-handicapping on a resistance training task were influenced by stereotype threat. The methods of Study 2b differed from Study 2a on four critical dimensions: (1) using subtle rather than blatant stereotype threat manipulations; (2) using individual rather than group testing, (3) presenting measures after the test, and; (4) using behavioural rather than self-reported measures of self-handicapping. Similar to the first experiment, being exposed to stereotype threat did not lead to reduced performance on the resistance training task or to increased self-handicapping. However, being in the control condition was associated with improved performance overall ($p = .07, \eta^2_p = .19$).

The null effect of stereotype exposure in this study is encouraging, but does not evidence an absence of stereotype threat in resistance training altogether. Participants who expected men to outperform women did not display more gender activation or self-doubt activation than participants who expected no difference between the genders. Furthermore, men who were told that they were expected to outperform women on the task actually rated performance on the task as more equal between genders than other participants. The manipulation check was therefore not strong enough to change participants’ expectations surrounding gender and strength, or was misinterpreted by some participants. Although similar studies of sports performance have used subtle threat successfully (Chalabaev, Sarrazin, et al., 2008; Hively & El-Alayli, 2014), it is
possible that the current study’s manipulation of threat was insufficient. All of the threat manipulations were a part of the consent process. Given that all of the threat manipulations were written, it is possible that participants whose first language was not English (38%) missed the subtlety of this manipulation. Anecdotally, many participants completed the consent form quickly and were unaware of the requirements of the task upon entering the experimental testing room. It is possible that participants did not read the consent form or task instructions thoroughly enough to be affected by the threat manipulation.

**General Discussion**

The purpose of the present research was to determine whether stereotype threat influences men’s and women’s performance on a resistance training task, and how stereotype threat influences self-handicapping in resistance training. Neither blatant (Study 2a) nor subtle (Study 2b) threat worsened the performance of women on a resistance-training task. Furthermore, there was no evidence of increased self-handicapping in response to negative gender stereotypes in either experiment.

The findings of this paper are consistent with those of the only other examination of stereotype threat in resistance training (Chalabaev et al., 2013). Chalabaev et al. (2013) found that stereotype threat did not effect women’s maximal voluntary contraction on an isometric strength task. However, stereotype threat did affect women’s rate of force development (Chalabaev et al., 2013). Given that maximal force development is a conscious process and rate of force development is not, Chalabaev et al. (2013) reasoned that the effect of stereotype threat on simple athletic tasks occurs largely outside conscious control. Participants’ ability to complete the squatting task in the present study largely requires muscular endurance, a process under conscious control (St Clair Gibson & Noakes, 2004). Therefore, it is possible that conscious
control of the strength task in the present study overrode the effect of stereotype threat on performance. Although the influence of conscious processing is perhaps the most likely explanation for the null effect, it is also possible that having a female experimenter reduced stereotype threat susceptibility in female participants (Marx & Goff, 2005), and/or that the selected sample of women (2a: kinesiology students, 2b: participants self-selecting to participate in a fitness test) had dissociated from their feminine identity in order to maintain sport and physical activity participation (Steele et al., 2002). Regardless of the mechanisms, the two studies presented here provide converging evidence that women may not be susceptible to stereotype threat on strength-training tasks.

In both studies, there was a significant or approaching significant effect of condition. Overall, participants performed better in conditions where men’s superior strength was not stated or implied. Some literature shows that men perform better physically following a threat to their masculinity (Goff, Di Leone, & Kahn, 2012), and this may have been the case in the current studies. In Study 2a, men may have felt the “women better” condition posed a threat to their masculinity, leading them to exert more effort on the physical task to re-assert masculinity (Goff et al., 2012). Study 2b provided further evidence for the threatened masculinity explanation: Firstly, condition differences only emerged only in the second set of study two, after participants had received failure feedback. In this case, the failure feedback may have made the threat to masculinity more salient, and promoted renewed effort in the second set. Furthermore, when men were told they should outperform women, they actually espoused the opinion that test performance should be equal between genders. This finding is similar to that of Hunt et al. (2013) who found that men have less confidence in their physical ability following masculinity threat. If men’s masculinity was indeed threatened in the strength conditions, the aerobic
condition may have facilitated performance for both women, who did not experience stereotype threat, and men, who were driven by a threat to their masculinity.

The stereotype threat manipulation in the present studies also failed to increase claimed (Study 2a) or behavioural (Study 2b) self-handicapping. The findings regarding claimed self-handicapping replicate previous research in sport, finding no difference in claimed self-handicapping between threat and no threat manipulations (Stone et al., 1999). However, the findings regarding behavioural self-handicapping contradict a previous study of behavioural self-handicapping on a sports task (Stone, 2002). Stone (2002) reported that stereotype threatened golfers practiced for significantly less time under stereotype threat than golfers not experiencing threat. However, it is possible that practice time was more indicative of self-handicapping on Stone (2002)’s golf task than in the present study. Anecdotally, the PowerBlock weights used in the present study were difficult for novice users to set up, and the time participants took to choose a weight might reflect difficulty using the weights, rather than actual practice time. Therefore, the findings from the current study do not provide conclusive evidence that female exercisers do not engage behavioural self-handicapping when experiencing stereotype threat. However, they provide preliminary evidence that this might be the case.

Several limitations in experimental design prevent drawing concrete conclusions from the data presented. In the first study, social facilitation or stereotype reactance may have improved performance on the athletic task, perhaps overriding any effects of stereotype threat (Bond & Titus, 1983). In the Study 2b, the manipulation check revealed that participants did not experience more semantic activation of gender in the “males better” condition, nor did women experience more self-doubt activation in the threat condition. Furthermore, individuals’ expectations of the gender differences in performance on the task were not affected by the
manipulation in the direction expected. Men actually expected to perform almost equally to women in the *males better* condition. These results reveal that the subtle manipulation used in the second experiment was not effective at inducing stereotype threat, and may have been misinterpreted by or threatening to some participants. Therefore, the influence of social facilitation in the first study and the failure to manipulate threat in the second experiment prevent the authors from drawing conclusions about the effect of stereotype threat on women’s resistance training performance and self-handicapping. Future research may benefit from running participants individually, and ensuring participants thoroughly read and understand the threat manipulation.

Overall, these findings provide preliminary evidence that stereotype threat does not influence women’s performance on resistance training tasks, but that threats to masculinity may improve men’s performance on the tasks. These findings were consistent in a large, poorly controlled sample and a smaller well-controlled pilot study, leading the authors to believe the results of these studies are reliable. However, future well-controlled research in large samples is required to draw firm conclusions.
Chapter 5: General discussion

The focus of this thesis was to examine how gender roles influence men and women’s exercise training behaviour. Researchers of the social role theory propose that individuals form their own gender identities based on traditional division of labour they observe (Eagly & Steffen, 1984). In doing so, individuals begin to categorize behaviour as appropriate or inappropriate for their gender and themselves (Eagly et al., 2000). Individuals often anticipate performing poorly in gender-incongruent domains (Steele et al., 2002; van Laar & Derks, 2003). In order to preemptively protect their social identity in case of failure, they may disidentify from (i.e., discount the importance of) the gender-incongruent domain. Disidentification has been associated with worsened motivation for gender-incongruent activities (Davies et al., 2002, 2005; van Laar & Derks, 2003) and avoidance of these activities altogether (Davies et al., 2002; Steele et al., 2002). Anticipation of failure on gender-incongruent tasks is also associated with self-handicapping on these tasks (Spencer et al., 2016). In many cases, these processes result in stereotype threat — a performance detriment experienced by individuals who perceive being negatively stereotyped (Spencer et al., 2016; Stone, 2002). As a result of stereotype threat and disidentification, individuals may exhibit low motivation for, participation in, and poor performance in gender-incongruent activities.

The purpose of this set of studies was to examine whether domain disidentification and stereotype threat influence men and women’s performance, motivation, and participation in exercise, primarily resistance training. Resistance training is a stereotypically masculine activity (Koivula, 1995; Matteo, 1986), and some authors suggest that this may be a barrier to women’s participation (Dworkin, 2001; Salvatore & Marecek, 2010). However women’s perceptions of the masculinity of resistance training have largely been studied in regards to musculature, and
transgressions against the ideal feminine body shape (Dworkin, 2001; Salvatore & Marecek, 2010). The masculine culture of resistance training may also influence women’s participation and performance by way of domain disidentification and stereotype threat.

Based on the findings from the three studies, there is little support for an effect of gender-role stereotypes on women’s resistance training behaviour. Contrary to the hypotheses, there was no evidence for disidentification from resistance training among women. Specifically, women did not implicitly perceive resistance training as more masculine than aerobic training, and women’s implicit perceptions of resistance training’s masculinity were not associated with motivation for or participation in this activity. Furthermore, as demonstrated in the second experiment, women did not experience stereotype threat in response to either subtle or blatant negative stereotypes about their strength. These results provide promising evidence that gender roles surrounding resistance training are weakening (Koivula, 1995; Matteo, 1986), and may no longer exert a strong influence on women’s motivation, participation, and performance in resistance training.

Despite the promising findings for women, and contrary to the hypotheses, gender role stereotypes had a negative effect on men’s motivation and participation and performance in resistance training. Specifically, men who perceived resistance training as masculine had lower autonomous motivation for resistance training and, as a result, participated less often. Study 2 provided preliminary evidence that participants (and in Study 2a, men specifically) may perform better in control (i.e., women stronger, no strength difference between genders) rather than masculine conditions. This pattern of results is characteristic of threatened masculinity theory (discussed below; Hunt et al., 2013; Mishkind et al., 1986).
Conceptual and Theoretical Contribution

Effects of Gender-Role Stereotyping on Women’s Exercise. Based on the combined data of Studies 1 and 2, a revision of the traditional dialogue around women’s avoidance of resistance training may be needed. Traditionally, women are hypothesized to avoid resistance training because they fear muscularity (Dworkin, 2001), and masculinity (Salvatore & Marecek, 2010). However, based on the current studies, there was no evidence that gender-role stereotypes affect women’s motivation, performance or participation in resistance training. Eagly et al. (2000) suggest that women may engage in gender-incongruent behaviour if they believe the benefits of doing so (e.g., health, toned body, function fitness) outweigh the costs (e.g., social disapproval, feeling uncomfortable). It appears that, in the case of resistance training, women overcome the costs of resistance training to garner the benefits. Researchers have found that resistance training is gaining popularity among women (Thompson, 2015), increasing numbers of women are participating in resistance training (Centers for Disease Control and Prevention, 2011), and women may no longer see resistance training as contrary to their feminine identity (McCreary et al., 2005) or body-ideal (Gruber, 2007).

This increase in the popularity of resistance training for women may be related to a re-appraisal of the typical gender roles applied to resistance training, and may continue to improve women’s participation through a self-perpetuating effect (Gruber, 2007). Gawronski and Bodenhausen (2006) suggest that implicitly held stereotypes might be altered by small changes in associative structure. For example, repeatedly seeing women engaging in resistance training may weaken mental connections between masculinity and resistance training (Gruber, 2007), increase competence (Tse, Logel, & Spencer, 2011), and decrease stereotype threat (Tse et al., 2011). Therefore, increasing numbers of women participating in resistance training (Centers for
Disease Control and Prevention, 2011) may create a self-perpetuating effect whereby increasing the number of female resistance trainers weakens the gender stereotype associated with this behaviour (Gawronski & Bodenhausen, 2006), and improves women’s feelings of competence in the weight room (Marx & Goff, 2005; Tse et al., 2011). Presumably these changes may lead to increasing numbers of women participating in resistance training, and lower the potential for stereotype threat in resistance training (Tse et al., 2011). Furthermore, it is encouraging that these results were found implicitly; implicit findings are less susceptible to social desirability bias (Payne et al., 2005), and changes in implicit perceptions are often associated with changes in explicit attitudes (Gawronski & Bodenhausen, 2006).

Based on the present findings and previous literature, it is important to adjust how women’s motivation for resistance training is conceptualized. Evidently, the effect of gender stereotypes on women’s performance, motivation and participation in resistance training is weakening. Future research should elucidate the mechanisms of this change, and identify other barriers to women’s participation in resistance training, given that women are still participating at lower levels than men (Centers for Disease Control and Prevention, 2011).

**Effects of Gender Role Stereotyping on Men’s Exercise.** Despite masculine stereotypes having little effect on women’s participation and motivation for resistance training, men’s motivation and participation were significantly related to gender-role stereotypes. Based on these findings, theoretical models predicting men’s participation in exercise, especially resistance training, should consider the influence of perceived masculinity on participation. Specifically, highly masculine physical activities may threaten the masculinity of male participants, leading to worsened self-determined motivation and participation.
Threatened masculinity theory suggests that as gender equality increases in most domains, men compensate by demonstrating masculinity physically through masculinity (Mishkind et al., 1986). This drive to achieve or maintain masculinity may have negative consequences for men’s motivation and participation, despite having positive effects on performance.

In regards to motivational outcomes, investment in muscularity may be related to men becoming ego-involved in resistance training, such that the main reason for participation is to display masculinity and bolster self-esteem (McCreary et al., 2005; Mishkind et al., 1986; Ryan et al., 1991). Ego-involvement is internally controlling and may lead to worsened motivation for resistance training (Ryan et al., 1991). Furthermore, when ego-involved participants feel that they have met their goals (e.g., become muscular, demonstrated masculinity) they show poor task persistence (Ryan et al., 1991). Furthermore, men who experience a threat to their masculinity (e.g., from social comparison in the gym or to male fitness magazines) report less confidence in their physical strength, less motivation to resistance train, and self-report engaging in fewer muscle-building activities (Hunt et al., 2013).

Despite its negative effects on motivation and participation, threatened masculinity may improve performance on physical tasks. Men in Study 2 performed better when (a) they believed women were expected to perform them, or (b) they expected no gender difference on performance and received failure feedback ($p = .11$). Both of these situations may have caused a threat to male participants’ masculinity by asserting women’s competence in a domain that usually defines their masculinity (i.e., physical performance; Mishkind et al., 1986). Men experiencing a masculinity threat may exert more effort on physical tasks following this threat (Goff et al., 2012), although evidence is mixed (Hunt et al., 2013). However, the findings from
the present study support this assertion. Overall, the patterns exhibited by men in this research are characteristic of those theorized by threatened masculinity theory, and suggest that the masculine stereotypes surrounding resistance training may be detrimental to men’s long-term motivation and participation.

Based on the results of the present analyses and threatened masculinity theory, men may be discouraged by masculine-typed physical activities. This finding opposes common health promotion strategies for men, which promote resistance training as a means to gain or maintain masculinity (Salvatore & Marecek, 2010; Stibbe, 2004). Though more study is required, promoting resistance training as a means to masculinity may undermine men’s self-determined motivation and participation. The work reported in this thesis therefore provides evidence that typically endorsed promotional strategies may be ineffective at increasing men’s participation in resistance training, and that novel promotional strategies are required.

**Methodological Contribution**

In addition to providing an updated and expanded theoretical perspective on the effect of gender-roles on exercise participation, Study 1 contributes novel methodology to the field of implicit perceptions and exercise. Previous studies of implicit perceptions of exercise have primarily examined implicit valence (i.e., positive, negative; Calitri et al., 2009; Conroy et al., 2010) or self-schema (i.e., me, not me; Banting et al., 2009). This thesis is the first to include an implicit measure of gender role stereotypes. Additionally, Study 1 may be the first to examine implicit perceptions associated related to aerobic and resistance training separately. Given the predictive power of implicit perceptions of masculinity and the observed differences in implicit predictors of aerobic and resistance training, researchers may benefit from expanding the implicit perceptions used to include perceptions of gender-congruency. Furthermore, when examining the
impact of gender roles on exercise participation, it is pertinent to examine aerobic and resistance training separately.

**Practical Contribution**

The findings presented here have numerous implications for the promotion of resistance training to men and women. An analysis of modern women’s fitness discourse suggests that resistance training is a promoted as a means to a feminine figure, and that women are encouraged to “claim” what has traditionally been a masculine domain (Andreasson & Johansson, 2013). The efficacy of this promotional strategy is evidenced in the present research: There was no evidence that women in this study perceived resistance training as more masculine than aerobic training, and their participation in resistance training was not affected by their perceptions of the masculinity of training. Despite encouraging results in women, the authors suggest that the promotion of resistance to men is failing. Resistance training is promoted to men as a means to demonstrate masculinity, rather than an intrinsically enjoyable activity or a means towards positive health (Stibbe, 2004). These discourses are damaging to men’s motivation for resistance training as they promote internally controlling motives for resistance training, and do not facilitate continued participation (Hunt et al., 2013; Ryan et al., 1991). The discourse surrounding men’s participation in resistance training needs to change in order to facilitate optimal health in this population. By focusing on resistance training as an enjoyable activity or a means to health and functional fitness, rather than masculinity, it may be possible to increase men’s self-determined motivation for and participation in resistance training.

**Limitations and Future Directions**

The findings of this thesis should be interpreted with caution due to the highly specific nature of the sample. Participants in Study 1 and Study 2a were primarily second year
undergraduate students studying Kinesiology. Kinesiology students possess above average musculoskeletal health (Saville et al., 2014), and may possess above average knowledge of the benefits of resistance training to both genders (Glendhill & Jamnik, 2009). As such, these students may possess weaker gender-role stereotypes surrounding exercise than the general population (Gawronski & Bodenhausen, 2006). As in Study 2, the relationships between gender-role stereotypes and motivation, participation, and performance should therefore be expanded to study in a more general population in order to confirm the findings of the present study.

These findings also suggest that more study is needed to understand how the masculinity promoted in men’s physical activity discourse influences men’s motivation for and participation in physical activity. This represents an understudied field of exercise psychology and sociology, and future study is required to replicate the relationship in men of different ages and educational backgrounds, understand which factors are most important in promoting masculinity in physical activity, and understand how to increase men’s participation in physical activity by reducing the influence of masculinity.

**Conclusions**

This thesis has many strengths. Notably, Study 1 used a methodologically innovative study to examine the effect of implicit gender role endorsement on motivation and participation in exercise. The findings of Study 1 are novel, robust and provide a much-needed updated account of masculinity-related barriers to resistance training participation. Study 2 extends the findings of previous work on stereotype in sport by applying it to a novel domain, and generally supports the findings of Study 1. However, these studies were not without limitations, including limited generalizability due to highly active samples in Studies 1 and 2a, and methodological flaws in Studies 2a and 2b that prevent drawing concrete conclusions about the influence of stereotype
threat on resistance training. Despite the limitations, these studies provide an alternative to the common dialogue about masculinity stereotypes in exercise. Specifically, this thesis finds consistent evidence that masculinity poses a larger barrier to men’s continued participation in resistance training than it does to women’s.
References


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### Appendix I: Tables

**Table 1**

*Descriptive statistics for all Study 1 variables, divided by gender and mean comparisons (N = 170)*

<table>
<thead>
<tr>
<th>Variables</th>
<th>Range</th>
<th>Total Sample</th>
<th></th>
<th>Women (n = 92)</th>
<th></th>
<th>Men (n = 78)</th>
<th></th>
<th>t(168)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>M (SD)</td>
<td>M (SD)</td>
<td>M (SD)</td>
<td></td>
<td>M (SD)</td>
<td></td>
<td></td>
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<tr>
<td>Masculine RET</td>
<td>-.33 – .60</td>
<td>.01 (.13)</td>
<td>-.01 (.12)</td>
<td>.03 (.13)</td>
<td>1.93*</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Masculine AET</td>
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<td>.02 (.11)</td>
<td>.01 (.10)</td>
<td>.03 (.13)</td>
<td>1.05</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pleasant RET</td>
<td>-.36 – .27</td>
<td>.00 (.11)</td>
<td>.00 (.12)</td>
<td>-.01 (.11)</td>
<td>.76</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pleasant AET</td>
<td>-.25 – 31</td>
<td>.01 (.11)</td>
<td>.01 (.11)</td>
<td>.01 (.11)</td>
<td>.12</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MVPA</td>
<td>0–963</td>
<td>228.78 (228.54)</td>
<td>228.79 (232.21)</td>
<td>228.77 (225.63)</td>
<td>.00</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>RET</td>
<td>0–602</td>
<td>117.43 (144.42)</td>
<td>102.57 (138.59)</td>
<td>134.96 (150.01)</td>
<td>1.46</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>AET Amotivation</td>
<td>0–4</td>
<td>.27 (.51)</td>
<td>.30 (.54)</td>
<td>.23 (.47)</td>
<td>.94</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>AET External</td>
<td>0–4</td>
<td>.97 (.61)</td>
<td>.94 (.83)</td>
<td>1.00 (.79)</td>
<td>.53</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>AET Introjected</td>
<td>0–4</td>
<td>2.38 (.97)</td>
<td>2.40 (1.02)</td>
<td>2.37 (.89)</td>
<td>.19</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>AET Autonomous</td>
<td>0–4</td>
<td>2.99 (.71)</td>
<td>2.92 (.78)</td>
<td>3.08 (.61)</td>
<td>1.41</td>
<td></td>
<td></td>
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<tr>
<td>RET Amotivation</td>
<td>0–4</td>
<td>.48 (.66)</td>
<td>.58 (.69)</td>
<td>.36 (.62)</td>
<td>2.13*</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>RET External</td>
<td>0–4</td>
<td>.82 (.83)</td>
<td>.75 (.81)</td>
<td>.90 (.86)</td>
<td>1.12</td>
<td></td>
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<tr>
<td>RET Introjected</td>
<td>0–4</td>
<td>1.65 (1.15)</td>
<td>1.51 (1.21)</td>
<td>1.81 (1.05)</td>
<td>1.71</td>
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<tr>
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<td>0–4</td>
<td>2.21 (1.03)</td>
<td>2.09 (1.08)</td>
<td>2.35 (.97)</td>
<td>1.61</td>
<td></td>
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<td></td>
</tr>
</tbody>
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Notes. *p<0.05; RET: resistance exercise training; AET: aerobic exercise training
Table 2

Partial and zero-order correlations for Study 1 (N=170)

<table>
<thead>
<tr>
<th>Variable</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
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<th>11</th>
<th>12</th>
<th>13</th>
<th>14</th>
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<td>1. Masculine RET</td>
<td>.46**</td>
<td>.11</td>
<td>.16</td>
<td>.11</td>
<td>.10</td>
<td>.02</td>
<td>-0.02</td>
<td>.07</td>
<td>-0.01</td>
<td>-0.06</td>
<td>-0.01</td>
<td>.05</td>
<td>.03</td>
<td></td>
</tr>
<tr>
<td>2. Masculine AET</td>
<td>.63**</td>
<td>-0.03</td>
<td>-0.05</td>
<td>-0.06</td>
<td>-0.02</td>
<td>-0.25*</td>
<td>.13</td>
<td>-0.06</td>
<td>.09</td>
<td>.20*</td>
<td>.09</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Pleasant RET</td>
<td>-0.06</td>
<td>0.51**</td>
<td>-0.07</td>
<td>0.15</td>
<td>-0.03</td>
<td>-0.05</td>
<td>0.04</td>
<td>-0.17</td>
<td>0.07</td>
<td>0.23*</td>
<td>0.23</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. Pleasant AET</td>
<td>-0.25</td>
<td>0.36**</td>
<td>0.09</td>
<td>0.14</td>
<td>-0.03</td>
<td>-0.06</td>
<td>-0.08</td>
<td>0.12</td>
<td>-0.07</td>
<td>-0.01</td>
<td>0.07</td>
<td>0.01</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. MVPA</td>
<td>-0.09</td>
<td>-0.12</td>
<td>-0.10</td>
<td>0.21*</td>
<td>-0.16</td>
<td>-0.06</td>
<td>-0.01</td>
<td>0.35**</td>
<td>-0.10</td>
<td>0.02</td>
<td>0.13</td>
<td>0.23</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6. RET</td>
<td>-0.33**</td>
<td>-0.30**</td>
<td>0.11</td>
<td>0.15</td>
<td>0.22</td>
<td>-0.16</td>
<td>-0.07</td>
<td>0.17</td>
<td>0.39*</td>
<td>-0.30*</td>
<td>-0.03</td>
<td>0.41*</td>
<td>0.52</td>
<td></td>
</tr>
<tr>
<td>7. AET</td>
<td>-0.18</td>
<td>-0.12</td>
<td>-0.06</td>
<td>0.14</td>
<td>0.35**</td>
<td>0.20</td>
<td>0.32**</td>
<td>-0.23*</td>
<td>-0.46**</td>
<td>0.39**</td>
<td>0.17</td>
<td>-0.06</td>
<td>-0.02</td>
<td></td>
</tr>
</tbody>
</table>

Amotivation\(^1\)

| 8. AET External | -0.11   | -0.27*  | 0.10    | 0.07    | 0.15    | 0.17    | 0.39**  | 0.08    | 0.02    | 0.50**  | -0.02   | -0.14   |
| 9. AET Introjected | 0.01  | -0.08   | -0.11   | 0.00    | 0.30**  | 0.03    | 0.13    | 0.32**  | 0.36**  | -0.27** | -0.04   | 0.60**  | 0.33**  |
| 10. AET         | -0.07   | -0.14   | -0.17   | 0.08    | 0.32**  | 0.30**  | -0.14   | -0.01   | 0.27*   | -0.43** | -0.04   | 0.42**  | 0.60**  |

Autonomous

| 11. RET         | -0.08   | -0.03   | -0.05   | 0.05    | 0.36**  | 0.01    | 0.70**  | 0.36**  | 0.23*   | -0.17   | 0.22*   | -0.32** | -0.45** |

Amotivation

| 12. RET External | -0.06   | -0.24*  | 0.21    | 0.06    | 0.17    | 0.23    | 0.33**  | 0.63**  | 0.39**  | 0.16    | 0.34**  | 0.19    | 0.05    |
| 13. RET Introjected | -0.17  | -0.28*  | 0.05    | 0.00    | 0.29**  | 0.46**  | 0.07    | 0.29**  | 0.56**  | 0.37**  | 0.02    | 0.52**  | 0.71**  |
| 14. RET         | -0.27** | -0.40** | 0.22*   | 0.14    | 0.16    | 0.63**  | -0.12   | 0.03    | 0.11    | 0.55**  | -0.24*  | 0.24*   | 0.63**  |

Autonomous

Note. *p<0.05, **p<0.01 Correlations for women presented above the diagonal, correlations for men below the diagonal; \(^1\)correlations should be interpreted with caution due to the high skew of the variable; bolded correlations are those that differ significantly between men and women; RET: resistance exercise training; AET: aerobic exercise training
Table 3.

Bootstrap indirect effects of physical activity motivation on total number of resistance training minutes per week, moderated by gender in Study 1 (N = 170).

<table>
<thead>
<tr>
<th>Variable</th>
<th>Index of moderated mediation</th>
<th>Men (n = 78)</th>
<th>Women (n = 92)</th>
<th>R²</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Point Estimate [BC 95% CI]</td>
<td>Point Estimate [BC 95% CI]</td>
<td></td>
</tr>
<tr>
<td><strong>RET masculinity</strong></td>
<td></td>
<td></td>
<td></td>
<td>.36**</td>
</tr>
<tr>
<td>Amotivation</td>
<td>-.13</td>
<td>-.13 [-.31.27, 32.09]</td>
<td>-.13 [-39.43, 13.30]</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>[-.31.27, 32.09]</td>
<td>[-39.43, 13.30]</td>
<td></td>
</tr>
<tr>
<td>External</td>
<td>-1.22</td>
<td>-1.47 [-38.17, 13.63]</td>
<td>-.25 [-23.39, 14.34]</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>[-38.17, 13.63]</td>
<td>[-23.39, 14.34]</td>
<td></td>
</tr>
<tr>
<td>Introjected</td>
<td>-15.86</td>
<td>-11.76 [-84.12, 18.39]</td>
<td>4.09 [19.98, 74.44]</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>[-84.12, 18.39]</td>
<td>[19.98, 74.44]</td>
<td></td>
</tr>
<tr>
<td>Autonomous</td>
<td>-158.03</td>
<td>-140.70 [-198.29, 144.63]</td>
<td>17.32 [-126.20, 145.97]</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>[-198.29, 144.63]</td>
<td>[-126.20, 145.97]</td>
<td></td>
</tr>
<tr>
<td><strong>RET pleasantness</strong></td>
<td></td>
<td></td>
<td></td>
<td>.34**</td>
</tr>
<tr>
<td>Amotivation</td>
<td>6.65</td>
<td>-2.74 [-17.46, 78.47]</td>
<td>-9.39 [-76.64, 22.82]</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>[-17.46, 78.47]</td>
<td>[-76.64, 22.82]</td>
<td></td>
</tr>
<tr>
<td>External</td>
<td>3.61</td>
<td>5.11 [-23.27, 62.15]</td>
<td>1.49 [-10.54, 39.11]</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>[-23.27, 62.15]</td>
<td>[-10.54, 39.11]</td>
<td></td>
</tr>
<tr>
<td>Introjected</td>
<td>-15.59</td>
<td>3.65 [-127.64, 24.98]</td>
<td>19.24 [-37.34, 106.83]</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>[-127.64, 24.98]</td>
<td>[-37.34, 106.83]</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>[-182.89, 232.36]</td>
<td>[13, 321.30]</td>
<td></td>
</tr>
</tbody>
</table>

*Note.** p<0.001; *p<0.05; RET: resistance exercise training
Table 4.

Bootstrap indirect effects of physical activity motivation on total number of aerobic training minutes per week, moderated by gender in Study 1 (N = 170).

<table>
<thead>
<tr>
<th>Variable</th>
<th>Index of moderated mediation</th>
<th>Men (n = 78)</th>
<th>Women (n = 92)</th>
<th>R²</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Point Estimate</td>
<td>Point Estimate</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>[BC 95% CI]</td>
<td>[BC 95% CI]</td>
<td></td>
</tr>
<tr>
<td>AET masculinity</td>
<td>Amotivation</td>
<td>-8.03</td>
<td>-32.42</td>
<td>-24.39</td>
</tr>
<tr>
<td></td>
<td></td>
<td>[-199.89, 66.99]</td>
<td>[-225.97, 12.89]</td>
<td>[-135.54, 21.91]</td>
</tr>
<tr>
<td></td>
<td>External</td>
<td>-18.26</td>
<td>-19.90</td>
<td>-1.64</td>
</tr>
<tr>
<td></td>
<td></td>
<td>[-145.13, 27.70]</td>
<td>[-130.25, 35.84]</td>
<td>[-55.77, 23.64]</td>
</tr>
<tr>
<td></td>
<td>Introjected</td>
<td>3.07</td>
<td>.55</td>
<td>-2.51</td>
</tr>
<tr>
<td></td>
<td></td>
<td>[-111.12, 138.95]</td>
<td>[-31.26, 53.44]</td>
<td>[-106.09, 91.46]</td>
</tr>
<tr>
<td></td>
<td>Autonomous</td>
<td>-217.89</td>
<td>-85.47</td>
<td>132.42</td>
</tr>
<tr>
<td></td>
<td>AET pleasantness</td>
<td>60.84</td>
<td>48.21</td>
<td>-12.63</td>
</tr>
<tr>
<td></td>
<td>Amotivation</td>
<td>[-31.97, 292.48]</td>
<td>[-12.50, 228.87]</td>
<td>[-147.18, 70.43]</td>
</tr>
<tr>
<td></td>
<td>External</td>
<td>12.53</td>
<td>6.65</td>
<td>5.88</td>
</tr>
<tr>
<td></td>
<td></td>
<td>[-21.39, 132.82]</td>
<td>[-13.03, 88.24]</td>
<td>[-91.20, 13.54]</td>
</tr>
<tr>
<td></td>
<td>Introjected</td>
<td>-47</td>
<td>-.01</td>
<td>.45</td>
</tr>
<tr>
<td></td>
<td></td>
<td>[-71.73, 57.71]</td>
<td>[-40.59, 42.08]</td>
<td>[-42.20, 51.31]</td>
</tr>
<tr>
<td></td>
<td>Autonomous</td>
<td>50.58</td>
<td>58.04</td>
<td>108.63</td>
</tr>
<tr>
<td></td>
<td></td>
<td>[-294.02, 181.02]</td>
<td>[-90.27, 230.30]</td>
<td>[-60.00, 310.78]</td>
</tr>
</tbody>
</table>

Note. ** p<0.001; *p<0.05; AET: aerobic exercise training
Table 5
Descriptive statistics for performance, self-handicapping and demographic variables in Study 2

<table>
<thead>
<tr>
<th>Variable</th>
<th>Study 2a (n = 170)</th>
<th>Study 2b (n = 26)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Range</td>
<td>M (SD)</td>
</tr>
<tr>
<td><strong>Overall performance</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Men</td>
<td>70 – 257</td>
<td>156.12 (42.05)</td>
</tr>
<tr>
<td>Women</td>
<td>90 – 258</td>
<td>156.71 (32.70)</td>
</tr>
<tr>
<td><strong>Set 1 performance</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Men</td>
<td>27 – 143</td>
<td>84.21 (21.75)</td>
</tr>
<tr>
<td>Women</td>
<td>45 – 123</td>
<td>81.54 (15.57)</td>
</tr>
<tr>
<td><strong>Set 2 performance</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Men</td>
<td>17 – 121</td>
<td>71.57 (23.27)</td>
</tr>
<tr>
<td>Women</td>
<td>33 – 135</td>
<td>75.16 (18.90)</td>
</tr>
<tr>
<td><strong>Athletic disengagement</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Men</td>
<td>1 – 7</td>
<td>3.89 (1.46)</td>
</tr>
<tr>
<td>Women</td>
<td>1 – 7</td>
<td>3.65 (1.31)</td>
</tr>
<tr>
<td><strong>Weekly minutes of RET</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Men</td>
<td>0 – 752</td>
<td>261.97 (209.53)</td>
</tr>
<tr>
<td>Women</td>
<td>0 – 750</td>
<td>145.28 (153.03)</td>
</tr>
<tr>
<td><strong>Psychological self-handicapping</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Men</td>
<td>1 – 5</td>
<td>2.55 (.82)</td>
</tr>
<tr>
<td>Women</td>
<td>1 – 5</td>
<td>2.97 (.79)</td>
</tr>
<tr>
<td><strong>Training self-handicapping</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Men</td>
<td>1 – 5</td>
<td>2.01 (.74)</td>
</tr>
<tr>
<td>Women</td>
<td>1 – 5</td>
<td>2.49 (.89)</td>
</tr>
<tr>
<td><strong>Health self-handicapping</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Men</td>
<td>1 – 5</td>
<td>2.00 (.87)</td>
</tr>
<tr>
<td>Women</td>
<td>1 – 5</td>
<td>2.26 (.92)</td>
</tr>
<tr>
<td><strong>Time to choose weight (sec)</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Men</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>Women</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td><strong>Gender activation</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Men</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>Women</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td><strong>Doubt activation</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Men</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>Women</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td><strong>Expected gender differences</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Men</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>Women</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td><strong>BMI</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Men</td>
<td>18.13 – 32.92</td>
<td>23.26 (2.67)</td>
</tr>
<tr>
<td>Women</td>
<td>16.60 – 39.06</td>
<td>22.00 (2.64)</td>
</tr>
<tr>
<td><strong>Weight (lbs)</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Men</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>Women</td>
<td>—</td>
<td>—</td>
</tr>
</tbody>
</table>

Note. In study 1, performance is measured as number of repetitions. In study two, performance was measured as work (repetitions × weight); RET: resistance exercise training.
Appendix II: Figures

Figure 1. The affect misattribution procedure
Figure 2. The association between men and women’s implicit perceptions of resistance training pleasantness and their participation in resistance training.
Figure 3. The association between men and women’s implicit perceptions of resistance training masculinity and weekly minutes of resistance training
Figure 4. The association between men and women’s implicit perceptions of aerobic training pleasantness and weekly minutes of moderate-to-vigorous physical activity.
Figure 5. The association between men and women’s implicit perceptions of aerobic training masculinity and weekly minutes of moderate-to-vigorous physical activity.
Figure 6. Simple slopes analysis for the interaction between sex role and perceived masculinity on weekly minutes of resistance training in men only.
Figure 7. Total number of repetitions across both sets divided by gender and condition for study 2a; error bars represent standard error; * p<.05

Figure 8. Claimed self-handicapping (study 2a) as a function of gender; error bars represent standard error; * p<.05
Figure 9. Total amount of work performed in the first set of study 2b, divided by gender and condition; error bars represent standard error.

Figure 10. Amount of time spent choosing a weight for study 2b, divided by gender and condition; error bars represent standard error.
Appendix III: Measures

Demographics

*Note.* All questions were included in both studies, except “how much do you weigh” which was only included in study two.

Age (years): _________ Sex: □ Male  □ Female

How much do you weight (indicate lb or kg): _________

People living in Canada come from many different cultural and racial backgrounds. Are you (check all that apply):

□ White  □ Filipino  □ West Asian (e.g. Afgan, Iranian)
□ Chinese  □ Latin American  □ Japanese
□ South Asian ((e.g., East Indian, Pakistani, Sri Lankan)  □ Southeast Asian (e.g., Cambodian, Indonesian, Laotian, Vietnamese)?  □ Korean  □ Other (specify): ___________
□ Black  □ Arab

What language you speak most often at home?
□ English  □ French  □ Other: ___________

What is your highest level of education?
□ High school diploma  □ Second Year Post-Secondary  □ Fourth year post-secondary
□ First Year Post-Secondary  □ Third Year Post-Secondary  □ Post-graduate degree

What is your marital status?
□ Single  □ Separate  □ Widowed
□ Married or living with life partner  □ Divorced

Employment Status:
□ Full-Time  □ Student  □ Not employed
□ Part-Time  □ Retired  □ Other (specify): ___________
Manipulation Check: Study 2

Please fill in the blanks with the first word that comes to mind. Don’t worry about coming up with unique words; we want your initial response.

To what extent do you expect there to be a gender difference on the H-TEA?

Women will perform better than men

Men and women will perform equally

Men will perform better than women

1 2 3 4 5 6 7

Athletic Disengagement Scale

Please indicate your agreement with the following statements

<table>
<thead>
<tr>
<th></th>
<th>Strongly Disagree</th>
<th>Neutral</th>
<th>Strongly Agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>No athletic test will ever change my opinion of how athletic I am</td>
<td>1 2 3 4 5 6 7</td>
<td></td>
<td></td>
</tr>
<tr>
<td>How I do athletically has little relation to who I really am</td>
<td>1 2 3 4 5 6 7</td>
<td></td>
<td></td>
</tr>
<tr>
<td>I don't really care what tests say about my athletic ability</td>
<td>1 2 3 4 5 6 7</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
**Bem Sex Role Inventory**
Rate yourself on each item, on a scale from 1 (never or almost never true) to 7 (almost always true)

<table>
<thead>
<tr>
<th></th>
<th>Never or almost never true</th>
<th>Always or almost always true</th>
</tr>
</thead>
<tbody>
<tr>
<td>Strong personality</td>
<td>1 2 3 4 5 6 7</td>
<td></td>
</tr>
<tr>
<td>Aggressive</td>
<td>1 2 3 4 5 6 7</td>
<td></td>
</tr>
<tr>
<td>Assertive</td>
<td>1 2 3 4 5 6 7</td>
<td></td>
</tr>
<tr>
<td>Dominant</td>
<td>1 2 3 4 5 6 7</td>
<td></td>
</tr>
<tr>
<td>Affectionate</td>
<td>1 2 3 4 5 6 7</td>
<td></td>
</tr>
<tr>
<td>Sympathetic</td>
<td>1 2 3 4 5 6 7</td>
<td></td>
</tr>
<tr>
<td>Forceful</td>
<td>1 2 3 4 5 6 7</td>
<td></td>
</tr>
<tr>
<td>Independent</td>
<td>1 2 3 4 5 6 7</td>
<td></td>
</tr>
<tr>
<td>Defends own beliefs</td>
<td>1 2 3 4 5 6 7</td>
<td></td>
</tr>
<tr>
<td>Has leadership abilities</td>
<td>1 2 3 4 5 6 7</td>
<td></td>
</tr>
<tr>
<td>Understanding</td>
<td>1 2 3 4 5 6 7</td>
<td></td>
</tr>
<tr>
<td>Sensitive to the needs of others</td>
<td>1 2 3 4 5 6 7</td>
<td></td>
</tr>
<tr>
<td>Tender</td>
<td>1 2 3 4 5 6 7</td>
<td></td>
</tr>
<tr>
<td>Soothes hurt feelings</td>
<td>1 2 3 4 5 6 7</td>
<td></td>
</tr>
<tr>
<td>Willing to take a stand</td>
<td>1 2 3 4 5 6 7</td>
<td></td>
</tr>
<tr>
<td>Warm</td>
<td>1 2 3 4 5 6 7</td>
<td></td>
</tr>
<tr>
<td>Compassionate</td>
<td>1 2 3 4 5 6 7</td>
<td></td>
</tr>
<tr>
<td>Gentle</td>
<td>1 2 3 4 5 6 7</td>
<td></td>
</tr>
</tbody>
</table>
### Behavioural Regulations in Exercise Scale

We are interested in the reasons underlying peoples’ decisions to engage, or not engage in physical activity. Using the scale below, please indicate to what extent each of the following items is true for you. Please note that there are no right or wrong answers and no trick questions. We simply want to know how you personally feel exercise.

<table>
<thead>
<tr>
<th>Item</th>
<th>Not true for me</th>
<th>Sometimes true for me</th>
<th>Very true for me</th>
</tr>
</thead>
<tbody>
<tr>
<td>It’s important to me to exercise regularly</td>
<td>0</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>I don’t see why I should have to exercise</td>
<td>0</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>I exercise because it’s fun</td>
<td>0</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>I feel guilty when I don’t exercise</td>
<td>0</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>I exercise because it’s consistent with my life goals</td>
<td>0</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>I exercise because other people say I should</td>
<td>0</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>I value the benefits of exercise</td>
<td>0</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>I can’t see why I should bother exercising</td>
<td>0</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>I enjoy my exercise sessions</td>
<td>0</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>I feel ashamed when I miss an exercise session</td>
<td>0</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>I consider exercise a part of my identity</td>
<td>0</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>I take part in exercise because my friends/family/partner say I should</td>
<td>0</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>I think it is important to make the effort to exercise regularly</td>
<td>0</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>I don’t see the point in exercising</td>
<td>0</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>I find exercise a pleasurable activity</td>
<td>0</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>I feel like a failure when I haven’t exercised in a while</td>
<td>0</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>I consider exercise a fundamental part of who I am</td>
<td>0</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>I exercise because others will not be pleased with me if I don’t</td>
<td>0</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>I get restless if I don’t exercise regularly</td>
<td>0</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>I think exercising is a waste of time</td>
<td>0</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>I get pleasure and satisfaction from participating in exercise</td>
<td>0</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>I would feel bad about myself if I was not making time for exercise</td>
<td>0</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>I consider exercise consistent with my values</td>
<td>0</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>I feel under pressure from my friends/family to exercise</td>
<td>0</td>
<td>1</td>
<td>2</td>
</tr>
</tbody>
</table>
**Behavioural Regulations in Resistance Training**

Now we are interested in the reasons underlying peoples’ decisions to engage, or not engage in resistance training SPECIFICALLY. Resistance training is any exercise where you move your body against external resistance, like weight lifting, resistance band exercises or bodyweight exercise. Using the scale below, please indicate to what extent each of the following items is true for you. Please note that there are no right or wrong answers and no trick questions. We simply want to know how you personally feel about exercise.

<table>
<thead>
<tr>
<th>Reason</th>
<th>Not true for me</th>
<th>Sometimes true for me</th>
<th>Very true for me</th>
</tr>
</thead>
<tbody>
<tr>
<td>It’s important to me to resistance train regularly</td>
<td>0</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>I don’t see why I should have to resistance train</td>
<td>0</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>I resistance train because it’s fun</td>
<td>0</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>I feel guilty when I don’t resistance train</td>
<td>0</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>I resistance train because it’s consistent with my life goals</td>
<td>0</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>I resistance train because other people say I should</td>
<td>0</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>I value the benefits of resistance training</td>
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<tr>
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<td>2</td>
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<td>2</td>
</tr>
<tr>
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<td>1</td>
<td>2</td>
</tr>
<tr>
<td>I don’t see the point in resistance training</td>
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<td>1</td>
<td>2</td>
</tr>
<tr>
<td>I find resistance training a pleasurable activity</td>
<td>0</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>I feel like a failure when I haven’t done resistance training in a while</td>
<td>0</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>I consider resistance training a fundamental part of who I am</td>
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<td>1</td>
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<tr>
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<td>2</td>
</tr>
<tr>
<td>I get restless if I don’t resistance train regularly</td>
<td>0</td>
<td>1</td>
<td>2</td>
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<tr>
<td>I think resistance training is a waste of time</td>
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<td>1</td>
<td>2</td>
</tr>
<tr>
<td>I get pleasure and satisfaction from participating in resistance training</td>
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<td>1</td>
<td>2</td>
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<tr>
<td>I would feel bad about myself if I was not making time for resistance training</td>
<td>0</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>I consider resistance training consistent with my values</td>
<td>0</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>I feel under pressure from my friends and family to resistance train</td>
<td>0</td>
<td>1</td>
<td>2</td>
</tr>
</tbody>
</table>
Modified International Physical Activity Questionnaire

During the last 7 days, on how many days did you do vigorous physical activities like digging, aerobics, or fast bicycling? Think about only those physical activities that you did for at least 10 minutes a time. Do not include resistance training.

____ days

How much time did you usually spend on one of those days doing vigorous physical activity? Please indicate your response in minutes.

____ minutes

Again, think only about those physical activities that you did for at least 10 minutes at a time. During the last 7 days, on how many days did you do resistance training (like weight lifting, bodyweight exercises, resistance band exercises)?

____ days

How much time did you usually spend on one of those days resistance training? Please indicate your response in minutes.

____ minutes

How intense was your average resistance training session?

Light
Moderate
Vigorous

Think only about those physical activities that you did for at least 10 minutes at a time. During the last 7 days, on how many days did you do moderate physical activities like bicycling at a regular pace, or doubles tennis? Do not include walking or resistance training.

____ days

How much time did you usually spend on one of those days doing moderate physical activity? Please indicate your response in minutes.

____ minutes

During the last 7 days, on how many days did you walk for at least 10 minutes at a time? This includes walking at work and at home, walking to travel from place to place, and any other walking that you did solely for recreation, sport, exercise or leisure.

____ days

How much time did you usually spend on one of those days walking? Please indicate your response in minutes.

____ minutes
Self-Handicapping in Exercise Questionnaire

In today's lab, you will be completing a jump squat test to understand the gender differences in performance on a cardiovascular task. Before you begin, we want to understand what factors might prevent you from performing well on a test of cardiovascular ability. Please indicate your agreement with the following explanations on a scale of 1-5.

<table>
<thead>
<tr>
<th>Explanation</th>
<th>Strongly Disagree</th>
<th>Neutral</th>
<th>Strongly Agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>I find it hard to fit cardiovascular training into my schedule because I would rather go out with friends</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>I feel limited by my cardiovascular training capabilities</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>I don't feel confident about my abilities inside a fitness facility</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>I don't want to look foolish in front of others at the fitness facility</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>I am injury prone which makes maintaining a regular cardiovascular training routine difficult</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>I am afraid of making a mistake when I am cardiovascular training</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>I always think others will be better at cardiovascular training than me</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Getting to the gym is a hassle</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>I find it hard to get motivated to train my cardiovascular ability regularly</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>I find there's not enough time in a day to fit in regular cardiovascular training</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>I have a hard time talking myself into cardiovascular training</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>If I didn't have so many nagging injuries I would be able to give my best effort in my cardiovascular training sessions</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>If I didn't have so much (school/job) work I might have some energy left for cardiovascular training</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Sometimes I am afraid I might injure myself while cardiovascular training</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>I worry about what others think of me when I am doing cardiovascular training</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>I work long hours which makes it hard for me to find time to do cardiovascular training</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>I have to be in the right frame of mind to do cardiovascular training</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>When it comes to cardiovascular training, I don’t feel like I know what I’m doing</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>It’s hard to do cardiovascular training when my schedule is so full</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>When I'm stressed, I like to go home and relax rather than do cardiovascular training.</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
</tbody>
</table>

Note. Specific surveys were used for strength training (strength condition) and exercising (control)
**Stigma Consciousness Questionnaire**

Please indicate the extent to which you agree with the following statements

<table>
<thead>
<tr>
<th>Statements</th>
<th>Strongly disagree</th>
<th>Neither agree nor disagree</th>
<th>Strongly Agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stereotypes about women have not affected me personally</td>
<td>1 2 3 4 5 6 7</td>
<td></td>
<td></td>
</tr>
<tr>
<td>I never worry that my behaviours will be viewed as stereotypical of women</td>
<td>1 2 3 4 5 6 7</td>
<td></td>
<td></td>
</tr>
<tr>
<td>When interacting with men, I feel that they interpret all my behaviours in terms of the fact that I am a woman</td>
<td>1 2 3 4 5 6 7</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Most men do not judge women on the basis of their gender</td>
<td>1 2 3 4 5 6 7</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Being female does not influence how men act with me</td>
<td>1 2 3 4 5 6 7</td>
<td></td>
<td></td>
</tr>
<tr>
<td>I almost never think about the fact that I am female when I interact with men</td>
<td>1 2 3 4 5 6 7</td>
<td></td>
<td></td>
</tr>
<tr>
<td>My being female does not influence how people act with me</td>
<td>1 2 3 4 5 6 7</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Most men have a lot more sexist thoughts than they actually express</td>
<td>1 2 3 4 5 6 7</td>
<td></td>
<td></td>
</tr>
<tr>
<td>I often think that men are unfairly accused of being sexist</td>
<td>1 2 3 4 5 6 7</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Most men have a problem viewing women as equals</td>
<td>1 2 3 4 5 6 7</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Note.* The genders in this questionnaire are reversed when administered to men.