2006

The effects of mirrors on perceived exercise intensity

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THE EFFECTS OF MIRRORS ON PERCEIVED EXERCISE INTENSITY

A Masters Thesis presented to the Faculty of the
Graduate Program in Exercise and Sport Sciences
Ithaca College

In partial fulfillment of the requirements for the degree
Master of Science

By

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September, 2006

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CERTIFICATE OF APPROVAL

MASTER OF SCIENCE THESIS

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ABSTRACT

This study examined whether the presence of mirrors effects exercise intensity and rating of perceived exertion (RPE), and whether body perception (Body Esteem x Body Awareness) had any influence on this relationship. It was hypothesized that individuals with low body perception would have disproportionately higher RPEs when exercising in front of mirrors. Sixteen moderately active (exercising at least 3 times/week) females volunteered for a total of four hours of testing across four days. On the first day, participants completed psychological inventories used to assess body esteem and body awareness levels along with several anthropometric measurements (i.e., height, weight, body composition). Subjects were grouped into high and low body perception groups based on the median split of their combined body esteem and body awareness scores. On the second day, participants completed a submaximal treadmill test used to establish a baseline level of physical performance. Protocol indicated that treadmill workload was increased by increasing the grade by 2% every three minutes until participants reached 85% of their predicted maximal heart rate. Once at 85% maximal heart rate, participants continued at the same work rate for two additional stages, which lasted approximately six minutes. Heart rate and RPE were recorded during each stage of exercise. On days three and four the participants performed the same submaximal treadmill test, but on one of the days the exercise was performed in front of a large mirror and on the other day the exercise was done without a mirror.

The results indicated that HR and RPE increased as expected with higher workloads, but did not differ significantly between the mirrored and non-mirrored conditions. The High Body Perception group began exercise with a higher heart rate; however, heart rate did not increase as much as it did in the Low Body Perception group. In addition, the High Body Perception group had a higher rise in RPE than did the Low Body Perception group. In conclusion, there appears to be no significant difference in actual or perceived exercise intensity when exercising in front of a mirror. However, the lack of significance may be a result of methodological issues (i.e., sample size), or mirrors may not have an effect on perceived or actual exercise intensity. In addition, body perception does appear to influence perceived and actual exercise intensity. More research must be done to define this phenomenon more clearly.

ACKNOWLEDGMENTS

"Discovery consists of seeing what everybody has seen and thinking what nobody has thought."

- Albert Szent-Gyorgyi

Attending my first graduate student meeting, I remember Dr. Gary Sforzo discussing "the thesis", stating that "writing a thesis will teach you to think in an entirely different way." He was absolutely right.

First, I would like to thank both Jeff Ives and Mary DePalma for providing equal parts physiology, kinesiology, psychology, challenge, reinforcement, motivation, and above all, fun.

Second, I would like to thank my Mom for always reminding me to "take one thing at a time."

And finally, I would like to thank Alex for embracing the nerd within.

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Chapter 1

INTRODUCTION

Men and women display a substantial amount of body dissatisfaction (Fallon & Rozin, 1985; Olivardio, Pope, Borowiecki , & Cohane, 2004; Zellner, Harner, & Adler, 1989). Body dissatisfaction is a discrepancy between individuals' perceived body and ideal body (Gruber, Pope, Lalonde, & Hudson, 2001). College-aged women identify themselves as being heavier than they actually are; conversely, males identify themselves as being smaller than they actually are. Whether men and women perceive their body accurately may be related to body consciousness.

Body consciousness is the awareness of the physical self (Miller, Murphy, & Buss, 1981). It is comprised of three domains: private body consciousness, public body consciousness, and body competence. Each domain is used to help define and understand observations made when attending to the self (Miller et al., 1981). The private domain can only be observed by the experiencing person. For example, thoughts, images, memories, and feelings are all examples of this domain. Body awareness is a type of private body consciousness. It is the amount of attention an individual pays towards internal bodily sensations such as heart rate or the feeling of hunger. Individuals with eating disorders have been shown to have impaired body-awareness (e.g., an inability to perceive sensations such as hunger) (VanDeusen, 1993), coupled with a disturbance in the perception of appearance of body, weight, size or shape (e.g., feeling fat even when obviously underweight) (Weinburg & Gould, 1999). However, individuals with eating

disorders or patterns of disordered eating are not the only individuals with body dissatisfaction.

Body dissatisfaction runs on a continuum and both men and women of any age can display some level of this (McCabe & Ricciardelli, 2003). Body dissatisfaction can be a result of three components: a) actual body fat, whereby women with a greater percent body fat are more dissatisfied with their body, b) body ideals, whereby women may have the same amount of body fat, however their body ideals may differ, and c) perceived body fat, whereby women may have the same body composition, however one may perceive their actual body fat to be greater than it actually is (Gruber, 2001).

The public domain of body consciousness is body image. It is the level of satisfaction with physical attributes. Although body image levels are gauged by the individual, the public domain can be observed by anyone (Miller et al., 1981). For example, appearance, manners, and behavioral style are all aspects of this domain. Individuals differ considerably in the amount of attention given to each domain; however the environment can mediate this.

In particular, the exercise setting can influence the perception of the workload and body consciousness levels (Katula, McAuley, Mihalk, & Bane, 1998; Nethery, 2002). Mirrors present in an exercise setting heighten self-focus, influence self-efficacy, and influence individuals' task-specific confidence (Katula, McAuley, Mihalk, & Bane, 1998; Sentyrz & Bushman, 1998). Females report weight-control reasons as being the greatest motivation to exercise and body dissatisfaction may be the underlying reason for this (Eklund & Crawford,

1994). If women are exercising because of body dissatisfaction, exercise in the presence of mirrors may be counter-productive. Can the presence of mirrors in exercise settings enhance self-focus causing more harm than good? Can the presence of mirrors in an exercise setting significantly affect the overall exercise experience and influence an incorrect perception of exercise intensity? Will the presence of mirrors in an exercise setting heighten self-awareness causing people with low body esteem levels to have greater misperceptions of the workload being performed than those with higher body esteem levels?

This study investigated whether the presence of mirrors would impact perceived exercise intensity. If there is a significant difference between actual workload and perceived workload in a mirrored condition, then the type of environment in which an individual chooses to exercise needs to be addressed. If this difference is only applicable to those with low body-esteem levels, than body consciousness needs to be addressed. Understanding individuals' reasons for exercise and perceptions of themselves pre/post exercise (e.g., "I feel good," versus "I look good.") may prove to be fundamental in increasing body-satisfaction and the effectiveness of the exercise prescription.

Purpose of the Study

The purpose of this study was to determine whether the presence of mirrors would affect perceived exercise intensity, and if an individual's level of body consciousness (i.e., body esteem and body awareness) influenced the relationship between the effects of the mirror and perceived exercise intensity.

Hypotheses

The major hypotheses for this study are as follows:

1. Subjects will display greater perceived exercise intensity (RPE) in a mirrored environment.
2. Subjects will display a higher heart rate and greater perceived exercise intensity in a shorter amount of time in front of a mirror than in a non-mirrored environment.
3. Subjects with a lower body perception score will reach submaximal heart rate levels sooner than those with a higher body perception score.
4. Subjects with a lower body perception score will have a greater RPE in front of a mirror than those with a lower body perception score.
5. Subjects with a lower body perception score will display heart rate levels less reflective of the actual workload being performed than subjects with a higher body perception score.
6. Subjects with a lower body perception will have more difficulty identifying their actual posture than subjects with a higher body perception.

Assumptions of the Study

The following assumptions were made for the purpose of this study:

1. Subjects are representative of habitual exercisers.
2. Subjects have not exercised on the day of testing.
3. RPE represents subjective assessment of exercise intensity.
4. All questionnaires are answered truthfully.
5. HR is a valid indicator of exercise intensity.

Definitions of Terms

1. Body Awareness: the amount of attention an individual pays to his or her internal bodily sensations (e.g., heart rate, ventilation rate, blood pressure) (Miller et al., 1981).
2. Body Consciousness: the awareness of the physical self (Miller et al., 1981). It can be expressed publicly (e.g., public consciousness, "I worry about making a good impression) or privately (e.g., aspects of the private self, "I notice changes in mood.").
3. Body Esteem: the overall attitude about the physical self that can be identified using the Body-Esteem Scale. The Body Esteem Scale identifies three different factors that comprise body esteem; for males (e.g., physical attractiveness, upper body strength, and physical condition) and females (e.g., sexual attractiveness, weight concern, and physical condition) (Franzoi & Herzog, 1986).
4. Body Image: the level of satisfaction with body shape and weight that include body perceptions, emotions, and cognitive aspects (Tiggemann & Lynch, 2001).
5. Intensity: the relative exercise workload, measured via heart rate, oxygen consumption, and/or rate of perceived exertion (Plowman & Smith, 2003).
6. Rate of Perceived Exertion (RPE): a numerical scale (e.g., Borg's 6-20) used in exercise, designed to assess the perceived overall effort or distress of the body during varying levels of exercise (American College of Sports Medicine, 2000).

7. Self - Efficacy: an individual's judgment towards his or her ability to successfully carry-out a task (e.g., "I will be able to run 3 miles without stopping.") (Williams, 2001).
8. Self -Esteem: an overall feeling an individual has towards his or her sense of value and worth (e.g., "I am a valuable asset to this team.") (Williams, 2001).

Delimitations of the Study

1. Subjects were females between the ages of 18 and 30.
2. Subjects were actively involved in cardiovascular exercise (e.g., treadmill, bike, walking, etc.) at least 3 times per week for a minimum of 20 minutes in duration each time.
3. Subjects were able to jog on a treadmill for at least 20 minutes in duration at a self-selected moderate pace.
4. Exercise took place in a controlled environment.
5. Body consciousness was assessed through the use of questionnaires (Body Awareness Questionnaire, The Body-Esteem Scale, and the Physical Self-Description Questionnaire).

Limitations of the Study

1. The results may only be applicable to young females.
2. The results may only apply to those who engage in treadmill activity (e.g., running and walking) on a regular basis.
3. Results may only apply to those able to jog for at least 20 minutes in duration at a self-selected pace.

4. The results may only apply to those who exercise in a controlled setting.
5. The results may only apply to those for whom body image can be assessed within the boundaries of the evaluation tools used.

Chapter 2

REVIEW OF LITERATURE

Introduction

Numerous organizations have established guidelines in order to promote safe and effective exercise (Martin et al., 2003). One guideline recommended by the American College of Sports Medicine (ACSM, 1997, p. 9.) suggests that all exercise classrooms should have "mirrors in at least two of [their] four walls." The reasons for this recommendation are to monitor form and technique and to improve supervision of participants. While this seems to justify the need for mirrors in exercise classrooms, some researchers have shown that mirrors in an exercise setting may increase state anxiety, self-focus, and decrease self-efficacy (Ginis & Jung, 2003). These findings suggest that exercise may not always improve mood and reduce anxiety (US Centers for Disease Control, 1996). The question is thus raised: Do mirrors elicit more harm than good?

Little research exists investigating the relationship between body esteem, exercise intensity, and the presence of mirrors in an exercise environment. This study investigates the effect of mirrors on perceived exercise intensity and the extent to which body consciousness can predict this effect. This chapter will examine issues pertaining to body consciousness and exercise in the following sections: (a) the effects of body consciousness on self-perceptions, (b) exercise and psychological factors, (c) ratings of perceived exertion and exercise, (d) the effects of mirrors on exercise, (e) the effect of the environment on exercise

intensity and perceived exertion, (f) tools used to assess body-esteem, (g) tools used to assess ratings of perceived exertion, and (h) summary.

The Effects of Body Consciousness Levels on Self-Perceptions

Body consciousness is the amount of attention an individual pays to his or her bodily sensations (Miller et el., 1981). Individuals attend to themselves both privately and publicly (Miller et al., 1981). The private aspect of body consciousness is only able to be observed and experienced by the individual (i.e., feelings, thoughts, and emotions) and is often referred to as body awareness. Public body consciousness refers to physical aspects of the self (i.e., appearance and behavior) and is often termed body-image (Miller et al., 1981). Individuals differ a great deal in the amount of attention they pay towards the private and public aspects of themselves (Miller et al., 1981). Both private and public body consciousness affects behavior (Miller, et al., 1981).

Private Body Consciousness: Body Awareness

The precise effects of body awareness on exercise are not known. However, several studies reveal that the amount of attention an individual pays to his or her internal bodily sensations can influence the interpretation of normal physiologic functions (i.e., heart rate, ventilation rate, etc.) (VanDeusen, 1993; Miller at al., 1981).

Body awareness levels run on a continuum. The exact point at which body awareness levels are too high or too low is unknown. However, research on eating disorders has cited that those suffering from eating pathologies do not perceive

internal sensations, such as hunger, or the feeling of being full (VanDeusen, 1993).

Body awareness levels can influence the amount of recognition an individual has towards the effects of certain stimuli (e.g., caffeine). Miller et al. (1981) looked at reactions to the ingestion of caffeine in individuals with high and low body consciousness levels. Participants were categorized using the top and bottom thirds (i.e., low and high) of the distribution of the private body consciousness scales (Miller at al., 1981). Results revealed that individuals who measured high in private body consciousness or high in private body consciousness and private self-consciousness were affected by caffeine. Individuals high in body consciousness reported a greater observable physiological change as a result of the caffeine compared to those low in private body consciousness.

There is an association between the presence of a negative affect (i.e., anxiety, emotionality and hypochondriasis) and levels of body consciousness and competence (Miller et al., 1981). This association suggests a link between body awareness, body image and physical self-efficacy.

Public Body Consciousness: Body Image

Body dissatisfaction is present in both men and women. Although there is a positive association between body dissatisfaction and eating disorders, body dissatisfaction is not unique to individuals with eating disorders (Mazzeo, 1999). Body dissatisfaction is a result of a difference in the perception of the actual body shape from the ideal body shape (Gruber et al., 2001). Women tend to perceive

themselves to be larger than what they actually are (Fallon & Rozin; 1985; Gruber et al., 2001). In addition, women strive to achieve an ideal figure that is significantly thinner than their actual figure (Fallon & Rozin, 1985). Numerous researchers have evaluated the sociocultural impact on body image, concluding that pressures to be thin encourage body dissatisfaction (Stice et al., 2003). There is a positive relationship among the amount of sociocultural exposure an individual has to thin-ideal images, the level of awareness of society's pressure to be thin, and body dissatisfaction (Stice et al., 2003). The greater exposure an individual has, and the more susceptible an individual is to sociocultural based pressures, the more likely the individual is to adopt a self-objectifying perspective.

The self-objectification theory suggests that women take an objectifying perspective from an outsider's point of view. Individuals who take on this perspective evaluate themselves based on their appearance (Frank & Thomas, 2003). Self-objectification increases physique anxiety and self-consciousness (Gapinski et al., 2003). Several studies have found an association between physique anxiety, self-objectification, and the environment (Eklund & Crawford, 1994; Gapinski et al., 2002). Eklund and Crawford (1994) investigated exercise behavior patterns, specifically looking at attitudes towards the favorability of the exercise setting, measuring social physique anxiety levels and self-presentational anxiety levels that are associated with the physique. Self-presentational anxiety is anxiety that results from attempting to achieve desired impressions and avoid undesired impressions. Social anxiety resulting from a desire to convey a physical

ideal is social physique anxiety (Eklund & Crawford, 1994). Eklund and Crawford (1994) looked at the extent to which attire influenced the favorability for the exercise setting. Attire emphasizing the physique had a significant affect on women's physique anxiety, motivation, efficacy, and self-conscious levels (Eklund & Crawford, 1994; Gapinski et al., 2002). Exercise may reduce anxiety levels, however, studies reveal that exercise performed in an unfavorable exercise setting will fail to produce these results. Exercise may generate psychological health benefits, but the perceptions held before, during and after exercise – perceptions of the self, of the surrounding environment, and of the physical activity itself – may determine the degree of the benefit.

Exercise and Psychological Factors

Mental disorders account for more then 15% of all diseases in the United States, only slightly less than cardiovascular disease (18.5%) (Murray & Lopez, 1999; Williams, 2001). Regular physical activity has been shown to provide significant psychological health benefits (Williams, 2001). Exercise is reported to reduce levels of anxiety and depression and increase self-esteem (McAuley, 1994; McAuley et al., 1996).

Current guidelines recommend that individuals participate in physical activity at least 3 to 5 days/week for a total of 20 to 60 minutes of continuous or intermittent aerobic activity (ACSM, 2000). Hansen et al, (2002) investigated exercise duration and mood state to determine if there was a difference in the psychological affects (i.e., vigor, confusion, fatigue, and total negative mood) of exercise in 10, 20, and 30 minute bouts of exercise on a bicycle ergometer.

Results indicated that there was an improvement in levels of vigor, fatigue, and total mood state after 10 minutes of exercise at 60% of participants' VO2 max. There were progressive decreases in confusion over 20 minutes but no additional improvements over a longer time period. Results of this study support the claim that physical activity promotes psychological well-being and supports current exercise recommendations. In addition, the exercise-induced improvements in aerobic fitness levels result in both short-term and long-term psychological benefits (Dilorenzo et al., 1999). However, reasons for exercise participation and perceived benefits and barriers of exercise may influence the psychological benefits associated with exercise.

Exercise and Motivation

Women identify the perceived benefits of exercise to be psychological and body-image related (Myers & Roth, 1997). Women indicate weight-related reasons as being their greatest motivator for exercise, which may be a result of body dissatisfaction (Crawford & Eklund, 1994). Exercise can play a powerful role in changing body image; it can enhance the way a person perceives themselves physically, but it can also be taken to excessive levels in attempt to achieve the "impossible" (Olsen, 2003).

The choice to exercise, and the amount of exercise an individual chooses to engage in, may relate to an individual's internal standard. The self-awareness theory states that an increase in self-focus will lead people to compare their actual behavior to internal standards (Sentyrz & Bushman, 1998). People are not usually self-focused, or inwardly attentive to themselves. However, certain circumstances

(e.g., mirrored environments) perpetuate self-focus and draw attention inward (Sentyrz & Bushman, 1998). Perhaps this shift in focus can lead to misperceptions of the workload being performed.

Ratings of Perceived Exertion and Exercise

There are psychological and physiological interactions that occur during exercise that contribute to perceptions of the workload being performed (ACSM, 2000). According to ACSM (2000), when there is an increase in the rate of ventilation, oxygen uptake, metabolic acidosis or a decrease in muscle carbohydrate stores, the perception of exercise effort increases.

Exercise intensity can be assessed using physiological and/or psychological measures. A psychophysiological scale used to measure an individual's perception of effort is the ratings of perceived exertion scale (RPE) (ACSM, 2000). Perceived exertion is a result of cognitive processes involved in subjectively determining levels of effort during exercise (Nethery, 2002). The RPE scale measures an individual's perception of the feelings of effort, strain, discomfort, and/or fatigue (ACSM, 2000). The RPE scale can be used to measure perceived exercise intensity during both aerobic and resistance training.

Perceived exertion levels are highly correlated with exercise heart rates and work rates (ACSM, 2000). As work-rate increases, both HR and RPE increase in a linear fashion. However, approximately 5% to 10% of individuals using the RPE scale underestimate RPE in the early and middle stages of an exercise test (ACSM, 2000). Buckley et al. (2003), investigated the validity and reliability of measures taken to assess VO2 max during a step test and to prescribe

subsequent exercise. Results indicate that for box stepping, the reliability and validity of the RPE and heart rate relation carry two stipulations for valid results: (1) when exercise intensity is greater than 50% VO2 max or greater than 65% HR max and (2) when a practice trial is first performed (Buckley et al., 2003). When exercising at a specific workload and after establishing familiarity with the scale, RPE can be a valid and reliable measure of exercise intensity. However, RPE is subjective and based on an individual's perception of the feelings associated with the work being performed. Can situations that provoke an increase in self-focus and self-awareness influence RPE?

The Effects of Mirrors in Exercise

Mirrors increase an individual's self-focus and self-awareness and ultimately impact behavior. For example, self-focusing situations have been shown to impact food consumption (Sentyrz & Bushman, 1998). Sentyrz and Bushman (1998) found that individuals presented with high-fat, reduced-fat, and low-fat products, consumed less full-fat products in front of a mirror than those in a non-mirrored environment. In addition to food consumption, mirrors present in an exercise setting are shown to influence self-efficacy (Ginis & Jung, 2003; Katula et al., 1998; Katula & McAuley, 2001). Several studies observing the effects of mirrors on post-exercise mood in women found that self-efficacy is only affected in sedentary and moderately active individuals (Ginis & Jung, 2003; Katula et al., 1998). Active women showed no significant difference in self-efficacy levels in a mirrored and non-mirrored environment (Katula & McAuley, 2001). Ginis and Jung (2003) found that sedentary women exercising in a

mirrored environment generally felt worse in their levels of self-efficacy and mood after exercising than those exercising in a non-mirrored environment. How mirrors affect people during exercise has not been examined; however, other environmental factors that present sensory distraction impact perceptual responses to exercise intensity (Nethery, 2002).

The Effect of the Environment on Exercise Intensity and Perceived Exertion

The external environment where exercise takes place can influence mood state, exercise intensity and perceived exertion. Numerous researchers have compared indoor versus outdoor exercise, weather conditions, and other environmental factors that may impact physical activity (Brooks et al., 2003; Humpel et al., 2002). Of more interest to the current study is the level of self-awareness promoted by the exercise environment.

The exercise environment can encourage recognition of signals relevant to the work being performed (e.g., muscle strain and pulmonary ventilation) or sensory signals as a result of the environment (Nethery, 2002). These signals can be either internal or external. Internal cues increase self-awareness, drawing greater focus to the physiological responses to work (e.g., heart-rate, ventilation rate and fatigue) (Nethery, 2002). External cues are distractions (e.g., music and television) from the senses related to the work being performed. Internal and external cues compete for focal awareness (Nethery, 2002). The extent to which sensation is brought to an individual's attention relies on the strength of the stimulus and the degree of interest in that particular sensation (Nethery, 2002). Nethery (2002) examined the effect of exercise setting (i.e., sensory deprived,

music, video, and control) on the rating of perceived exertion. Results indicated that RPE was lower in the music environment. The sensory-deprived environment resulted in a significantly higher RPE than all environments, although there was no difference among heart rate in all the environmental conditions. Overall, the presence of external distraction resulted in the perception of an easier workload, whereas no distraction resulted in a perception of a higher workload. The difference is predicted to be a result of greater awareness of internal body sensations (i.e., heart rate, ventilation rate, etc.). Individuals in the sensory-deprived environment were more aware of the physiological responses of exercise due to the absence of external distractions.

Research has demonstrated the environment can influence the perception of the workload regardless of the exercise intensity being performed (Nethery, 2002). However, research does not exist examining the effects of a mirrored environment on RPE and the extent to which body conscious levels may predict this.

Tools Used to Assess Body Image

According to Stewart et al. (2001), the vast majority of body assessment questionnaires have been generalized into two categories: (1) perceptual measures, and (2) attitudinal measures. For the purpose of this study, investigation into the perceptions of body image will be assessed. A wide variety of inventories are used to assess body image, including the Physical Self-Efficacy Scale (Ryckman et al., 1982), the Body Awareness Questionnaire (Shields, Mallory & Simon, 1989), the Body-Esteem Scale (BES: Franzoi & Shields, 1984), the

Physical Self-Description Questionnaire Instrument (PSDQ: Marsh et al., 1994), the Eating and Attitude Test (EAT: Garner, Olmstead, Bohr & Garfinkel, 1982) and Fallon and Rozin's (1985) Body Image Questionnaire.

No studies have explored the effects of body esteem and presence of mirrors on exercise intensity. In the current study the three assessment tools used were: the Body-Esteem Scale (Franzoi & Shields, 1984), the PSDQ (Marsh et al., 1994) and the Body Awareness Scale (Shields, Mallory, & Simon, 1989). All three assessment tools have been shown to have good reliability and validity (Franzoi, 1994; Marsh, 1996; Shields et al., 1989). Specifics for each questionnaire are discussed further in the following sections.

The Body-Esteem Scale

The Body-Esteem Scale is a 35-item questionnaire that is used to assess individual differences in body-esteem (Franzoi & Shields, 1984). It consists of three subscales; (1) physical attractiveness (PA) for males (e.g., nose or lips) or sexual attractiveness (SA) for females (e.g., body scent or lips), (2) upper body strength (UBS) for males (e.g., muscular strength or biceps), or weight concern (WC) for females (e.g., appetite or waist) and (3) physical condition (PC) for both males (e.g., energy level or physical coordination) and females (e.g., energy level or agility). Individuals are asked to identify on a 5-point Likert scale the extent to which they are satisfied with specific physical attributes. The Body-Esteem Scale has an alpha coefficient for each subscale greater than .70 (physical attraction (.78), weight concern (.87) and physical condition (.82). and a test-retest

reliability for each subscale greater than .70 (sexual attraction (.81), weight concern (.87), and physical condition (.75) (Franzoi, 1994).

Body Awareness Questionnaire

The Body Awareness Questionnaires is an 18-item questionnaire designed to assess awareness to normal, non-emotive body sensations (e.g., "I notice distinct body reactions when I am fatigued."). This questionnaire concentrates on nonemotive sensations that are specific to the levels of sensitivity to cycles of the body and rhythms (e.g., "There seems to be a "best" time for me to go to sleep at night."), minute changes that occur during normal body functioning (e.g., "I notice specific body responses to changes in the weather."), and the level of ability to feel or foresee bodily reactions (e.g., "When my exercise habits change, I can predict very accurately how that will affect my energy level.") (Shields, Mallory & Simon, 1989). The questionnaire is suitable for use with college-aged students and non-student adults (Shields et al., 1989). Individuals respond to each statement on a 7-point Likert scale (e.g., 1 = not at all true of me and 7 = very true of me). The Body Awareness Questionnaire has a good alpha coefficient (.82) and test-retest reliability (.80) (Shields et al., 1989).

The Physical Self-Description Questionnaire

The Physical Self-Description Questionnaire is a 70-item questionnaire comprised of 11 categories: Health, Coordination, Physical Activity, Body Fat, Sports Competence, Global Physical, Appearance, Strength, Flexibility, Endurance, and Esteem. For the purpose of this study the four categories assessed were body fat (e.g., "I am too fat" or "My waist is too large."), appearance (e.g.,

"I am attractive for my age" or "I have a nice looking face."), endurance (e.g., "I can run a long way without stopping" or "I could jog a 5k without stopping.") and Esteem (e.g., "Overall, most things I do turn out well" or "Most things I do, I do well.") (Marsh, Richards, Johnson, Roche, & Tremaybe, 1994). All domains of the questionnaire have an alpha coefficient of greater than or equal to .87 [body fat (.96), appearance (.91), endurance (.92) and esteem (.91)] and a test-retest reliability of greater than or equal to .70 [body fat (.89), appearance (.78), endurance (.87, and esteem (.89)](Shields et al., 1989; Franzoi, 1994; Marsh, 1996).

Tools Used to Assess Ratings of Perceived Exertion

The rating of perceived exertion scale (RPE) is widely used in the exercise science literature and has been established as being both a valid and reliable measure (Borg, 1998; Katula et al., 1998; Lamb et al., 1999; Nethery, 2002). The two most commonly used RPE scales are the category scale which rates perceived exercise intensity from 6-20 (6 = resting state or extremely light workload and 20 = maximal exertion), and the revised category-ratio scale which rates exercise intensity from 0-10 (0 = nothing at all or "no intensity" and 10 = extremely strong or "strongest intensity"). For the purpose of this study RPE was measured using Borg's 6-20 scale (Borg, 1998; ACSM, 2000).

Borg's 6-20 Rating of Perceived Exertion (RPE) Scale

The Borg Rating of Perceived Exertion Scale was developed to monitor an individual's tolerance to exercise (Borg, 1998; ACSM, 2000). The scale is designed to subjectively assess feelings during exercise. The RPE scale takes into

account individual fitness levels, environmental conditions and levels of fatigue (ACSM, 2000). Borg's RPE scale has a good alpha coefficient (for heart rate (.80) and oxygen consumption (.79) and test-retest reliability .90 (Leung et al., 2003).

Summary

The American College of Sports Medicine (2000) recommends that all persons engage in 20-60 minutes of continuous or intermittent exercise every day at a moderate intensity. Gauging workload incorrectly, perhaps as a result of perceptual irregularities, may make adherence to this recommendation more difficult.

Innovative exercise promotion is important to understanding exercise recommendations and guidelines, and to establish exercise as a means to achieve wellness as opposed to "beauty". Promoting exercise as a way to achieve aesthetic ideals to an individual who has a poor body image may perpetuate and strengthen negative feelings, in addition to obligatory exercise behaviors. Perceptions held of the self, exercise setting, and exercise experiences are fundamental to exercise adherence and maintenance. The exact way to carry out these programs and to better understand individual variances and reasons for misperceptions is not yet understood. As a result, more research is required to investigate a relationship among body esteem levels, the environment, and exercise intensity. Recognition of inabilities to accurately perceive and interpret the body and its sensations may serve to better understand interpretations of the self and exercise behavior. No research exists that examines body consciousness levels and the effects of mirrors on perceived exercise intensity.

Chapter 3

METHODS AND PROCEDURES

The purpose of this study was to investigate the effects of mirrors on perceived exercise intensity, and examine whether a relationship existed between body consciousness and perceived exercise intensity. The procedures and instruments used in this study are covered in this chapter. Sections include: (a) participant selection, (b) procedures and testing schedule, and (c) data analyses.

Participant Selection

Participants were volunteers recruited from Ithaca College and the surrounding community. Recruitment took place by means of classroom announcements and by word of mouth.

All participants were females between the ages of 18 and 30 years old, had no known medical problems or symptoms as determined based on the health/lifestyle intakes. Participants were actively engaged in a regular cardiovascular exercise routine (at least 3 times a week for a total of 20 minutes each time) for at least 6 consecutive weeks, were familiar with treadmill exercise, and by self-report, were able to run at a steady pace for at least 20 consecutive minutes on the treadmill. In addition, all participants signed an informed consent. The proposed study design and method selected was approved by the Human Subjects Research Committee at Ithaca College.

Procedures and Testing Schedule

All participants underwent an initial day (Day 1) of testing for screening purposes (N = 19). Three were referred for medical clearance and did not

participate in the study. All remaining participants (N = 16) who were accepted to participate in the study completed testing days 2-4.

The first day of testing lasted approximately 45 minutes. Participants (N = 19) met with the primary investigator individually in the Neuromuscular Laboratory. Upon arrival each participant completed a test packet consisting of an informed consent (Appendix A), physical-activity readiness questionnaire (PAR-Q: Appendix B), health/lifestyle intake (Appendix C), and psychological assessments (Appendix D). In addition, participants completed anthropometric assessments of posture, body-mass index (BMI), waist-to-hip ratio (WHR), height, weight, and skinfolds (Appendix E). Participants who did not meet the minimum criteria for physical activity and physical health (n = 3) were referred for physician's approval and did not participate in the study. Criteria for exclusion included not engaging in a regular cardiovascular exercise, being unfamiliar with the treadmill or unable to run on the treadmill for 20 consecutive minutes, and answering "yes" to any of the questions on the PAR-Q form.

On day 1, participants completed several psychological inventories and each underwent a series of anthropometric measures to examine body shape and size. These measurements included: posture, waist and hip girth, stature, body weight, and body composition. In addition, resting heart-rate was gathered to help calculate each participant's 85% maximal heart-rate. The psychological tests used were the Body-Esteem Scale, the Body Awareness Questionnaire, and the Physical Self-Description Questionnaire.

The Body-Esteem Scale

The Body Esteem Scale questionnaire consists of three subscales; (1) physical attractiveness (PA) for males (e.g., nose or lips) or sexual attractiveness (SA) for females (e.g., body scent or lips), (2) upper body strength (UBS) for males (e.g., muscular strength or biceps), or weight concern (WC) for females (e.g., appetite or waist) and (3) physical condition (PC) for both males (e.g., energy level or physical coordination) and females (e.g., energy level or agility). Participants were be asked to identify on a 5-point Likert scale the extent to which they have positive or negative feelings about each body part or function. Higher scores reflected greater levels of body esteem, although absolute categorization of "low" and "high" levels of body esteem cannot be determined (Franzoi, 2005, personal communication).

The Body Awareness Questionnaire

Following the body esteem scale, subjects were assessed on their body awareness. Participants answered 18 questions (e.g.,*"I notice specific body reactions to being hungry; "When my exercise habits change, I can predict very accurately how that will affect my energy level."*) on a 7 point Likert scale (1= not at all true of me, and 7 = very true of me). One of the 18 questions (Item # 10) required reverse scoring. One's Body Awareness score was computed by summing all the items. The higher the score, the greater the participant's body awareness.

The Physical Self-Description Questionnaire (PSD-Q)

Following the body awareness scale, subjects completed the PSD-Q. The PSD-Q is divided into 11 categories: (1) Health, 8-items (e.g., *"When I get sick I feel so bad that I cannot get out of bed."*), (2) Coordination, 6-items (e.g., *"I feel confident when doing coordinated movements."*), (3) Physical activity, 6-items (e.g., *"Several times a week I exercise or play hard enough to breathe hard (to huff and puff)."*), (4) Body fat , 6-items (i.e., *"I am too fat."*), (5) Sports competence, 6-items (e.g., *"I am good at most sports."*), (6) Global physical, 6-items (e.g., *"Physically, I am happy with myself."*) (7) Appearance, 6-items (e.g., *"I am attractive for my age."*), (8) Strength, 6-items (e.g., *"I am a physically strong person."*), (9) Flexibility, 6-items (e.g., *"My body is flexible."*), (10) Endurance, 6-items (e.g., *"I can run a long way without stopping."*), and (11) Esteem, 8-items (e.g., *"Overall, most things I do turn out well."*). Subjects rated their answers on a 6-point Likert scale (1 = false, 2 = mostly false, 3 = more false than true, 4 = more true than false, 5 = mostly true, and 6 = true). The mean was computer for each component of the PSD-Q. Higher scores indicated an overall greater self-concept level.

Anthropometric Measurements

Posture was the first anthropometric measurement assessed. Sagittal plane posture was assessed using the plumb-line. The plumb-line was hanging from the ceiling and out of view during the placement of the participant. A strategically placed ruler on the floor served as a guide to allow for proper placement of the participant. The plumb-line hung so that it bisected the participant's lateral

malleolus in the sagittal plane. Participants wore blinders to prevent them from viewing the plumb-line. Upon proper placements, the plumb-line was brought into view for the primary investigator. The investigator then identified on the data collection sheet whether the ear of the participant was in front of the line, centered with the line, or behind the line. The plumb-line was removed and the participant was asked, using three illustrations to serve as examples (Appendix E), whether she believed her ear to be in front of the line, centered with the line, or behind the line. Following the response, the participant was asked how confident she was of her response. The purpose of this was to assess the accuracy of the participant's postural awareness and their confidence in their self assessment.

Height and weight were taken following the posture assessment. Height was taken in centimeters using a measuring tape attached to a wall. Weight was taken in pounds (lbs) using a weighing scale and later converted to kilograms (kg). Participants were asked to stand facing away from the scale so they could not see their actual weight. BMI was calculated by the primary investigator using the subjects height and weight (ht(cm)/weight(kg)^2) (ACSM, 2000). These anthropometic variables were gathered as part of a larger study and were not analyzed as part of the current study.

Waist and hip circumferences were taken following the height and weight assessment. Measurements were taken using a cloth measuring tape. Waist circumference was taken at the narrowest part of the torso, and hip measurements were taken at the largest part of the buttocks in accordance with ACSM guidelines

(ACSM, 2000). A waist-to-hip ratio was calculated as waist circumference divided by hip circumference (WHR).

The final anthropometric measurement taken was body composition. Participants were first asked their perceived percent body fat. The primary investigator asked participants; *"Do you believe that your percent body fat is 1) above average, 2) average, or 3) below average?"* Subjects were then asked; *"Do you believe that your percent body fat is; 1) too high, 2) just right, or 3) too low?"* Actual body composition was determined by using the skin caliper, measuring 7-sites. There were two trials, with the second trial beginning after all 7-sites had already been assessed. Actual percent body fat was calculated using ACSM's generalized skinfold equation for 7-site measurement (ACSM, 2000). Participants were not informed of these results until completion of the study.

On day 2, participants underwent a submaximal exercise treadmill test that was used to establish baseline fitness and to familiarize the participants with the exercise environment. On days 3 and 4 participants underwent the treatment conditions of exercising on a treadmill one day in a mirrored environment and one day in a non-mirrored environment. In the mirrored environment, the treadmill was positioned to face a large wall mirror. The treadmill was facing the mirror and located at the farthest end of the mirror so when standing next to the participant exercising on the treadmill, the primary investigator's reflection in the mirror was unable to be seen. Participants exercised in both conditions. Participants who exercised in the mirrored condition first (n = 8) and participants who exercised in the non-mirrored condition first (n = 8) were alternated (e.g., P1

= mirrored condition, P2 = non-mirrored condition, P3 = mirrored condition, P4 = non-mirrored condition, etc.). All treadmill testing took place in the Wellness Clinic at Ithaca College. Only the primary investigator and participant were present during the testing session.

Submaximal Treadmill Testing, Heart Rate and RPE Measurements

On days 2 to 4 the participants performed a total of three submaximal treadmill tests. The first test took place on the treadmill located in the non-mirrored environment. This test was used to establish a baseline measurement and to familiarize each participant with the protocol. There was a minimum of a 24 hour rest/recovery period between each treadmill test and a maximum of seven days between each test. All submaximal tests followed the same protocol. Test termination criteria set by the American College of Sports Medicine for low-risk adults (ACSM, 2000, p. 80).

The protocol used was based on the American College of Sports Medicine's general procedure for submaximal testing (ACMS, 2000, p. 72). Submaximal testing was performed on a motorized treadmill. Each test comprised of several 3-minute exercise intervals, allowing the participant to reach a steady-state heart rate, with 2% grade increments. Increments were smaller than the commonly used 2.5% work-rate increase, to allow for a greater number of ratings of perceived exertion (RPE). Participants were given a 5-minute warm-up prior to the start of the protocol. Participants self-selected a pace typical of a comfortable jog. The pace was recorded and used for the final two submaximal tests. There was an increase in work rate until participants reached 85% maximal heart-rate

(±5 bpm) that was determined using the Karvonen formula ((220-age)- resting heart-rate (RHR))+ RHR). Heart rate was recorded at 2 minutes and 30 seconds of each stage, and RPE was taken at 2 minutes and 45 seconds of each stage. Heart rate was monitored using Polar Heart-Rate monitors (HealthCheck Systems, 431A Avenue U, Brooklyn, NY, 11223). Rating of perceived exertion was identified using the Borg Scale. The primary investigator asked participants *"what is your RPE?"* and participants identified their RPE at that moment without hesitation. Once the participant reached 85% maximal heart rate, participants continued at the same work-rate for a duration of two stages, which lasted approximately 6 minutes. Participants followed the same protocol for HR and RPE, however work rate remained constant. Upon completion of the final two stages, there was a brief cool-down. Heart rate and participant observations were monitored each minute of the cool-down. The primary investigator asked sporadically throughout the test *"how are you feeling?"* to ensure the safety and well-being of the participant. No positive or negative reinforcements (e.g., "*good job*"," *keep it up*") were provided by the primary investigator.

Data Analyses

Preliminary analyses included grouping participants into Low and High Body-Esteem groups and Low and High Body Awareness groups. However, discrete groups could not be made since true "low" and "high" body esteem and body awareness scores were not defined within the context of the questionnaires. Instead groups were formed multiplying Body Esteem scores x Body Awareness scores and creating a new Body Perception factor. Analyses were performed using

these groups, comparing the criterion measure HR and RPE across two treatment conditions (mirrored versus non-mirrored). Separate multiple analyses of variance were performed using two different variables. The first variable looked at the two stages of exercise performed at 85% maximum heart rate. The second variable looked at exercise from the beginning of exercise to the end of exercise (first stage and last stage). Following this, post-hoc and univariate analyses were conducted to assess results further. The level of significance for these analyses was also set at .05.

Chapter 4

RESULTS

This research was designed to investigate whether the presence of mirrors in an exercise setting influenced perceived exercise intensity (RPE). More specifically, this research explored whether one's perception of their own body as measured by a body esteem scale and a body awareness scale, influenced exercise performance (i.e., perceived and actual exercise intensity) in front of a mirror as compared to no mirror. The initial strategies used to analyze the data, specifically a 2 x 2 x 2 ANOVA (2 Body Esteem/Body Awareness Groups x 2 Mirror Conditions x 2 Exercise Stages, with repeated measures on the Condition and Stage factors), did not prove useful for several reasons. First, separating the participants into groups using the median split of the body-esteem and body awareness scores did not provide sufficiently distinct groups. In addition, preliminary analyses revealed a relationship or interaction between body esteem and body awareness that was not addressed in the original analysis plan.

As a result, the decision was made to first group the subjects by a combined score of their Body Esteem Scale results and Body Awareness Questionnaire results. Each subject's Body Esteem score was multiplied by her Body Awareness score for a final "Body Perception" score. The subjects were then grouped by a median split of the scores into a Low Body Perception group and a High Body Perception group. Combining body-esteem and body awareness scores provided insight into both the public and private aspects of body consciousness. This is important because it designates the total amount of

attention participants pay to their internal body sensations and body image. This grouping was then used in a 2 x 2 x 2 MANOVA (Group x Mirror Condition x Stage, with repeated measures on the Condition and Stage factors) that simultaneously examined the HR and RPE dependent measures. Post-hoc analyses and univariate tests were conducted as indicated by the results. Analysis of the data was conducted using two different variables. The first variable examined HR and RPE changes in the actual first stage of exercise and the actual final stage of exercise. The second variable examined the dependent measures using the two stages of exercise performed at 85% (i.e., Stage 1 at 85% to Stage 2 at 85%) maximum heart rate. Presented first are the data from the two stages at 85% maximum heart rate.

Description of the Subjects

Nineteen females, ranging from 19 to 29 (M = 21.4) years old volunteered to participate in this study. During the course of the study, three female participants were unable to participate in the final three days of testing due to exercise contraindications identified using the PAR-Q. The remaining 16 females were included in the data analysis. All of the volunteers were moderately active or active exercisers, had no known health problems, and if taking medications, were taking medications on a regular basis. Table 1 contains the descriptive statistics, including the mean age, height, weight, body composition and waist-to-hip ratio for the Low and High Body Perception groups.

Table 1.

Participant Characteristics (Means, Standard Deviations) for the Low and High Body Perception Groups

	Low (n = 8)		High (n = 8)		Total (n = 16)	
Variables	M	SD	M	SD	M	SD
Age (years)	21.38	1.69	21.88	3.09	21.62	2.42
Avg. Num. Days Ex./ Wk	5.00*	1.07	3.94	0.82	4.47	1.07
Height (m)	1.67	0.05	1.70	0.06	1.69	0.05
Weight (kg)	60.80	7.27	60.23	7.96	60.51	7.37
Waist-to-Hip Ratio	0.73	0.04	0.73	0.03	0.73	0.03
% Body Fat	19.20	3.55	19.26	2.52	19.23	2.97
Body Esteem Total Score	111.75*	10.10	142.00	17.00	126.88	20.65
Body Esteem - Sexual Attractiveness	44.38*	4.47	52.25	5.15	48.31	6.18
Body Esteem - Weight Concern	25.88*	4.32	40.38	5.83	33.13	8.98
Body Esteem - Physical Condition	31.75*	2.77	37.75	6.14	34.75	5.54
Body Awareness Score	68.50*	7.15	92.50	10.20	68.50	7.15
Body Perception Score	7662.63*	1089.66	13081.40	1742.67	7662.63	385.25

* Low Body Perception group significantly differs from the High Body Perception group, $p < .05$

Independent t-tests were conducted to compare the anthropometric and exercise/fitness variables of the groups. The Low Body Perception group had a significantly greater number of days exercised per week ($p = .04$) than the High Body Perception group. In addition the Low Body Perception group had a significantly lower body esteem total score ($p < .00$) and body awareness score ($p < .00$) than the High Body Perception group, which was expected as a result of forming discrete groups.

Heart Rate and Rating of Perceived Exertion Changes at 85% Max Heart Rate

Means (M) and standard deviations (SD) for HR and RPE for Groups, Mirror Condition, and Exercise Stage are presented in Table 2. MANOVA results are displayed in Table 3. Results reveal only a significant Stage effect on the dependent variables HR and RPE, indicating that both HR and RPE increased as exercise continued from the first stage at 85% Max HR to the last stage at 85% Max HR.

Heart Rate and Rating of Perceived Exertion Changes From Start to Finish of Exercise

Means (M) and standard deviations (SD) for HR and RPE are nested across Groups, Mirror Condition, and Exercise Stage are presented in Table 4. MANOVA results are displayed in Table 5. Results from the MANOVA revealed only a significant ($p < .05$) Stage effect and a nearly significant ($p = .053$) Stage x Body Perception group interaction. However, this nearly significant p-value ($p = .054$), in addition to a robust effect size, (*Eta-squared* = .36) warranted further attention and assessment of this interaction. Univariate repeated measures ANOVA's on HR and RPE were performed to examine this interaction.

Table 2.
Means (M) and Standard Deviations (SD) for HR and RPE Nested by Groups, Condition, and Time at 85% MHR

	Condition							
	Mirror				Non- Mirror			
Group	HR	SD	RPE	SD	HR	SD	RPE	SD
Low Body Perception								
S1 at 85%	176.25	4.98	13.88	1.90	175.13	5.69	14.06	1.97
S2 at 85%	180.25	5.80	14.25	2.14	178.25	9.16	15.06	1.47
High Body Perception								
S1 at 85%	175.38	3.42	14.75	1.04	174.13	4.55	14.25	0.89
S2 at 85%	178.75	4.74	15.88	1.64	179.13	5.64	15.63	1.69
Total								
S1 at 85%	175.80	4.15	14.31	1.55	174.63	5.00	14.16	1.48
S 2 at 85%	179.50	5.18	15.06	2.02	179.10	7.15	15.34	1.55

Note. n = 8 for each group. S1 = First stage at 85% of maximum HR. S2 = Second stage at 85% of maximum HR.

Table 3.
Group x Mirror x Stage Repeated Measures Multiple Analysis of Variance of RPE and HR at 85% Maximum HR

Source	Value	F	Hyp. df	Error df	p-value	Eta²	Pwr.
Group	0.09	0.62	2	13	0.555	0.09	0.13
Mirror	0.08	0.54	2	13	0.596	0.08	0.12
Mirror x Group	0.28	2.54	2	13	0.117	0.28	0.42
Stage	0.77	22.18	2	13	.000*	0.77	1.00
Stage x Group	0.10	0.72	2	13	0.506	0.10	0.15
Mirror x Stage	0.13	1.00	2	13	0.395	0.13	0.19
Mirror x Stage x Group	0.12	0.85	2	13	0.451	0.12	0.16

*Statistically significant, = .05

Table 4.
Means (M) and Standard Deviations (SD) for HR and RPE Nested by Groups, Conditions and Time at First and Final Stages of Exercise

Group	Condition							
	Mirror				Non- Mirror			
	HR	SD	RPE	SD	HR	SD	RPE	SD
Low Body Perception								
First	155.88	9.67	11.50	2	155.88	8.36	11.50	0.76
Final	178.13	4.97	14.93	1.94	176.88	5.99	15.56	0.82
High Body Perception								
First	164.63	10.89	11.50	1.07	165.25	13.13	11.63	1.75
Final	180.88	5.33	15.19	2.24	180.50	8.54	15.13	2.10
Total								
First	160.25	10.93	11.50	1.55	160.56	11.69	11.56	1.30
Final	179.50	5.18	15.06	2.02	179.10	7.15	15.34	1.55

Note. n = 8 for each group.

Table 5.
Group x Mirror x Stage Repeated Measures Multiple Analysis of Variance of RPE and HR at First and Final Stages of Exercise

Source	Value	F	Hyp. df	Error df	p-value	Eta²	Power
Group	0.16	1.24	2	13	0.323	0.16	0.22
Mirror	0.04	0.25	2	13	0.785	0.04	0.08
Mirror x Group	0.03	0.21	2	13	0.811	0.03	0.08
Stage	0.92	74.93	2	13	.000*	0.92	1.00
Stage x Group	0.36	3.73	2	13	0.053	0.36	0.58
Mirror x Stage	0.12	0.92	2	13	0.425	0.12	0.18
Mirror x Stage x Group	0.14	1.09	2	13	0.365	0.14	0.20

*Statistically significant, = .05

Results from the univariate repeated measures ANOVAs for HR (Table 6) and RPE (Table 7) revealed only a highly significant Stage effect for HR and RPE. A nearly significant ($p = .08$) Stage x Body Perception group effect was revealed for HR, but not RPE. This Stage x Body Perception group interaction was examined further to investigate why RPE showed a non-significant Stage x Body Perception group effect and HR differed, showing a nearly significant effect for the same interaction. Plots of RPE and HR over time for each Body Perception group were made. These plots, in Figures 1 and 2, illustrate a visible paradox in the data (see Table 3 for means and SDs).

Table 6.
Group x Mirror x Stage Univariate Repeated Measures Analysis of Variance of HR at the First and Final Stages of Exercise

Source	df	SS	MS	F	p	Eta²
Group	1	600.25	600.25	2.48	.138	.15
Error	14	3389.25	242.09			
Mirror	1	1	1	0.06	.814	.00
Error	14	242.25	17.30			
Mirror x Group	1	2.25	2.25	0.13	.724	.01
Stage	1	5587.56	5587.56	141.23	.000*	.91
Error	14	553.88	39.56			
Stage x Group	1	138.06	138.06	3.49	.083	.20
Mirror x Stage	1	5.06	5.06	0.55	.470	.04
Error	14	128.38	9.17			
Mirror x Stage x Group	1	0.06	0.06	0.01	.935	.00
Total	63	10648				
Grand Mean	5.73	968				

*Statistically significant α, = .05

Table 7.
Group x Mirror x Stage Univariate Repeated Measures Analysis of Variance of RPE at the First and Final Stages of Exercise

	df	SS	MS	F	p	Eta²
Group	1	0.00	0.00	0.00	0.978	.00
Error	14	67.06	4.79			
Mirror	1	0.47	0.47	0.45	0.512	.03
Error	14	14.65	1.05			
Mirror x Group	1	0.32	0.32	0.30	0.591	.02
Stage	1	215.72	215.72	42.47	.000*	.75
Error	14	71.12	5.08			
Stage x Group	1	0.10	0.10	0.02	0.892	.00
Mirror x Stage	1	0.19	0.19	0.50	0.490	.04
Error	14	5.34	0.38			
Mirror x Stage x Group	1	0.66	0.66	1.73	0.209	.11
Total	63	375.62				
Grand Mean	5.73	34.15				

*Statistically significant α, = .05

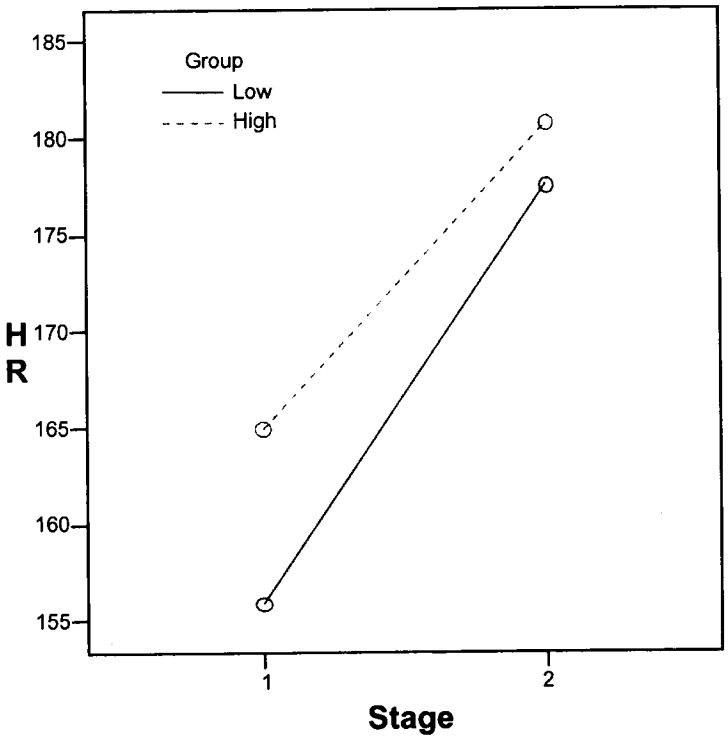


Figure 1. Graph of the Group x Stage interaction (p = .083) for heart rate during the first and final stage of exercise.

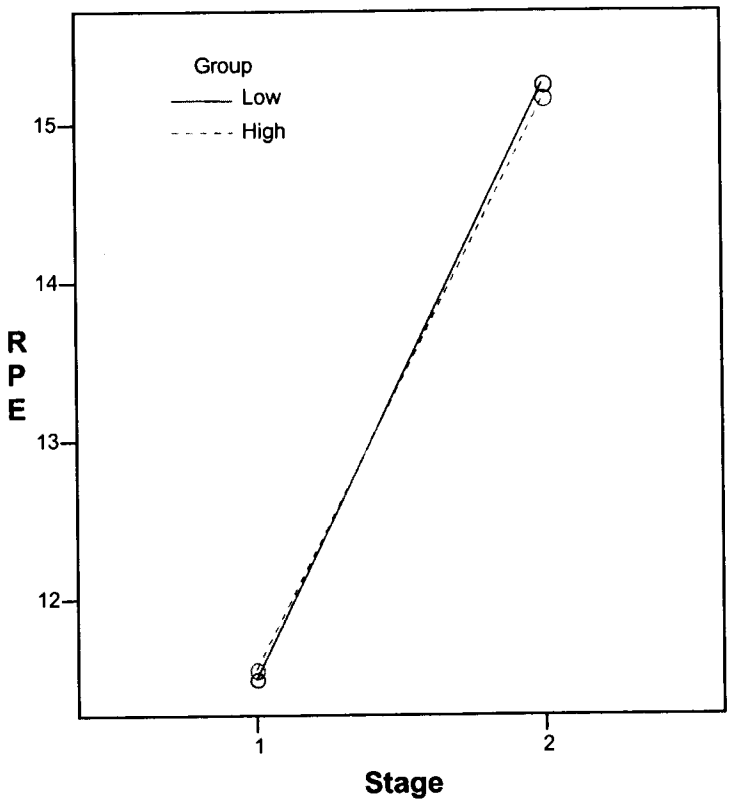


Figure 2. Graph of the Group x Stage interaction for RPE during the first and final Stage of exercise. This interaction was not statistically significant ($p < .05$).

These graphs illustrate that both the Low and High Body Perception groups were nearly identical in RPE from the first stage of exercise to the final stage of exercise. However, although RPE is nearly the same, the groups were different in their heart rate response ($p = .083$). The High Body Perception group started exercise at a HR 9 bpm higher than the Low Body Perception group, however did not increase in heart rate over the exercise session as much as the

High Body Perception group. The observation that HR and RPE did not increase uniformly for each group explains the nearly significant (p = .053) Stage x Body Perception group interaction in the MANOVA.

To look at these results more closely, an analysis of covariance was used to examine RPE, while removing the effects of HR. Doing so allowed for the examination of the behavioral component of exercise (i.e., perceived exertion) while holding the physiological component (i.e., heart rate) stable for each group. HR as a time-varying covariate (beginning stage HR and end stage HR) was used in a full-factorial 2 x 2 (Body Perception x Exercise Stage) repeated measures ANCOVA. Given that the Mirror Condition showed no significant main effects or interaction effects in any analyses, the data were collapsed over mirror condition in order to simplify further analyses. Averages for HR and RPE were taken across mirror conditions (i.e., mirror and no mirror) for the beginning stage and end stage. Means and standard deviations for the non-covariate adjusted means are shown in Table 8 and ANCOVA results are shown in Table 9.

The significant (p = .00) Stage x S1HR (i.e., beginning stage HR covariate) and nearly significant (p = .07) Stage x S2HR (i.e., end stage HR covariate) indicates that there was a change in RPE over time and this change is largely a result of HR at the at the first stage of exercise and to a lesser extent the HR at the final stage of exercise. Although the Stage x Body Perception group interaction was not quite significant (p = .10), Figure 3 illustrates an interesting aspect in the data. The individual HR and RPE plots from the univariate analyses suggested that the High Body Perception group had a "normal" rise in RPE

Table 8.
HR as a Time-Varying Covariate Adjusted Means (M) and Standard Deviations (SD) for RPE Nested by Groups and Time

	Group					
	Low		High		Total	
	Mean	SD	Mean	SD	Mean	SD
Stage						
First	11.50	1.34	11.56	1.38	11.53	1.31
Final	15.25	1.24	15.15	2.15	15.20	1.70

Note. N = 8 for each group. N = 16 for total.

Table 9.
Group x Stage Analysis of Covariance of RPE for First and Final Stages

Source	df	SS	MS	F	p
Stage	1	0.01	0.01	0.01	0.93
Error	12	13.70	1.14		
Stage x S1HR	1	16.44	16.44	14.40	.00*
Stage x S2HR	1	4.64	4.64	4.06	0.07
Stage x Body Group	1	3.60	3.60	3.15	0.10

*Statistically significant α, = .05

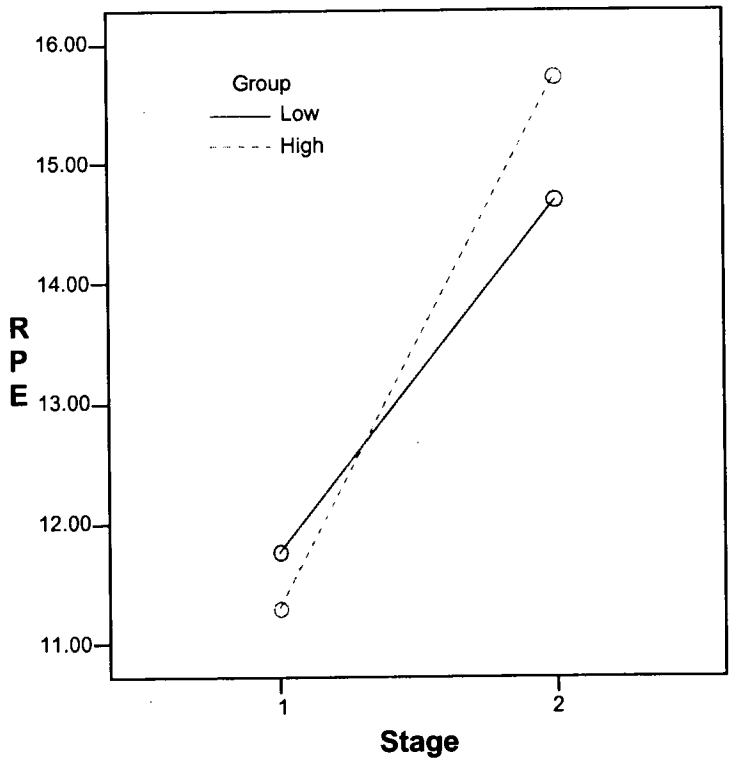


Figure 3. Graph of HR as time-varying covariate in the Group x Stage interaction for RPE in the first and final stages of exercise.

despite a high HR. The ANCOVA and Figure 3 look more closely at this relationship. The ANCOVA and Figure 3 look at the rise (slope) in RPE and HR between groups, illustrating that when actual HR is controlled, individuals with a high body perception have an increase in RPE at a greater rate during exercise than individuals with low body perception.

In summary, the Low Body Perception group and the High Body Perception group differed in their exercise response. Although the groups were

nearly identical in their RPE, the High Body Perception group began exercising at a higher heart rate than the Low Body Perception group. In addition, when holding heart rate constant, the High Body Perception group experienced a greater rise in RPE than the Low Body Perception group. This rise in RPE was not explained by the rise in HR.

Chapter 5

DISCUSSION OF RESULTS

Exercise has been shown to improve mood and decrease anxiety. However, research has also shown that the exercise environment may perpetuate feelings of anxiety (Crawford & Eklund, 1994). Although mirrors are used to help monitor form and technique during exercise, they can also elicit negative psychological effects. Mirrors in an exercise setting have been shown to increase state anxiety, self-focus, and decrease self-efficacy in women after exercise (Martin et al., 2003). Mirrors have not yet been explored as a potential influence in perceived and actual exercise intensity.

The intention of this study was to explore the possibility that mirrors present during exercise would influence exercise intensity (HR) and rating of perceived exertion (RPE). Specifically, the extent to which body perception levels influence this relationship was explored.

The results from Chapter 4 are discussed in relation to the following topics: (a) The effect of mirrors on heart rate and rating of perceived exertion (b) the effect of stage on heart rate and rating of perceived exertion, (c) the effect of body perception on heart rate and rating of perceived exertion.

The Effect of Mirrors on Heart Rate and Rating of Perceived Exertion

Results of this study reveal no effect of mirrors on HR or RPE (Table 3 and Table 5). Of course, one possibility is that there simply were no effects of mirrors on HR and RPE, butt the lack of effect may be related to experimental design issues that merit attention. For example, the exercise intensity levels and

protocol requirements are each sources of experimental limitations as discussed below.

Exercise Protocol and Intensity Level Requirements

The American College of Sports Medicine (2000) recommends that for most individuals to achieve an increase in cardiorespiratory fitness, they must exercise between 70 to 85% maximum heart rate. It was thought that if participants were to incorrectly gauge exercise intensity, it would be more obvious at a higher workload without reaching maximal exertion, thus requiring participants to exercise up to 85% maximum heart rate. In addition, it was hypothesized that individuals exercising in front of a mirror would display an RPE reflective of harder workload regardless of the actual exercise intensity. Results show no difference between HR and RPE in a mirrored and non-mirrored exercise environment.

It is unlikely that this lack of effect was a result of exercising too close to maximal exertion. ACSM (2000) states, "most subjects reach their subjective limit of fatigue at an RPE of 18 to 19" (pg. 79). Participants in both the Low and High Body Perception groups did not reach an RPE greater than 15 (Hard) throughout the exercise session in either condition.

In addition, the lack of treatment effect may have been the result of low sample size. Although preliminary explorations denote the sample size (N = 16) used in this study as being robust, results reveal that the main effect of the condition (mirror vs. no mirror) as having both a low effect size and power in all analyses , indicating the need for a larger sample size.

The American College of Sports Medicine (2000) states that "approximately 5 to 10% of individuals tend to underestimate RPE during the early and middle stages of an exercise test" (ACSM, 2000, pg.79); however, it is unlikely that the exercise protocol was carried out improperly due to an absence of treatment effect on HR and RPE and an increase in HR and RPE as exercise progressed in both conditions.

The Effect of Stage on Heart Rate and Rating of Perceived Exertion

The exercise protocol used in this study consisted of several 3-minute stages (plus a 5-minute warm-up and 5-minute cool-down). Participants were required to increase exercise intensity at the end of each 3-minute stage until 85% maximum heart rate had been achieved. Participants remained at 85% maximum heart rate for two stages. As expected, results demonstrated a significant increase in HR and RPE as exercise progressed (Table 2 and Table 4). This increase in HR and RPE was predominantly a result of the increase in workload during the exercise tests. Additional factors that may have facilitated this increase was possible anxiety created by the testing session, the normal nonemotive physiological responses to exercise (i.e., increase in ventilation rate and increase in body temperature) and body perception levels.

The Effect of Body Perception on Heart Rate and Rating of Perceived Exertion

Preliminary exploratory analyses revealed that neither Body Esteem grouping nor Body Awareness grouping had any main effect or interacting effect on HR or RPE. However, preliminary analyses revealed a relationship or interaction between Body Esteem and Body Awareness. To address this, a Body

Perception factor was created. When Body Esteem and Body Awareness scores were combined (Body Esteem Score x Body Awareness Score) as a total "Body Perception" factor, interesting results emerged concerning both HR and RPE (Table 5).

Heart Rate

Results reveal that although both the Low and High Body Perception groups were almost identical in RPE from the first to the final stage of exercise, they differed in HR response. The High Body Perception group began exercising at a HR higher than the Low Body perception group, however HR did not increase over the exercise session as much as the High Body Perception group (Table 4).

A relationship exists between recognition of physiological changes (i.e., HR) and body awareness levels (Miller et al., 1981). Similarly, results reveal a relationship between HR and Body Perception. However, results differ in that the relationship is not between recognition of physiological changes and body awareness, but rather actual physiological changes and body awareness.

Another point worth considering that may have impacted the HR response, is the use of the Polar heart-rate monitors. The elevated heart rate in the High Body Perception group may have been a result of awareness of the monitor. It is reasonable to suggest that the High Body Perception group was more aware of the heart rate monitor, leading to heightened awareness of HR. Heightened awareness could then have contributed to a psychophysiological response of an elevated HR.

Rating of Perceived Exertion

Heart rate was not the only dependent variable which differed between groups. Rating of perceived exertion in the High Body Perception group appeared to increase at a greater rate than the Low Body Perception group.

The RPE scale is often used when administering an exercise test because of the high correlation with exercise heart rates and workload (ACSM, 2000). Results of this study suggest other factors may influence this relationship. Individuals with a High Body Perception differed from the Low Body Perception group by beginning exercise at a higher heart rate, experiencing a lesser rise in HR throughout the exercise session, and increasing in RPE at a greater rate.

Although analyses reveal a seemingly "normal" increase in RPE throughout the exercise session (Figure 2), when delving deeper and removing the effects of HR, a phenomenon appears (Figure 3). It appears that the High Body Perception group has a greater rise in RPE than the Low Body Perception group when controlling for the effects of HR, that is, differences in HR are not responsible for the differences in RPE. Another point worth mentioning is that although the High Body Perception group began exercise at a higher HR, their RPE was less than the Low Body Perception group. This suggests that RPE is not merely a reflection of HR and workload. More research must be done to determine what this additional RPE correlate may be.

Again, a reasonably significant Stage x Body Perception group is present, only suggestive of a difference among groups with RPE. Yet again, it is coupled

with both a small effect size and less power, suggesting that a larger sample size may be needed to detect a difference, if one exists.

Summary

This investigation found that the presence of mirrors had no effect on RPE or HR, regardless of Group, or Stage. In fact, all groups and conditions experienced a rise in HR and RPE as exercised progressed. It is possible that a small sample size may have contributed to the lack of effect. Equally possible is that HR and RPE are not affected by the presence of mirrors.

Several studies reveal that the presence of mirrors influence post-exercise mood state (Katula,, & McAuley, 2001, Katula, et al., 1998, and Martin, & Jung., 2003). In addition, the exercise environment has shown to mediate RPE regardless of exercising at identical workloads (Nethery, 2000). No studies exist examining perceived and actual exercise intensity in front of a mirror and not in front of a mirror. Results from this study reveal no difference in HR and RPE when exercising in a mirror or no mirror condition; however they begin to offer support for the idea that RPE is not fully explained by HR and workload. Perhaps mechanisms other than HR (e.g., psychological) play a stronger role in predicting RPE.

Chapter 6

SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

Summary

This study examined the effects of mirrors on perceived exercise intensity. More specifically, this study examined the influence of body esteem and body awareness and perceived exercise intensity. Sixteen participants completed the Body-Esteem Scale and Body Awareness Questionnaire and three submaximal exercise tests on the treadmill. Exercise intensity was increased until participants reached 85% maximum heart rate. Once 85% maximum heart rate was achieved, the intensity remained constant for two stages. The first treadmill test was used to establish a baseline to ensure understanding and familiarity with the protocol. The final two treadmill tests were performed in a mirrored and non-mirrored environment. Heart rate and rating of perceived exertion was collected at every stage of exercise.

Preliminary analyses showed that there was no main effect or interacting effects of the Mirror on HR or RPE. In addition, they revealed no difference in HR or RPE when separately examining Body Awareness levels and Body Esteem levels. For several reasons, Body Esteem and Body Awareness scores were combined (Body Esteem score x Body Awareness score) and split into low and high "Body Perception" groups using the median split of the combined scores. This allowed for greater insight into participants' overall body consciousness levels. Multiple analyses of variance revealed a significant effect of Stage on HR and RPE, illustrating an increase in HR and RPE as exercise progressed. Further

analyses indicated that although there was a significant Group x Stage effect on HR, there was a non-significant Group x Stage effect on RPE. Analyses indicate that although the groups were nearly identical in RPE, the high body perception group began exercise at a higher heart rate than the low body perception group, thus explaining the nearly significant Group x Stage effect of HR but not RPE. An analysis of covariance with HR as the covariate revealed a rise in RPE. However, this rise in RPE was not explained by the rise in HR. In addition, the High Body Perception group experienced a greater rise in RPE than did the Low Body Perception group.

It may be worthwhile to continue exploring mirrors, body perception levels, HR, and RPE with a larger sample size. Due to the presence of small effect sizes coinciding with low power levels, a larger sample size may help to better explain this phenomenon. Should body perception levels play a role in the behavioral component of exercise (i.e., perceived exertion) and the physiological component (i.e., heart rate) more should be evaluated when creating and implementing an exercise prescription to achieve desired response and result.

Conclusions

The following conclusions were made based on the results of this study:

1. The presence of mirrors in an exercise setting does not significantly affect HR and RPE.
2. Body esteem levels and body awareness levels alone do not significantly affect HR and RPE.

3. The Body Perception groups differ in their response to exercise (HR and RPE).

Recommendations

The following recommendations are made for future research on this topic:

1. Further testing of the effects of mirrors on perceived exercise intensity should be carried out using a larger sample size. It is possible that significant effects and interacting effects may arise with a larger number of participants.
2. It might be worthwhile for future research to examine body perception levels pre and post exercise, to determine if there is a significant difference prior to, and following exercise.
3. Further investigation of the HR and RPE relationship when analyzing body perception levels should be made. Perhaps the perception of the exercise setting, protocol, and workload influence HR and RPE during exercise greater than the actual workload.

APPENDIX A

Informed Consent Form

Purpose of the Study:

This study will investigate body consciousness and exercise on a treadmill. This study serves as a thesis project for the student investigator as partial fulfillment toward a master's degree.

Benefits to be Expected:

You will gain information about your overall body consciousness and aerobic fitness level. You will receive information about your fitness level, if requested, upon the completion of the study.

Participant Information:

There will be a total of 4 testing days. The first day of testing you will fill out a brief health screening form called "The Physical Activity Readiness Questionnaire (PAR-Q)." In addition, you will be asked to fill out three self-assessments relating to body consciousness and have anthropometric measurements taken. These measurements include: (a) posture assessment, (b) height and weight, (c) waist-to-hip, and (d) skinfolds. The final three days of testing will involve submaximal exercise tests on a motorized treadmill.

The submaximal treadmill tests will require you to jog at a steady pace with an increase in work rate until you have reached 85% of your predicted max heart-rate (MHR). You will be asked to maintain this intensity (85% MHR) for a total of 6-minutes. Throughout each test you will be asked to identify your rate of perceived exertion (RPE) and heart-rate will be monitored. You will be asked to wear a Polar heart-rate monitor so that HR can be tracked throughout the test. The test may be terminated at any time upon your request.

Responsibility of the Participant:

Information about your previous health status may affect the safety and value of the exercise tests being administered today. You are responsible for disclosing such information to the exercise testing personnel. In addition, it is important to be honest regarding any sensations or feelings associated with effort during the exercise testing itself.

Subject's Initials _____

APPENDIX A Continued

Risks and Discomforts:

The physical activity involved with this study may result in muscular soreness following the exercise. There exists the potential for musculoskeletal injuries such as muscle strain, however a proper warm-up and cool-down will be used to help minimize this risk. The graded exercise test being performed does elicit the possibility for potential complications (irregular heartbeats, abnormal blood pressure response and possibly a heart attack); however efforts will be made to minimize these risks by following standard recommendations and guidelines, along with an emergency action plan.

Compensation for Injury:

If you suffer an injury that requires any treatment or hospitalization as a direct result of the study, the cost for such care will be charged to you. If you have insurance, you may bill your insurance company. Your will be responsible to pay all costs not covered by your insurance. Ithaca College will not pay for any care, lost wages, or provide other financial compensations.

Questions:

Additional questions regarding your participation in this study can be directed to Sarah Anderson at sanders3@ithaca.edu.

Freedom to Discontinue Participation:

Your participation in this study is voluntary. You understand that you are free to discontinue participation in this study at any time, without penalty.

Confidentiality:

All documents and data that identify you will only be available to those involved in the study. Your name will only be on the informed consent, PAR-Q, health/lifestyle intake, and used for scheduling purposes. An ID# will be assigned to all other data collection materials. Documents will be kept in a locked cabinet when not in the possession of the investigator. The data collected will not be shown to anyone in a way that will allow for the association of your participation in the study.

I have read the above and understand its contents and I agree to participate in the study. I acknowledge that I am 18 years of age or older.

Signature_____

Date_____

APPENDIX B

Physical Activity Readiness Questionnaire

Physical Activity Readiness Questionnaire - PAR-Q (revised 1994)

PAR - Q & YOU

(A Questionnaire for People Aged 15 to 69)

Regular physical activity is fun and healthy, and increasingly more people are starting to become more active every day. Being more active is very safe for most people. However, some people should check with their doctor before they start becoming much more physically active.

If you are planning to become much more physically active than you are now, start by answering the seven questions in the box below. If you are between the ages of 15 and 69, the PAR-Q will tell you if you should check with your doctor before you start. If you are over 69 years of age, and you are not used to being very active, check with your doctor.

Common sense is your best guide when you answer these questions. Please read the questions carefully and answer each one honestly: check YES or NO.

YES	NO	
☐	☐	1. Has your doctor ever said that you have a heart condition and that you should only do physical activity recommended by a doctor?
☐	☐	2. Do you feel pain in your chest when you do physical activity?
☐	☐	3. In the past month, have you had chest pain when you were not doing physical activity?
☐	☐	4. Do you lose your balance because of dizziness or do you ever lose consciousness?
☐	☐	5. Do you have a bone or joint problem that could be made worse by a change in you physical activity?
☐	☐	6. Is your doctor currently prescribing drugs (for example, water pills) for your blood pressure or heart condition?
☐	☐	7. Do you know of any other reason why you should not do physical activity?

If you answered

YES to one or more questions

Talk with your doctor by phone or in person BEFORE you start becoming much more physically active or BEFORE you have a fitness appraisal. Tell your doctor about the PAR-Q and which questions you answered YES.

- You may be able to do any activity you want—as long as you start slowly and build up gradually. Or, you may need to restrict your activities to those which are safe for you. Talk with your doctor about the kinds of activities you wish to participate in and follow his/her advice.
- Find out which community programs are safe and helpful for you.

NO to all questions

If you answered NO honestly to all PAR-Q questions, you can be reasonably sure that you can:

- start becoming much more physically active – begin slowly and build up gradually - This is the safest and easiest way to go.
- take part in a fitness appraisal – this is an excellent way to determine your basic fitness so that you can plan the best way for you to live actively.

DELAY BECOMING MUCH MORE ACTIVE:

- if you are not feeling well because of a temporary illness such as a cold or a fever — wait until you feel better, or
- if you are or may be pregnant— talk to your doctor before you start becoming more active.

[redacted]

Informed Use of the PAR-Q: The Canadian Society for Exercise Physiology, Health Canada, and their agents assume no liability for persons who undertake physical activity, and if in doubt after completing this questionnaire, consult your doctor prior to physical activity.

You are encouraged to copy the PAR-Q but only if you use the entire form

NOTE: If the PAR-Q is being given to a person before he or she participates in a physical activity program or a fitness appraisal, this section may be used for legal or administrative purposes.

I have read, understood and completed this questionnaire. Any questions I had were answered to my full satisfaction.

NAME _____

SIGNATURE _____ DATE _____

SIGNATURE OF PARENT _____ WITNESS _____

or GUARDIAN (for participants under the age of majority)

APPENDIX C

Health/Lifestyle Intake

Risk Factor Checklist

Gender: Male Female **Age:** _____

If you are a male >= 45 years or female >= 55 years of age (or had premature menopause w/o Estrogen Replacement) please check the box to the right. ☐

Risk Factors:

Family History: Heart attack or sudden death before 55 yrs in father, son, or brother; or before 65 in mother, sister, or daughter	Yes	No	Don't Know
Current cigarette smoking (any amount) or quit less than 6 months ago	Yes	No	
High Blood Pressure (>140/90 or taking Blood Pressure medication)	Yes	No	Don't Know
High cholesterol (total cholesterol > 200 mg/dL)	Yes	No	Don't Know
Have diabetes or had test results suggesting impaired blood glucose levels	Yes	No	Don't Know
Sedentary lifestyle/physical inactivity (no regular exercise or active recreational pursuits and have sedentary job)	Yes	No	Don't Know
Obesity (e.g., waist girth >100 cm)	Yes	No	Don't Know

If you answered "YES" or "Don't Know" to 2 or more of the above questions, please check the box to the right. ☐
We treat "Don't Know" answers as "Yes" until there is a confirmed "No" response and will not prescribe vigorous exercise until such time.

<u>Do you ever experienced any of these symptoms?</u>

Pain or discomfort in the chest, neck, jaw, or arms that may be due to reduced blood flow?	Yes	No
Shortness of breath at rest or with mild exertion?	Yes	No
Dizziness or fainting?	Yes	No
Difficulty breathing while lying down or sudden difficult or labored breathing at night?	Yes	No
Ankle edema (swelling)?	Yes	No
Heart palpitations or rapid heart rate without exertion (above 100bpm)?	Yes	No
Cramping or aching in legs during physical activity?	Yes	No
Known heart murmer?	Yes	No
Known cardiovascular, pulmonary, or metabolic disease?	Yes	No

If you answered "YES" to any of the above questions please check the box to the right. ☐

APPENDIX C Continued

Do you have any known health conditions or concerns?

Cardiovascular Issues: _____

Any muscle injuries or orthopedic problems? _____

Respiratory: _____

Other: _____

Are you pregnant or less than 12 weeks postpartum? Yes No

If you become pregnant, please consult your healthcare provider before continuing your program.

Do you smoke? Yes No

Do you use caffeine? Yes No _____

If yes, how much

Are you taking any over-the-counter or prescription drugs or dietary supplements that might affect your response to exercise?

APPENDIX D

Psychological Inventories

Body Awareness Questionnaire (Shields, Mallory & Simon, 1989)

Instructions:

Listed below are a number of statements regarding your sensitivity to normal, nonemotive body processes. For each statement, select a number from 1 to 7 that best describes how the statemen describes you and place the number in the box to the right of the statement.

Not at all true of me						Very true of me
1	2	3	4	5	6	7

1.	I notice differences in the way my body reacts to various foods.	☐
2.	I can always tell when I bump myself whether or not it will become a bruise.	☐
3.	I always know when I've exerted myself to the point where I'll be sore the next day.	☐
4.	I am always aware of changes in my energy level when I eat certain foods.	☐
5.	I know in advance when I'm getting the flu.	☐
6.	I know I'm running a fever without taking my temperature.	☐
7.	I can distinguish between tiredness because of hunger and tiredness because of lack of sleep.	☐
8.	I can accurately predict what time of day lack of sleep will catch up with me.	☐
9.	I am aware of a cycle in my activity level throughout the day.	☐
10.*	I *don't* notice seasonal rhythms and cycles in the way my body functions.	☐
11.	As soon as I wake up in the morning, I know how much energy I'll have during the day.	☐
12.	I can tell when I go to bed how well I will sleep that night.	☐
13.	I notice distinct body reactions when I am fatigued.	☐
14.	I notice specific body responses to changes in the weather.	☐
15.	I can predict how much sleep I will need at night in order to wake up refreshed.	☐
16.	When my exercise habits change, I can predict very accurately how that will affect my energy level.	☐
17.	There seems to be a "best" time for me to go to sleep at night.	☐
18.	I notice specific bodily reactions to being overhungry.	☐

APPENDIX D Continued

The Body-Esteem Scale (Franzoi & Shields, 1984)

Instructions: On this page are listed a number of body parts and functions. Please read each item and indicate how you feel about this part or function of your own body using the following scale:

1 = Have strong negative feelings
2 = Have moderate negative feelings
3 = Have no feeling one way or the other
4 = Have moderate positive feelings
5 = Have strong positive feelings

---

1. body scent _____
2. appetite _____
3. nose _____
4. physical stamina _____
5. reflexes _____
6. lips _____
7. muscular strength _____
8. waist _____
9. energy level _____
10. thighs _____
11. ears _____
12. biceps _____
13. chin _____
14. body build _____
15. physical coordination _____
16. buttocks _____
17. agility _____
18. width of shoulders _____
19. arms _____
20. chest or breasts _____
21. appearance of eyes _____
22. cheeks/cheekbones _____
23. hips _____
24. legs _____
25. figure or physique _____
26. sex drive _____
27. feet _____
28. sex organs _____
29. appearance of stomach _____
30. health _____
31. sex activities _____
32. body hair _____
33. physical condition _____
34. face _____
35. weight _____

APPENDIX D Continued

THE PHYSICAL SELF-DESCRIPTION QUESTIONNAIRE

Name / ID_____Birth Date_____Gender_____

	FALSE	Mostly FALSE	More FALSE than true	More TRUE than false	Mostly TRUE	TRUE
1. When I get sick I feel so bad that I cannot even get out of bed.						
2. I feel confident when doing coordinated movements.						
3. Several times a week I exercise or play hard enough to breathe hard (huff & puff).						
4. I am too fat.						
5. Other people think that I am good at sports.						
6. I am satisfied with the kind of person I am physically.						
7. I am attractive for my age.						
8. I am a physically strong person.						
9. I am quite good at bending, twisting, and turning my body.						
10. I can run a long way without stopping.						
11. Overall, most things I do turn out well.						
12. I usually catch whatever illness (flu, virus, cold) is going around.						
13. Controlling movements of my body comes easily to me.						
14. I often do exercises or activities that make me breathe hard.						
15. My waist is too large.						
16. I am good at most sports.						
17. Physically, I am happy with myself.						
18. I have a nice looking face.						
19. I have a lot of power in my body.						
20. My body is flexible.						
21. I would do well in a test of physical endurance and stamina.						

APPENDIX D Continued

	FALSE	Mostly FALSE	More FALSE than true	More TRUE than false	Mostly TRUE	TRUE
22. I don't have much to be proud of.						
23. I am sick so often that I cannot do the things I want to do.						
24. I am good at coordinated movements.						
25. I get exercise or activity three to four times a week that makes me huff and puff and lasts at least 30 minutes.						
26. I have too much fat on my body.						
27. Most sports are easy for me.						
28. I feel good about the way I look and what I can do physically.						
29. I'm better looking than most of my friends.						
30. I am stronger than most people my age.						
31. My body is stiff and inflexible.						
32. I could jog 5 kilometers (3.1 miles) without stopping.						
33. I feel that my life is not very useful.						
34. I hardly ever get sick or ill.						
35. I can perform movements smoothly in most physical activities.						
36. I do physically active things (like jogging, dancing, bicycling, aerobics, swimming) at least three times a week.						
37. I am overweight.						
38. I have good sports skills.						
39. Physically I feel good about myself.						
40. I am ugly.						
41. I am weak and have no muscles.						
42. My body parts bend and move in most directions well.						

APPENDIX D Continued

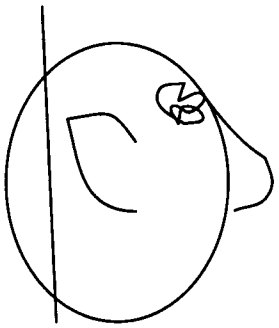
	FALSE	Mostly FALSE	More FALSE than true	More TRUE than false	Mostly TRUE	TRUE
43. I think I could run a long way without getting tired.						
44. Overall, I am no good.						
46. I find my body handles coordinated movements with ease.						
47. I do lots of sports, dance, gym, or other physical activities.						
48. My stomach is too big.						
49. I am better at sport than most of my friends.						
50. I feel good about who I am and what I can do physically.						
51. I am good looking.						
52. I would do well in a test of strength.						
53. I think that I am flexible enough for most sports.						
54. I can be physically active for a long period of time without getting tired.						
55. Most things I do, I do well.						
56. When I get sick, it takes me a long time to get better.						
57. I am graceful and coordinated when I do sports and activities.						
58. I do sports, exercise, dance or other physical activities almost every day.						
59. Other people think that I am fat.						
60. I play sports well.						
61. I feel good about who I am physically.						
62. Nobody things that I am good looking.						
63. I am good at lifting heavy objects.						

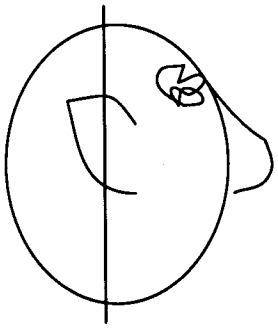
APPENDIX D Continued

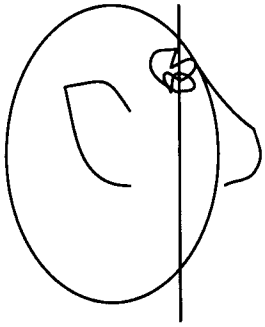
	FALSE	Mostly FALSE	More FALSE than true	More TRUE than false	Mostly TRUE	TRUE
64. I think that I would do well on a test measuring flexibility.						
65. I am good at endurance activities like distance running, aerobics, bicycling, swimming, or cross-country skiing.						
66. Overall, I have a lot to be proud of.						
67. I have to go to the doctor because of illness more than most people my age.						
68. Overall, I am a failure.						
69. I usually stay healthy even when my friends get sick.						
70. Nothing I do ever seems to turn out right.						

APPENDIX E

Posture Identification







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