An examination of exercise dependence and its relation to eating pathology.

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AN EXAMINATION OF EXERCISE DEPENDENCE AND ITS RELATION TO EATING PATHOLOGY

by

Dory Becker

A Master's Thesis
Submitted to the College of Graduate Studies and Research through Psychology
in Partial Fulfillment of the Requirements for the Degree of Master of Arts at the University of Windsor

Windsor, Ontario, Canada
2000
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Abstract

Exercise provides a number of health related benefits. However, it can be maladaptive when it becomes excessive and depended upon. The study of exercise dependence has been limited by the reliance on measures of frequency and duration, ignoring the importance of motives and withdrawal symptoms. Most research has assessed exercise dependence as a feature of eating disorders. Few have recognized that exercise dependence can be an autonomous disorder, take on many forms, and affect both men and women. The purpose of the present study was to examine exercise dependence and its relationship with eating pathology. Participants included 250 undergraduate females. Exercise dependence was assessed using the Obligatory Exercise Questionnaire and the Commitment to Exercise Scale. Motives for exercise were assessed with the Reasons for Exercise Inventory. Eating pathology was assessed with the Eating Attitudes Test – 26 and the Eating Disorder Inventory - 2. Thirty-five individuals (14%) met the criteria for exercise dependence. Twenty-one (8.4%) were identified as having primary exercise dependence and 14 (5.6%) were identified as having secondary exercise dependence.

Exercise dependent individuals, non-dependent regular exercisers, and non-exercisers were found to differ on their reasons for engaging in exercise and eating pathology. Those with primary and secondary exercise dependence did not differ on measures of exercise dependence, but they differed on reasons for engaging in exercise and eating pathology. Individuals with primary exercise dependence and those with eating pathology differed on measures of exercise dependence, eating pathology, and reasons for engaging in exercise. Individuals with secondary exercise dependence and those with eating pathology differed only on measures of exercise dependence. Current results both support and challenge the existing literature on exercise dependence. This study provides support for the identification of two different forms of exercise dependence. While one form appears to be significantly related to eating pathology, the other form is quite distinct. The present findings also suggest that the discrepant results of previous studies may not only be the result of the inconsistent use of a definition for exercise dependence, but also a consequence of combining individuals suffering from primary and secondary exercise dependence into one group.
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An Examination of Exercise Dependence and its Relation to Eating Pathology

In recent decades, physical exercise has become increasingly popular throughout North America (Yates, 1991). The public has been inundated with messages promoting the multiple benefits exercise has to offer, as we have been told that exercise will help us feel better, look younger, and be healthier. As such, the media has taught us to admire those who exercise regularly and feel guilty when we do not. Throughout this same time period, the prevalence of eating disorders has increased dramatically (Gordon, 1990). Whereas anorexia nervosa and bulimia nervosa were once rarities among the North American public, most people today know what anorexia and bulimia are as well as someone who has been afflicted with one and/or the other.

Although the relationship between eating disorders and exercise is not always in the forefront of discussions on eating disorders, it has been well documented that the two are often related (Brehm & Steffen, 1998; Davis, Fox, Cowles, Hastings, & Schwass, 1990; Davis, Katzman, Kaptein, Kirsh, Brewer, Kalmbach, Olmsted, Woodside, & Kaplan, 1997). Excessive exercise is a common symptom of eating disorders, as it is often used as a form of weight control by those with anorexia and bulimia. That is, some eating disordered individuals exercise excessively to lose even more weight or burn off the extra calories of a binge. These individuals may even be characterized as exercise dependent.

Whereas the relationship between exercise and eating disorders has received a lot of attention by both researchers and clinicians, the notion that some individuals may exercise excessively and be dependent on exercise in the absence of an eating disorder has not received this same attention. Some research has looked at male long-distance runners (Yates, 1983; Yates, Shisslak, Allender, Crago, & Leehey, 1992) and competitive female athletes (Davis & Cowles, 1989; Davis et al., 1990), but within the lay public, research is lacking. Additionally, little is known about individuals who are exercise dependent as compared to their non-dependent and non-exercising counterparts. The purpose of this study is to shed light on some of these questions.

Exercise

The number of individuals engaging in regular exercise has increased substantially over the last few decades. Polls in the late 1980s and early 1990s found that
approximately fifty percent of the U.S. population exercised daily. Additionally, the number of people claiming to exercise regularly has doubled in the last 25 years (Yates, 1991). Consequently, a billion dollar industry has been generated by the exercise phenomenon, as sporting goods, health foods, fitness clubs, magazines, and books have become necessities for exercisers.

Regular exercise is often recommended by physicians because it can provide a number of health benefits. Numerous researchers have found that regular exercise can reduce an individual's risk of coronary heart disease, hypertension, and osteoporosis (Davis, Brewer, & Ratusny, 1993; Curfman, 1993; Blumenthal, Williams, Needels, & Wallace, 1982). It can also help individuals control their weight. Current recommendations suggest engaging in vigorous exercise three to five times per week. Each session should range from twenty to sixty minutes in length (Schlundt & Johnson, 1990).

There are also a number of psychological benefits of regular exercise. It can reduce depression and anxiety, enhance self-esteem, self-confidence, and body image, reduce stress and tension, and improve sleep (Anshel, 1991; Baekeland, 1970; Blumenthal et al., 1982; Callen, 1983; Chan & Grossman, 1988; Curfman, 1993; Davis et al., 1993; Morgan, 1985). In fact, numerous researchers suggest that regular aerobic exercise be used as a tool to promote psychological health in normal adults (Blumenthal et al., 1982; Chan & Grossman, 1988).

A number of researchers have postulated reasons why physical exercise can lead to significant improvements in an individual's overall psychological functioning. Anshel (1991) argues that aerobic exercise is psychologically beneficial because it leads to an improved cardiovascular system. That is, aerobically fit individuals tend to have lower resting heart rates which tend to remain low and increase more slowly in response to anxiety. The distraction hypothesis proposes that exercise serves as a distraction from stressful stimuli. As such, the improved affect associated with exercise is a result of the distraction and not the exercise per se (Morgan, 1985). Clough, Shepherd, and Maughan (1989) propose that regular exercise may lead to improvements in general mood because it enhances one's energy level. Exercisers may also view themselves in a more positive mood after exercise because of the emphasis placed upon the positive effects of exercise.
by the media (Dyer & Crouch, 1987). Blumenthal et al. (1982) suggest that psychological health is improved because of improvements in physical health. Regular exercise can also help improve one's physical appearance, thereby enhancing one's body image, self-esteem, confidence, as well as sense of control and achievement (Clough, Shepherd, & Maughan, 1989).

**Exercise Dependence**

While exercise is often adaptive because it provides numerous physical and psychological benefits, it can also be maladaptive when it becomes excessive. The notion of what constitutes excessive exercise has come under debate by a variety of researchers and clinicians, as it has been challenging to differentiate between the amount of exercise that is necessary to benefit physical and psychological health and how much is too much. Consequently, definitions of exercise dependence have not been consistent. Neither have classification and measurement instruments.

Exercise dependence has also been referred to as obligatory exercise, excessive exercise, and compulsive exercise. Many of the studies which have attempted to define exercise dependence have been based solely on behavioral measures that assess frequency, duration, and intensity of exercise (Davis et al., 1993). However, these criteria are not useful on their own because they provide little information about underlying psychological factors that may contribute to and/or perpetuate the excessive exercise. Additionally, the amount of regular exercise that is necessary for a serious professional or amateur athlete differs from the average individual who engages in regular exercise (De la Torre, 1995). Consequently, inconsistent findings are commonplace in the literature, limiting our understanding of the disorder and the psychological characteristics of those afflicted with it.

Numerous researchers and clinicians (Davis, Brewer, & Ratusny, 1993; De Coverley Veale, 1987) argue that the definition of exercise dependence must be multifaceted as, like other forms of dependence, it is evidenced by both behavioral and psychological disturbances. De Coverley Veale (1987) proposed diagnostic criteria for exercise dependence that summarize the findings of numerous researchers and clinicians. These include: a narrowing of repertoire leading to a stereotyped pattern of exercise with a regular schedule once or more daily; salience with the individual giving increasing priority
over other activities to maintaining the pattern of exercise; increased tolerance to the
amount of exercise performed over the years; withdrawal symptoms such as tension,
depression, anxiety, insomnia, and anger following the cessation of the exercise schedule;
relief or avoidance of withdrawal symptoms by further exercise; subjective awareness of a
compulsion to exercise; and rapid reinstatement of the previous pattern of exercise and
withdrawal symptoms after a period of abstinence. Associated features include either the
continuation of exercise despite a serious physical disorder known to be caused,
aggravated or prolonged by exercise after the individual is advised of such by a health
professional, or having arguments or difficulties with one’s partner, family, friends, or
occupation about exercise; and self-inflicted loss of weight by dieting as a means towards
improving performance. Thus, exercise dependence is characterized by exercise that is
not only extreme in frequency and duration, but also relatively resistant to change, even in
the face of injury, fatigue, or other personal demands (Davis et al., 1993).

As just mentioned, one of the most striking features of exercise dependence is the
withdrawal symptoms experienced by its sufferers when exercise is ceased. A number of
explanations have been postulated. Since many individuals take up exercise because
engaging in regular exercise can gradually reduce depression in mildly or severely
depressed people, the rewarding aspects and distraction effects of exercise would be
expected to dissipate gradually after exercise stops. Consequently, individuals who
experience exercise withdrawal revert back to their ‘natural’ pre-exercise state (Morris et
al., 1990). Depression may also be caused by a loss of rewarding activities, as individuals
may become dependent on the psychological reinforcements of exercise (Chan &
Grossman, 1988; Morris et al., 1990). Possibly, the time which would have been spent
exercising is spent in activities which themselves are depressing or anxiety-provoking.
Additionally, some people may continue to exercise regularly and at a high intensity in
order to avoid withdrawal symptoms (Morris et al., 1990). Withdrawal effects may also
occur because of a decline in physical appearance that often accompanies withdrawal from
regular exercise.

One of the most researched forms of exercise dependence is what has been termed
“obligatory running.” Obligatory runners often run more than 160 kilometers in a week
and continue to run even when it is detrimental to their health. As such, obligatory
runners are often said to be “addicted” to running, as running becomes a consuming goal that preempts all other interests in life (Yates, Leehey, & Shisslak, 1983).

**Prevalence of Exercise Dependence**

Because of the inconsistency in a definition of exercise dependence, and consequently, poor classification and measurement techniques, the prevalence of exercise dependence in general is relatively unknown. Only one study, conducted by Brehm and Steffen (1998) assessed the prevalence using a multidimensional set of criteria. They found that 31% of 250 high school first year males and females could be classified as exercise dependent.

**Comparison of Exercise Dependent, Non-Dependent, and Non-Exercising Individuals**

A number of studies have compared exercise dependent individuals with non-dependent exercisers and non-exercisers. The most important distinction to be made between exercise dependent and non-dependent individuals is that exercise dependent individuals often organize their lives around their exercise whereas highly-committed, but non-dependent individuals will organize their exercise around their lives. As such, exercise dependency often has adverse effects on the lives of not only the participant, but also those with whom that person lives and works (Cockerill & Riddington, 1996). Cockerill and Riddington further differentiate between committed and compulsive exercisers by suggesting that committed exercisers are invigorated and strengthened by exercise, whereas exercise dependent individuals often see exercise as work. As such, these individuals no longer enjoy the pleasure that exercising once provided.

A study by Anshel (1991) compared male and female exercise addicts to their non-addicted counterparts. Findings suggested that exercise addicts were more restless and stressed prior to exercise, experienced a high degree of positive affect after exercising, were more depressed, anxious, and angry after missing a workout, and tended to ignore physical discomfort in order to complete their exercise program. Furthermore, the two groups engaged in exercise for different reasons. “The priorities of the addicted group included, from most to least important: (1) health and well-being, (2) reduced stress, (3) improve fitness, (4) feel good, (5) improved general appearance/weight control, and (6) forget personal problems. Fun and social reasons were never mentioned by the addicted subjects” (p.152) and this may contribute to findings indicating that exercise dependent
individuals are more likely to prefer exercising alone as compared to their non-dependent counterparts (Yates, Shisslak, Allender, Crago, & Leehey, 1992). However, the reasons listed by the non-addicted exercisers included, from most to least important: "(1) improving general appearance/weight control, (2) health and well-being, (3) social enjoyment, (4) fitness improvement, (5) having fun, and (6) stress reduction, with no mention of personal problems" (Anshel, 1991, p.152).

Coen and Ogles (1993) also compared obligatory and nonobligatory runners and found that the two groups did not differ in their development of a sense of identity. However, the obligatory group was more perfectionistic and reported higher personal standards. Further, whereas the obligatory group had substantially higher levels of trait anxiety, the two groups did not differ significantly in trait anger.

There has been some conflicting evidence describing and comparing the body image and satisfaction of exercise dependent individuals, non-dependent exercisers, and non-exercisers. Yates et al. (1992) and Cockerill and Riddington (1996) found that exercise dependent individuals described adhering to a more rigid and restrictive diet than that depicted by the non-dependent exercisers. The obligatory exercisers were more health-conscious and preoccupied with their bodies. They also displayed a rigid, ritualistic concern with weight and body control which Yates et al. compared to that described by individuals with eating disorders. In accordance, Cockerill and Riddington found that exercise dependent individuals demonstrated higher levels of psychopathology on measures such as eating control, body satisfaction, self-esteem, and self-efficacy. However, Davis (1990) compared avid exercisers and non-exercisers and found that the two groups did not differ significantly on measures of body weight, self-perceived body shape, degree of weight and diet concerns, and emotional reactivity. Thus, avid exercisers and non-exercisers did not differ on any aspects of the psychopathology associated with eating disorders. Davis and Fox (1993), who compared exercise dependent individuals, regular exercisers, and non-exercisers, found that compared to non-exercisers, exercise dependent individuals reported greater body satisfaction and body focus. The exercise dependent individuals were also less emotionally reactive (neurotic) and more extraverted. In all cases, the moderate exercisers obtained scores that fell between those of the exercise dependent and non-exercising groups.
One explanation for the conflicting evidence regarding body image and satisfaction is that some exercise dependent individuals also suffer from an eating disorder. Thus, exercise dependence can be separated into two forms, primary and secondary exercise dependence. Individuals who suffer from primary exercise dependence do not exhibit eating pathology while those who suffer from secondary exercise dependence exhibit both exercise and eating pathology. The conflicting results may have been a result of none of the studies controlling for the presence of an eating disorder, as all combined the primary and secondary exercise dependent individuals into one group. Thus, it is not clear what contributed to the body image and satisfaction of these individuals – their exercise dependence and/or some form of eating pathology. Before a more thorough examination of primary and secondary exercise dependence can be undertaken, a review of eating disorders is necessary.

**Eating Disorders**

As already mentioned, the number of Americans claiming to exercise regularly has increased dramatically over the last 25 years. The last 25 years has also seen a dramatic increase in the number of reported cases of eating disorders. “Dieting behavior, like exercise, has become part of our contemporary culture” (Brewerton, Stellefson, Hibbs, Hodges, & Cochrane, 1995, p.414). According to Chan and Grossman (1988), exercise and diet are two of the most common body-based activities. Both focus on the intake and output of the body, as the number of calories consumed through food and the number of calories expended in exercise are common (Brewerton et al., 1995). In order to assess how eating disorders are related to exercise dependence, it is important to first describe both anorexia nervosa and bulimia nervosa.

Anorexia nervosa is characterized by an extreme, self-imposed weight loss. Based on the standards set by the American Psychological Association in 1994, and in accordance with the *Diagnostic and Statistical Manual of Mental Disorders: Fourth Edition (DSM IV)*, individuals should be diagnosed as being anorexic if they: weigh at least fifteen percent less than their minimal normal weight, have an intense fear of gaining weight or becoming fat even though they are underweight, have a disturbance in the way in which they feel about their body weight, size, or shape, and experience an undue influence of body weight or shape on self-evaluation, and deny the seriousness of their
current low body weight. In addition to the aforementioned symptoms, postmenarcheal females must have also stopped menstruating for three consecutive menstrual cycles in order to be diagnosed as anorexic. Individuals suffering from anorexia typically focus their entire attention on food, carefully calculating grams of fat and calories in almost everything they consume. The obsession with food and possible weight gain leads some anorexics to become compulsive exercisers, sometimes devoting several hours each day to vigorous exercise (Atkinson, Atkinson, Smith, & Bem, 1993).

Relative to other eating disorders, anorexia is rare, affecting approximately one percent of the American population. Furthermore, it is ten times more likely to occur in women than in men, particularly women in their early and late teens. When the incidence of anorexia is displayed graphically, a bimodal frequency distribution is evident. One peak occurs at 14.5 years of age and the other at 18 years of age. Individuals who are anorexic are also more likely to be Caucasian and come from families of higher socioeconomic status. Since anorexia nervosa only occurs under conditions of adequate food supplies, it is relatively unknown in Third World nations. Thus, anorexia nervosa is considered to be an illness of developed countries. Furthermore, it is far more prevalent in major cities than in rural areas (American Psychiatric Association, 1994; Stavrakaki & Williams, 1990).

According to the DSM-IV, the essential features of bulimia nervosa are binge eating and inappropriate compensatory methods to prevent weight gain. Binge eating is characterized by: eating within a discrete period of time (i.e. within a 2 hour period), eating an abnormally large amount of food when compared to others during a similar time period and under similar circumstances, and a sense of lack of control over eating during the eating episode. Inappropriate compensatory behaviours include self-induced vomiting, the misuse of laxatives, diuretics, enemas, or other medications, fasting, or excessive exercise. Furthermore, to be diagnosed with bulimia, both the binge eating and inappropriate compensatory behaviours must occur at least twice a week for three months on average and an individual’s self-evaluation must be inappropriately influenced by body shape and weight. While the typical bulimic may consume thousands of calories during a binge episode, his/her weight may stay relatively stable. This occurs because the purging behaviour allows the bulimic to expel a significant amount of the consumed calories.
Thus, individuals with bulimia typically are within the normal weight range, although some may be slightly underweight or overweight (American Psychiatric Association, 1994).

Like anorexia, bulimia primarily afflicts young women. However, bulimia is more common than anorexia. It affects approximately one to three percent of the American population. Bulimia usually begins in late adolescence or early adult life. Like anorexia, bulimia is mostly found among Caucasians, but has also been reported among other ethnic groups (American Psychiatric Association, 1994).

Although anorexics and bulimics differ behaviorally in their pursuit of thinness, the foundation of these disorders is largely similar in nature. Individuals with anorexia and bulimia share many of the same psychological traits, such as perfectionism and dysfunctional thought processes. They also share an obsession with food, weight, and body shape, as well as a goal of maintaining sub-optimal body weight (Gordon, 1990). Furthermore, the signs characteristic of anorexia and bulimia are similar in nature. Metabolic, gastrointestinal, cardiovascular, renal, dental, hematological, electrolyte, and endocrine abnormalities are all common features (Stavrakaki & Williams, 1990). Moreover, patients may move between the two syndromes at different times (Ganer, 1986).

**Sub-Clinical Eating Disorders**

A recent development in the field of eating disorders concerns the recognition of sub-clinical or partial-syndrome eating disorders. According to Yates (1991), a substantial number of individuals, both male and female, diet, binge, purge, and exercise compulsively. However, these individuals are not sufficiently disturbed to qualify for a diagnosis of anorexia or bulimia. Yates also suggests that individuals with disordered eating behaviors out-number individuals who can be formally diagnosed with an eating disorder.

Although the DSM-IV does not include specific diagnostic criteria for partial-syndrome eating disorders, it does recognize the importance of diagnosing an individual with an eating disorder if she/he displays almost all of the necessary criteria for either anorexia or bulimia. For example, an individual would be diagnosed as having an “Eating Disorder Not Otherwise Specified” if she met all of the criteria for anorexia nervosa but
had regular menses. An individual would receive the same diagnosis if her/his current weight is in the normal range, despite a significant weight loss. A diagnosis of “Eating Disorder Not Otherwise Specified” would also be given if an individual met all of the necessary criteria for bulimia nervosa except that the binge eating and inappropriate compensatory behaviors occur less than twice a week or for a duration of less than 3 months (American Psychiatric Association, 1994). As such, a partial-syndrome eating disorder diagnosis is usually made when an individual does not meet the full DSM-IV diagnostic criteria for anorexia nervosa or bulimia nervosa because one or more features, although present, are not of sufficient severity (Mintz & Betz, 1988).

**Prevalence of Sub-Clinical Eating Disorders**

According to Shisslak, Crago, and Estes (1995), the prevalence of sub-clinical eating disorders in a nonclinical population is approximately twice that of full-syndrome eating disorders, as approximately 3% to 5% of adult women suffer from a sub-clinical eating disorder. Furthermore, women with eating disturbances are more likely to develop eating disorders than the rest of the population. Shisslak et al. argue that it is necessary to recognize the full spectrum of eating disorders in order to gain a better understanding of eating disorders and identify those at risk for developing a clinical eating disorder.

**Comparison of Individuals with Full-Syndrome vs. Sub-Clinical Eating Disorders**

Dancyger and Garfinkel (1995) as well as Mintz and Betz (1988) compared individuals suffering from full-syndrome and sub-clinical eating disorders and found that individuals suffering from full-syndrome eating disorders displayed significantly higher levels of depression and lower self-esteem than those with sub-clinical eating disorders. However, the sub-clinical group displayed higher levels of depression and lower self-esteem compared to non-eating disordered controls. Similarities between individuals with full-syndrome and sub-clinical eating disorders have also been noted, as Dancyger and Garfinkel found that the level of body dissatisfaction did not differ between these two groups.

**Primary vs. Secondary Exercise Dependence**

As already mentioned, exercise dependence has often been used as a construct of its own. However, it can be divided into two concepts: primary exercise dependence and exercise dependence that is secondary to an eating disorder. A diagnosis of primary
exercise dependence is made after the diagnoses of anorexia and bulimia nervosa are excluded (De Coverley Veale, 1987). As such, "primary exercise dependence can be differentiated from an eating disorder by clarifying the ultimate aim of the exercise. In primary exercise dependence, the exercise is an end in itself and the dieting and weight loss is used to improve performance" (De Coverley Veale, p.738). A diagnosis of secondary exercise dependence is made when the individual can be diagnosed with anorexia and/or bulimia nervosa and uses exercise as a compensatory behavior to lose weight or balance calories (De Coverley Veale).

**Primary Exercise Dependence**

Little has been written about primary exercise dependence as a distinct disorder. Although theories have been postulated regarding the causes of the disorder, no studies appear to differentiate between those individuals suffering from primary and secondary exercise dependence. Consequently, little is known about primary exercise dependence and those suffering from it. These individuals tend to be grouped with those suffering from secondary exercise dependence, thereby minimizing our understanding of primary exercise dependence and those suffering from it.

**Proposed Causes of Primary Exercise Dependence**

A number of explanations for primary exercise dependence have been proposed. One of the most popular is based on endorphin production (Cockerill & Riddington, 1996). However, Cockerill and Riddington argue that a number of other factors may explain an exercise-dependent lifestyle. As such, it is necessary to provide a holistic explanation that incorporates biological, social and situation-specific, as well as psychological factors.

Some research indicates that for some individuals, exercise is initiated in order to reduce depression, anxiety, and stress (Anshel, 1991). For these individuals, exercise becomes an important strategy in the alleviation of these unpleasant psychological characteristics. They often believe that they cannot live without exercising, because they fear returning to their pre-exercise psychological state. Consequently, these individuals may become dependent on the rewarding aspects of exercise and their fear may contribute to their dependence. Robbins and Joseph (1985) postulate that for exercise dependent individuals, exercise acts as an escape activity, because it helps these individuals avoid
life’s stressors. Therefore, the cessation from exercise may increase tension because of the loss of this escape strategy (Anhel, 1991). A related finding suggests that obligatory runners often experience depression and anxiety about physical deterioration when unable to run (Yates et al., 1983). Thus, obligatory runners also fear returning to their pre-exercise physical state.

Other theorists propose that individuals exercise excessively in order to exert control over their lives (Cockerill & Riddington, 1996). However, like anorexic individuals who often refuse to eat in order to exert control, exercise dependent individuals become controlled by their exercise. Exercising occupies a great deal of these individual’s waking hours, even when they are not actually exercising, as they are constantly thinking about their next exercise session and/or what/when to eat. They become dependent on the euphoric and calming benefits of exercise, and become socially withdrawn.

As already mentioned, some research indicates that excessive exercisers are dissatisfied with their body and/or themselves, and often score towards the extreme end of a scale measuring eating control, body satisfaction, self-esteem, and self-efficacy (Cockerill & Riddington, 1996). Since exercise tends to increase muscle tone and decrease body fat percentage, it helps individuals feel that they look better. Additionally, a long period of exercise, particularly in hot weather, will cause dehydration and this may be experienced psychologically as feeling thin (Schlundt & Johnson, 1990). Consequently, “the perceived effect of exercise on feelings of fatness may be greater than its actual effect on energy balance” (Schlundt & Johnson, 1990, p.111-112). Individuals may also exercise excessively and become exercise dependent in order to attain the idealized images they see portrayed in the media. Therefore, some individuals who suffer from primary exercise dependence may not have an eating disorder, but they may suffer from some symptoms of an eating disorder.

Cockerill and Riddington (1996) add that the majority of excessive exercisers are high achievers in other walks of life. They are often independent and avid goal setters. However, they tend to set goals which are constantly readjusted upwards. Consequently, they never actually attain them, explaining why these individuals may spend hours exercising a day, as their standards and goals continuously increase.
Secondary Exercise Dependence

In recent years, studies have shown that exercise is often related to weight concerns and dieting behaviors (Davis et al., 1993). Some attribute this relationship to the current association between physical fitness, slenderness, and attractiveness promoted by the media (Davis et al., 1997, Davis, Fox, Cowles, Hastings, & Schwass, 1990; Davis, Kennedy, Ravelski, & Dionne, 1994). Exercise is often promoted to enhance weight control and physical attractiveness rather than for its health benefits (Davis & Cowles, 1989; Davis et al, 1994). Exercise is also a socially acceptable way for people, particularly women, to deal with their weight and diet concerns (Davis, 1990). Therefore, it should come as no surprise that a relationship between excessive exercise and eating disorders has been recognized in recent years, as exercise dependence is often a symptom of anorexia and bulimia nervosa.

Excessive exercise is more often encountered in individuals suffering from anorexia and/or bulimia as compared to a nonclinical population (Davis & Fox, 1993). Furthermore, overexercising is more commonly found in those with anorexia nervosa as compared to those with bulimia nervosa (Brewerton et al., 1995). Research associating anorexia and excessive exercise is considerable, because hyperactivity has been a well recognized symptom of anorexia since its discovery in the late 19th century. According to Pruitt, Kappius, and Imm (1991), a substantial percentage of anorexic individuals use exercise as one of their primary means of losing weight. Estimates of the number of anorexics who are exercise dependent range from 14% (Halmi, 1974) to 81% (Davis et al., 1997). This marked difference is likely the result of the absence of a consistent operational definition of exercise dependence.

Whereas the research examining anorexia and excessive exercise is considerable, there has been a lack of research linking excessive exercise and bulimia (Davis et al., 1997). According to Schlundt & Johnson, 1990, vomiting is the most frequently used purging strategy among bulimic individuals. Exercise was found to be the second most common form of purging, followed by laxative and diuretic use. Using exercise as a form of purging to compensate for a moderate size eating binge necessitates spending several hours working out. Thus, these exercise sessions typically last longer than the recommended amount of exercise. Although only a few studies have assessed the use of
exercise as a compensatory behavior in bulimic individuals, estimates of the number of bulimic individuals who use excessive exercise to counteract the effects of binge eating range from 23% (Brewerton et al., 1995) to 76% (Pruitt et al., 1991).

Three explanations for the lack of research studying the relationship between excessive exercise and bulimia have been proposed. First, excessive exercise was not included as a form of purging in the diagnostic criteria for bulimia until 1987. Second, defining excessive exercise is difficult and often subjective. Finally, excessive exercise is much less striking in bulimic individuals compared to anorexic individuals because of the difference in their body weights. “Seeing an emaciated woman exercising for hours at a time is more notable than seeing a woman of normal weight engaging in exactly the same behavior” (Pruitt et al., 1991. P.143-144).

Proposed Causes of Secondary Exercise Dependence

According to Eisler and le Grange (1990), there are four models linking excessive exercise and eating disorders. It is possible that the different models apply to different individuals or different groups of individuals.

The first model proposes that excessive exercise is part of or symptomatic of an eating disorder. That is, eating disordered individuals exercise excessively to lose weight or compensate for an eating binge. (Davis et al., 1990, p.563). Therefore, excessive exercise is caused by an individual’s preoccupation with her/his weight and body shape (Eisler & le Grange, 1990).

The second model proposes that excessive exercise is a variant of an eating disorder. “The etiological factors (genetic, personality, familial, social) that might normally lead to the development of anorexia nervosa can lead in some cases to a disorder that is superficially different but is in effect the same disorder with different manifestations” (Eisler & le Grange, 1990, p.380). Therefore, this model argues that a specific etiological process underlies both excessive exercise and eating disorders.

The third model proposes that eating disorders and excessive exercise are both manifestations of an underlying disorder. Davis and Fox (1993) found some evidence for the third model as they found “evidence of underlying physiological links between excessive exercise and severe dieting. A body of research suggests that both may be maintained, in part, by a physiological addiction to, or dependence on, the endorphins
secreted in response to bodily stress” (p.209). A weaker version of this model proposes that another illness might act as a predisposing factor for both exercise dependence and eating disorders.

The fourth model proposes that excessive exercise can lead to the development of an eating disorder. This can occur for two reasons. First, the initial weight loss and improved muscle tone elicit certain biological and social reinforcers, which may lead an individual to a heightened interest in her/his physical appearance (Davis et al., 1990; Katz, 1986). Davis (1990) also suggests that regular and strenuous exercise may focus an individual’s attention on the relationship between body weight and maximal performance and competitive thoughts may generate excessive exercise because of an obligatory attitude to exercise more and lose weight. The second explanation suggests that high levels of physical activity, which are characteristic of exercise dependence, can reduce food intake because appetite is diminished (Davis et al., 1990; Eisler & le Grange, 1990). This may be a result of increased endorphin levels (Davis et al., 1990). Additionally, over-exercising and under-eating can become mutually reinforcing behaviors that become resistant to change and may influence the development and maintenance of eating disorders for some individuals (Davis, Kennedy, Ralevski, Dionne, Brewer, Neitzert, & Ratusny, 1995). For example, increased physical activity itself may foster greater food restriction by virtue of its appetite-suppressing effects and by encouraging a heightened focus on appearance, weight, and performance” (Davis et al., 1995, p.974).

Evidence for the fourth model comes from findings that suggest that eating disordered individuals were more physically active from childhood onwards as compared to normal controls. Davis et al. (1997) found that premorbid activity levels of anorexic individuals significantly predicted excessive exercise comorbidity. Results also indicated that anorexia nervosa is more closely linked to premorbid physical activity, as those suffering from bulimia reported significantly lower physical activity levels than those suffering from anorexia nervosa. Research also suggests that female athletes are at a greater than normal risk of developing eating disorders. This may occur because being committed to a sport can create a heightened focus on physical appearance and can increase one’s awareness of the relationship between weight and maximal performance. That is, athletes are often aware that their performance is influenced by their weight, as
extra weight can limit speed, endurance, and agility. and it can contribute to fatigue (Davis et al., 1994). Thus, they may become preoccupied with the relationship between diet and exercise for weight control, as well as other health and appearance-related benefits (Davis et al., 1994).

It is important to recognize that the findings linking exercise dependence to the development of eating disorders are generally limited to females and may be affected by the type of extra-curricular activities that girls traditionally pursue. Davis et al. (1997) recognize that the activities traditionally pursued by females, such as dance, figure-skating, and gymnastics, tend to emphasize a slender appearance, even at young ages.

In conclusion, these results suggest that “overactivity should not be routinely viewed as a secondary symptom in anorexia nervosa, equivalent to other behaviours. For a number of anorexic women, sport/exercise is an integral part of the pathogenesis and progression of self-starvation” (Davis et al., 1994, p.957). Therefore, not only can physical activity contribute to the development of an eating disorder, but it can also increase the chances of excessive exercise comorbidity.

Prevalence of Primary and Secondary Exercise Dependence

Like the prevalence rate for exercise dependence, the prevalence rates of both primary and secondary exercise dependence are relatively unknown and/or unreliable. This too is a result of the lack of a consistent definition of primary exercise dependence as well as researchers not assessing the comorbid condition in participants. Whereas there are no estimates of primary exercise dependence, estimates of eating disordered individuals suffering from exercise dependence range from 14% to 81% (Davis, Katzman, Kaptein, Kirsh, Brewer, Kalmbach, Olmsted, Woodside & Kaplan, 1997; Yates, 1991). A more detailed review of the prevalence rates of secondary exercise dependence will be presented later in the paper.

Comparison of Exercise Dependent and Eating Disordered Individuals

A review of the literature reveals that eating disorders and exercise dependence are often recognized as similar disorders, as both entail activities that become problematic because they assume too central a position in the life of the afflicted individual. Whereas eating disordered individuals are extremely committed to dieting, exercise dependent individuals are extremely committed to exercising. According to a number of researchers,
individuals who make an unusually intense commitment to diet or exercise are similar in other respects as well. The inhibition of anger, high self-expectation, tolerance of physical discomfort, denial of potentially serious debility, and a tendency towards depression are common to both. Both disorders entail obsessive rumination. Both groups are introverted, generally hard-working, and high achievers from affluent families (Yates, 1991; Yates et al., 1983; Yates et al., 1992).

Several researchers have noted other similarities. When compulsive athletes are prevented from exercising and disordered women are prevented from dieting, they often suffer from similar withdrawal symptoms, such as severe tension, depression, anxiety, anger, and a sense of body deterioration (Baekeland, 1970; Yates, 1991). Yates noted that “when obligatory runners continue to run in spite of clear contraindications, they have lost control over the athletic process...much as eating disordered women have lost control over the process of dieting” (Yates, 1991, p.8).

Not all researchers and clinicians have found that eating disordered individuals and obligatory exercisers have many psychological characteristics in common (Davis & Fox, 1993). Blumenthal, O'Toole, and Chang (1984) compared the MMPI profiles of anorexic individuals and obligatory runners and found that on the whole, anorexic individuals demonstrate significantly more pathology (as cited by Coen & Ogles, 1993). Davis and Fox (1993) found that excessive exercise is associated with a decrease in body dissatisfaction, while weight preoccupation is associated with an increase in this variable.

Much of the doubt pertaining to the perceived similarities between eating disordered and exercise dependent individuals stems from the research methodology of some of the studies comparing the two groups, as these two groups have often consisted of adolescent anorexic females and middle-aged male runners (Coen & Ogles, 1993). Thus, numerous factors were not controlled. Although Yates did not control for these factors, she did recognize the group gender differences which she attributed to the tendency of males to base their self-worth on physical efficacy and the tendency of females to base their self-worth on appearance (Yates et al., 1992). Additionally, many of the studies on exercise dependent individuals did not assess whether the exercise dependent individuals were suffering from some form of eating pathology. Thus, no study has attempted to assess the similarities and differences between individuals with primary exercise
dependence and eating disordered individuals. Additionally, no study has attempted to assess the similarities and differences between those with secondary exercise dependence and an eating disorder.

**Research Questions**

The overall purpose of this study is to gain a better understanding of exercise dependence. To date, most of the research on exercise dependence has focused on middle-aged male runners and competitive female athletes such as dancers, gymnasts, and ice-skaters, sports that often emphasize the benefits of a slim build. Thus, few researchers have recognized that excessive exercise can take on many forms and affect both males and females of different ages and athletic abilities. As such, this study will examine excessive exercise as well as its relationship with eating pathology in female university students. Six research questions have been proposed.

1. This study will assess the prevalence rate of exercise dependence. A multidimensional definition of the disorder that not only accounts for exercise that is extreme in frequency and duration, but also relatively resistant to change, even in the face of injury, fatigue, or other personal demands will be used.

   It is necessary to answer this question because of the contradictory evidence regarding prevalence rates, as previous studies have relied on different definitions of exercise dependence. Whereas some have only used measures of exercise frequency and duration, others have accounted for the presence of motives and withdrawal symptoms.

2. This study will assess the prevalence rates of both primary and secondary exercise dependence.

   These rates are relatively unknown and unexplored, as most studies about exercise dependence do not distinguish between these two forms of exercise dependence. Multidimensional definitions of both disorders will be used.
The present study will examine some of the behavioral, motivational, and cognitive similarities and differences exhibited by exercise dependent individuals, non-dependent regular exercisers, and non-exercisers.

Studies have found a variety of similarities and differences between these groups, however, a comparison of these results has been hindered due to the use of different definitions of exercise dependence as well as researchers combining non-dependent exercisers and non-exercisers into one group. Consequently, the differences between exercise dependent individuals, non-dependent exercisers, and non-exercisers remain unclear. A number of factors will be assessed, including frequency and duration of exercise, reasons for exercise, body dissatisfaction, feelings of effectiveness and perfectionism, as well as eating pathology.

The study will examine the behavioral, motivational, and cognitive similarities and differences exhibited by those individuals suffering from primary and secondary exercise dependence.

The similarities and differences exhibited by those individuals suffering from primary exercise dependence and those with eating pathology in the absence of exercise dependence will be assessed.

It is important to differentiate between individuals suffering from primary and secondary exercise dependence when comparing individuals suffering from exercise dependence and individuals suffering from eating pathology because these two groups may exhibit different relationships with eating pathology. No study has ever attempted to do so.

The similarities and differences exhibited by those individuals suffering from secondary exercise dependence and those with eating pathology in the absence of exercise dependence will also be examined.
This study should provide a better understanding of exercise dependence and its relationship with eating pathology. Findings may provide evidence for an autonomous exercise dependence disorder and/or they may provide support for one of the models linking excessive exercise and eating pathology. This could help researchers and clinicians devise more specific and, ultimately, more appropriate treatment plans for those suffering from both primary and secondary exercise dependence. Furthermore, findings could help researchers and clinicians devise more appropriate prevention plans.

Method

Participants

Two hundred and fifty female undergraduate students who were registered in psychology courses participated in this study. All were members of a university participant pool and were randomly selected to participate in this study. Each was offered 2 bonus credits toward their final grade in the course in exchange for their participation. All participants were asked to sign a consent form indicating the purpose of the study and indicating that their identity would kept confidential. Participants were treated in accordance with APA ethical codes.

The mean age of participants was 20.7 years (SD = 3.04). Of the 250 participants, 76% were Caucasian, 6.8% were African-Canadian, 6.0% were Asian, 3.2% were Native-Canadian, 2% were Middle-Eastern, 2% were bi-racial, 1.6% were West-Indian, 0.8% were East-Indian, 0.8% were Latin-American, and .8% did not specify. Approximately 10% had a family income of less than $30,000, 10.9% had a family income between $30,000 and $44,999, 21.3% earned between $45,000 and $59,999, 16.7% earned between $60,000 and $74,999, 17.2% earned between $75,000 and $89,999, 6.3% had a family income between $90,000 and $99,999, and 17.2% earned more than $100,000.

Forty-two percent of individuals considered themselves to be regular exercisers, 16.4% indicated that they participate in amateur sports, 1.2% indicated that are involved in professional sports activities, and 6% considered themselves to be addicted to exercise. Approximately 17.8% of the individuals felt that they exercised more than others the same age, while 40.4% felt they exercised the same and 40.8% felt they exercised less than others the same age. When asked how they would feel about stopping exercising for a
period of 2 weeks, 59.2% said it would not be a problem, 29.6% said it would be difficult, and 6.8% said they would not stop. While 6.4% of the individuals felt that they currently had an eating disorder, 3.2% indicated that they had received treatment for an eating disorder in the past.

**Materials**

All participants were asked to read and complete a consent form indicating that the purpose of the study was to assess the relationship between thoughts and behaviours regarding exercise and eating. The consent form also indicated that participation was voluntary and all responses were anonymous and would be kept confidential (see Appendix A).

All participants were asked to provide some background information including their age, height, weight, exercise habits, thoughts concerning exercise and eating, and eating behaviours (see Appendix B).

**The Obligatory Exercise Questionnaire.**

The Obligatory Exercise Questionnaire was written by Pasman and Thompson (1988) and is used to identify individuals who are exercise dependent as well as non-dependent exercisers (see Appendix C). It is a 20-item scale and was modified from Blumenthal et al’s (1985) Obligatory Running Questionnaire. Sample items from the questionnaire include “When I miss an exercise session I may feel tense, irritable, or depressed” and “I have exercised even when advised against such activity (i.e. by a doctor, friend, etc.).” Subjects rate each question using a four-point Likert scale ranging from 1 “never” to 4 “always.” Factor analysis indicated one factor, as the items appear to tap a single construct reflecting a subjective need to engage in repetitive exercise behaviors. Internal consistency reliability of the measure was established to be 0.96. The test-retest reliability is also 0.96. (Pasman & Thompson, 1988). The items appear content valid as the total score has been found to correlate with external measures of exercise behavior, such as frequency and duration of exercise. Additionally, Coen and Ogles (1993) found that individuals with higher scores are more likely to exercise despite injury. Total possible scores range from 20 to 80. Those individuals who score 50 and above will be categorized as obligatory exercisers and those scoring less than 50 will be characterized as nonobligatory exercisers (Brehm & Steffen, 1998; Coen & Ogles, 1993).
The Commitment to Exercise Scale.

The Commitment to Exercise Scale was created by Davis, Brewer, and Ratusny (1993). It is an 8-item questionnaire used to assess an individual's psychological commitment to exercise (see Appendix D). According to Davis et al., it is a multifaceted assessment of exercise as it accounts for both attitudinal and behavioral aspects of exercise. Sample items include “How important do you think it is to your general well-being not to miss your exercise sessions?” and “Do you continue to exercise even when you have sustained an exercise-related injury?” Two factors describe the items. The first describes the obligatory aspect of exercising “whereby psychological well-being is contingent upon assiduous adherence to a regular and structured exercise regimen” (p.621). The second factor relates to pathological aspects of exercising as indicated by, for example, exercising in the face of adverse circumstances. The scale has acceptable internal consistency of .77 and construct validity has been demonstrated in a number of studies (Davis et al., 1993; 1995).

Below each of the 8 items, there is a 155mm horizontal line with bipolar adjectives at each end (“never” and “always”). Participants are asked to mark the point which best describes their position on the continuum. The distance from the beginning of the line to the point marked by the participant indicates the score for each item. Higher scores indicate a more pathological commitment to exercise.

The Reasons for Exercise Inventory.

The Reasons for Exercise Inventory was created by Silberstein, Striegel-Moore, Timko, and Rodin (1988). This is a 25-item inventory that assesses the importance of different motives for exercise. Sample items include “To improve my over-all health” and “To improve my appearance.” Participants rate items on a 7-point Likert scale ranging from 1 “not at all important” to 7 “extremely important.” Although the scale was originally developed by Silberstein et al., it was modified by Cash, Novy, and Grant (1994) (see Appendix E). Cash et al. re-analyzed the factor structure and reported internal consistency for four factors including Fitness/Health Management, Appearance/Weight Management, Stress/Mood Management, and Socializing. All subscales have 3 to 8 items. Cronbach alphas ranging from .73 to .91. A total score is calculated by averaging the
scores on all items. A search of the literature indicates that this inventory has been used repeatedly in studies assessing motives for exercise.

Participants were also asked a number of questions regarding their exercise habits. For example, they were asked about the types of activities in which they engage, whether they were physically active when they were children and adolescents, whether they prefer to exercise alone or with others, how they feel when they miss an exercise session, whether they feel that the level of physical activity they engage in is considerably more than typical for someone their age, and their views concerning the exercise habits of their peer group. They were also asked how easily they expect to be able to stop exercising for two weeks, how much they expect exercise cessation to affect their day-to-day life, and how addicted to exercising they think they are.

The Eating Attitudes Test-26.

The Eating Attitudes Test-26 (EAT-26) was created by Garner, Olmsted, Bohr, & Garfinkel (1982) (see Appendix F). The EAT-26 is a global measure of eating disorder symptoms and is an abbreviated form of the original EAT which consisted of 40 items (Garner & Garfinkel, 1979). The two scales have been found to correlate highly, $r = 0.98$ (Garner et al., 1982). Sample items include “Have gone on eating binges where I feel that I may not be able to stop” and “Vomit after I have eaten.” Factor analysis indicated that the items load on three factors: (1) Dieting, which relates to an avoidance of fattening foods and a preoccupation with being thinner; (2) Bulimia and Food Preoccupation, which reflects thoughts about food and is associated with bulimia; and (3) Oral Control, which relates to self-control of eating and the perceived pressure from others to gain weight (Garner et al., 1982). The authors of the EAT-26 indicate that the scale has excellent internal consistency with an alpha of 0.90. Garner et al. (1982) also reported that the convergent and divergent validity of the scale is high, as it tends to correlate highly with similar measures and it tends to be unrelated to scores on measures assessing symptoms of other disorders (i.e. anxiety and obsessionality). A number of researchers have pointed out that it is one of the most popular self-report eating disturbance inventories in research and clinical settings (Raciti & Norcross, 1987).

All of the items on the EAT-26 are composed of a Likert scale ranging from 1 (Always) to 6 (Never). According to Garner and Garfinkel (1979), items are scored using
the following procedure: 1=3, 2=2, 3=1, 4=0, 5=0, and 6=0. Item 25 is reverse scored so that: 6=3, 5=2, 4=1, 3=0, 2=0, and 1=0. A total score is found by summing the item values. A cutoff score of 20 is suggested to determine both anorexic and bulimic tendencies. Although anorexic and bulimic individuals tend to obtain similar overall scores on the EAT-26, Garner et al. (1982) noted that these two groups tend to score significantly different on the three factors, as anorexics tend to score higher on the first and third factors and lower on the second factor as compared to bulimic individuals.

For the purpose of this study, individuals scoring at or above 20 were characterized as individuals with partial-syndrome anorexia or bulimia nervosa.

**The Eating Disorder Inventory-2 (EDI-2).**

The Eating Disorder Inventory (EDI) was created by Garner (1990). It is a revised version of the original 64-item Eating Disorder Inventory which was created in 1983 by Garner, Olmsted, and Polivy. The EDI-2 is a self-report measure and consists of 91 items (64 of the original items and an additional 27 items). It was designed to measure certain psychological traits and/or symptom clusters that appear in individuals with eating disorders (see Appendix G). The EDI-2 is composed of eleven subscales: (1) Drive for Thinness, which indicates excessive concern with dieting, a preoccupation with weight, and an extreme pursuit of thinness; (2) Bulimia, which indicates a tendency toward episodes of uncontrollable over-eating which may be followed by the impulse to engage in self-induced vomiting; (3) Body Dissatisfaction, which reflects the belief that specific parts of the body associated with shape change or increased “fatness” at puberty are too large; (4) Ineffectiveness, which assesses feelings of general inadequacy, insecurity, worthlessness and the feeling of not being in control of one’s life; (5) Perfectionism, which indicates excessive personal expectations for superior achievement; (6) Interpersonal Distrust, which reflects a sense of alienation and a general reluctance to form close relationships; (7) Interoceptive Awareness, which reflects one’s lack of confidence in recognizing and accurately identifying emotions and sensations of hunger or satiety; (8) Maturity Fears, which measures one’s wish to retreat to the security of the preadolescent years because of the overwhelming demands of adulthood; (9) Asceticism, which reflects and individual’s tendency to seek virtue through the pursuit of spiritual ideals such as self-discipline, self-denial, self-restraint, self-sacrifice, and control of bodily urges; (10)
Impulse Regulation, which measures one’s tendency toward impulsivity, recklessness, substance abuse, hostility, and destructiveness towards the self and in relationships; and (11) Social Insecurity, which assesses the belief that social relationships are tense, disappointing, insecure, unrewarding, and generally of poor quality (Garner. 1990). Sample items from the EDI-2 include “I feel extremely guilty after overeating” and “I feel satisfied with the shape of my body.”

All items on the EDI-2 are composed of a 6-point Likert scale ranging from “Always” to “Never”. According to Garner et al. (1983), “the scoring is identical to the EAT with the most extreme “anorexic” response (always or never depending on the keyed direction) earning a score of 3; the immediately adjacent response 2, the next response 1, and the three choices opposite to the most "anorexic” response receiving no score (0). Scale scores are the summation of all item scores for that particular scale” (p.19). Garner et al. (1983) and Wear & Pratz (1987) demonstrated that the EDI is a reliable and valid test. It has been used extensively since its creation. Garner (1990) also indicated that the EDI-2 is a reliable and valid measure.

Demographic Information.

A questionnaire requesting demographic as well as additional information was also administered. Information regarding the participant’s age, race, socio-economic status, height, and weight was requested. Participants were also questioned about their involvement with sports teams, both amateur (including university teams) and professional. The frequency of physical activity was assessed, as each subject was asked to rate the number of weeks of participation during the last 2 months, the average number of sessions per week, and the average duration (in minutes) of each session (1-30, 31-60, 61-90, 91-120, 121+).

Other questions asked included whether or not she had ever received treatment for an eating disorder. If she had, she was asked about the type of eating disorder she had, whether she was officially diagnosed, and how long she was in treatment.

Participants were debriefed following the completion of the questionnaires. At this time, they were given more detailed information about the study and the research questions were relayed to all participants. Participants were also told that the study could have implications for the treatment and prevention of exercise dependence. Phone
numbers were provided for the participants who may have concerns about their own eating or exercise behaviours and wish to seek assistance (see Appendix H).

**Classification Criteria**

In order to qualify as exercise dependent, individuals had to obtain a score of 50 or more on the Obligatory Exercise Questionnaire and engage in physical activity at least three times a week for at least 30-60 minutes at a time over the past two months. This frequency and duration criteria were chosen by the researcher because few studies indicated the criteria used. Those studies that did appeared to use quite stringent criteria. As such, participants were asked for additional information regarding their exercise history.

In order to determine which non-dependent exercisers were regular exercisers and which were non-exercisers, individuals who exercise at least once a week for thirty minutes at a time over the last four weeks were classified as regular exercisers. All others were characterized as non-exercisers. This criteria is consistent with that used by Gebhardt and Maes (1997) and Hsiao and Thayer (1998).

Individuals were characterized as suffering from primary exercise dependence if they met the criteria for exercise dependence but did not meet the requirements for partial-syndrome anorexia and/or bulimia nervosa using the EAT-26 (EAT-26 ≥ 20). Individuals were categorized as suffering from secondary exercise dependence if they met the criteria for exercise dependence and a partial-syndrome eating disorder.

**Procedure**

Due to the large number of participants, all were asked to meet the examiner in small groups in a pre-arranged room at the university. They were asked to read and sign a consent form and fill out some background information. Participants were then asked to complete the self-report questionnaires. All students were told that the purpose of the study was to assess the relationship between exercise habits and eating habits. After they completed their questionnaires, students were given a debriefing statement that provided them with some information about the study as well as phone numbers for some community agencies if they had concerns about their own or someone else’s exercise and/or eating behavior (see Appendix H).
Results

Approach to Data Analysis

Following descriptive analyses, a number of ANOVA’s and t-tests were conducted, using SPSS, in order to compare the exercise dependent individuals, non-dependent exercisers, and non-exercisers on a number of measures. T-tests were also used to compare individuals with primary and secondary exercise dependence, individuals with primary exercise dependence and those with eating pathology, and individuals with secondary exercise dependence and those with eating pathology in the absence of exercise pathology. Whereas the alpha level was set at the 0.05 level for the ANOVA’s, it was set at the 0.017 level for the t-tests. That is, a Bonferroni correction was applied in order to control for the Type I error rate.

Descriptive Statistics

The ranges, means, and standard deviations for the subject descriptive information and for all of the measures are shown in Table 1. Descriptive information for a normative sample was not available for the Obligatory Exercise Questionnaire and the Commitment to Exercise Scale. Consequently, a comparison could not be made. However, the information was available for the other three measures. The internal reliability Cronbach alpha coefficients for all of the measures are also included. All scales had good inter-item reliabilities, as scores were above the .85 level (Nunnally, 1978).

Correlations of the Measures

Correlations of and significance levels for the different measures can be found in Tables 2, 3, and 4. Significant correlations were found between the Obligatory Exercise Questionnaire (OEQ) and the Commitment to Exercise Scale ($r = .77$), the OEQ and the Reasons for Exercise Inventory ($r = .44$), the OEQ and the Eating Attitudes Test-26 ($r = .44$), as well as the OEQ and the Eating Disorder Inventory-II ($r = .20$). Significant correlations were also found between the OEQ and a number of subscales of the Reasons for Exercise Inventory, including Appearance/Weight Management ($r = .40$), Stress/Mood Management ($r = .35$), and Socializing ($r = .27$). Lastly, significant correlations were also found between the OEQ and the Asceticism ($r = .19$), Body Dissatisfaction ($r = .19$), Bulimia ($r = .16$), Drive for Thinness, ($r = .40$), and Interoceptive Awareness ($r = .19$) subscales of the Eating Disorder Inventory-2 (EDI-2).
Table 1

Descriptive Data for Study Measures (N = 250)

<table>
<thead>
<tr>
<th>Variable</th>
<th>Range</th>
<th>Mean</th>
<th>Standard Deviation</th>
<th>Cronbach Alpha</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>18 – 42</td>
<td>20.69</td>
<td>3.04</td>
<td></td>
</tr>
<tr>
<td>OEQ</td>
<td>23 – 73</td>
<td>40.43</td>
<td>9.44</td>
<td>.87</td>
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<tr>
<td>CES</td>
<td>0 – 120</td>
<td>42.57</td>
<td>23.46</td>
<td>.85</td>
</tr>
<tr>
<td>RFE</td>
<td>1 – 6.96</td>
<td>4.76 (4.5)</td>
<td>0.83</td>
<td>.88</td>
</tr>
<tr>
<td>Appearance/Weight</td>
<td>1 - 7</td>
<td>4.91 (5.0)</td>
<td>1.31</td>
<td></td>
</tr>
<tr>
<td>Fitness/Health</td>
<td>1 - 7</td>
<td>5.47 (4.9)</td>
<td>1.03</td>
<td></td>
</tr>
<tr>
<td>Socializing</td>
<td>1 - 7</td>
<td>2.93 (2.1)</td>
<td>1.33</td>
<td></td>
</tr>
<tr>
<td>Stress/Mood</td>
<td>1 - 7</td>
<td>4.29 (4.2)</td>
<td>1.41</td>
<td></td>
</tr>
<tr>
<td>EAT-26</td>
<td>0 – 51</td>
<td>9.92 (9.9)</td>
<td>9.84</td>
<td>.88</td>
</tr>
<tr>
<td>EDI-2</td>
<td>4 – 155</td>
<td>44.66</td>
<td>31.55</td>
<td>.95</td>
</tr>
<tr>
<td>Drive for Thinness</td>
<td>0 – 21</td>
<td>4.44 (5.5)</td>
<td>5.65</td>
<td></td>
</tr>
<tr>
<td>Bulimia</td>
<td>0 – 18</td>
<td>1.65 (1.2)</td>
<td>2.93</td>
<td></td>
</tr>
<tr>
<td>Body Dissatisfaction</td>
<td>0 – 27</td>
<td>11.3 (12.2)</td>
<td>8.93</td>
<td></td>
</tr>
<tr>
<td>Ineffectiveness</td>
<td>0 – 28</td>
<td>2.89 (2.3)</td>
<td>4.32</td>
<td></td>
</tr>
<tr>
<td>Perfectionism</td>
<td>0 – 18</td>
<td>5.18 (6.2)</td>
<td>4.18</td>
<td></td>
</tr>
<tr>
<td>Interpersonal Distrust</td>
<td>0 – 16</td>
<td>2.33 (2.3)</td>
<td>3.17</td>
<td></td>
</tr>
<tr>
<td>Interoceptive Awareness</td>
<td>0 – 22</td>
<td>2.98 (3.0)</td>
<td>4.16</td>
<td></td>
</tr>
<tr>
<td>Maturity Fears</td>
<td>0 – 21</td>
<td>3.81 (2.7)</td>
<td>4.09</td>
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<tr>
<td>Asceticism</td>
<td>0 – 16</td>
<td>3.55 (3.4)</td>
<td>2.51</td>
<td></td>
</tr>
<tr>
<td>Impulse Regulation</td>
<td>0 – 22</td>
<td>3.14 (2.3)</td>
<td>4.48</td>
<td></td>
</tr>
<tr>
<td>Social Insecurity</td>
<td>0 – 22</td>
<td>3.36 (3.3)</td>
<td>3.49</td>
<td></td>
</tr>
</tbody>
</table>

Note: Normative data from Cash, Novy, & Grant (1994), Garner, Olmsted, Bohr, & Garfinkel (1982), and Garner (1991) are indicated in parentheses
OEQ = Obligatory Exercise Questionnaire
CES = Commitment to Exercise Scale
RFE = Reasons for Exercise Inventory
EAT-26 = Eating Attitudes Test – 26
EDI-2 = Eating Disorder Inventory - 2
### Table 2

**Correlations Between the Measures**

<table>
<thead>
<tr>
<th></th>
<th>OEQ</th>
<th>CES</th>
<th>RFE</th>
<th>EAT-26</th>
<th>EDI-2</th>
</tr>
</thead>
<tbody>
<tr>
<td>OEQ</td>
<td>---</td>
<td>.77**</td>
<td>.44**</td>
<td>.44**</td>
<td>.20**</td>
</tr>
<tr>
<td>CES</td>
<td>---</td>
<td>.41**</td>
<td>.35**</td>
<td>.20**</td>
<td></td>
</tr>
<tr>
<td>RFE</td>
<td>---</td>
<td>.39**</td>
<td></td>
<td>.26**</td>
<td></td>
</tr>
<tr>
<td>EAT-26</td>
<td>---</td>
<td></td>
<td>.67**</td>
<td></td>
<td></td>
</tr>
<tr>
<td>EDI-2</td>
<td>---</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Note.** **p ≤ .01**

OEQ = Obligatory Exercise Questionnaire  
CES = Commitment to Exercise Scale  
RFE = Reasons for Exercise Inventory  
EAT-26 = Eating Attitudes Test – 26  
EDI-2 = Eating Disorder Inventory – II
Table 3

Correlations Between Subscales of the RFE, the OEQ, and the EAT-26

<table>
<thead>
<tr>
<th>Subscale</th>
<th>OEQ</th>
<th>EAT-26</th>
</tr>
</thead>
<tbody>
<tr>
<td>Appearance/Weight Management</td>
<td>.40**</td>
<td>.57**</td>
</tr>
<tr>
<td>Fitness/Health Management</td>
<td>.12</td>
<td>-.02</td>
</tr>
<tr>
<td>Socializing</td>
<td>.27**</td>
<td>.19**</td>
</tr>
<tr>
<td>Stress/Mood Management</td>
<td>.35**</td>
<td>.20**</td>
</tr>
</tbody>
</table>

**Note**: 

**p ≤ .01**
Table 4

Correlations Between Subscales of the EDI-2, the OEQ, and the EAT-26

<table>
<thead>
<tr>
<th>Subscale</th>
<th>OEQ</th>
<th>EAT-26</th>
</tr>
</thead>
<tbody>
<tr>
<td>Drive for Thinness</td>
<td>.40**</td>
<td>.82**</td>
</tr>
<tr>
<td>Bulimia</td>
<td>.16*</td>
<td>.47**</td>
</tr>
<tr>
<td>Body Dissatisfaction</td>
<td>.19**</td>
<td>.57**</td>
</tr>
<tr>
<td>Ineffectiveness</td>
<td>.03</td>
<td>.43**</td>
</tr>
<tr>
<td>Perfectionism</td>
<td>.06</td>
<td>.27**</td>
</tr>
<tr>
<td>Interpersonal Distrust</td>
<td>.06</td>
<td>.23**</td>
</tr>
<tr>
<td>Interoceptive Awareness</td>
<td>.19**</td>
<td>.46**</td>
</tr>
<tr>
<td>Maturity Fears</td>
<td>.03</td>
<td>.24**</td>
</tr>
<tr>
<td>Asceticism</td>
<td>.19**</td>
<td>.50**</td>
</tr>
<tr>
<td>Impulse Regulation</td>
<td>-.05</td>
<td>.30**</td>
</tr>
<tr>
<td>Social Insecurity</td>
<td>.02</td>
<td>.23**</td>
</tr>
</tbody>
</table>

Note. *p ≤ .05. **p ≤ .01
Significant correlations were found between the Eating Attitudes Test-26 (EAT-26) and the EDI-2 ($r = .67$), the EAT-26 and the Reasons for Exercise Inventory ($r = .39$), as well as the EAT-26 and the Commitment to Exercise Scale ($r = .35$). Significant correlations were also found between a number of subscales of the Reasons for Exercise Inventory, including the Appearance/Weight Management ($r = .57$), Stress/Mood Management ($r = .20$), and Socializing ($r = .19$). The EAT-26 was also found to correlate significantly with all of the subscales of the EDI-2 ($0.23 \leq r \leq .82$).

Prevalence of Exercise Dependence

Forty-four individuals (17.6%) scored within the obligatory range (i.e. $\geq 50$) on the Obligatory Exercise Questionnaire. Thirty-five of these individuals (14% of the entire sample) met the frequency and duration criteria (i.e. engage in physical activity at least three times a week for at least 30-60 minutes at a time over the last two months) and were therefore classified as exercise dependent. One hundred and forty-two participants (56.8%) met the criteria for non-dependent regular exercisers (i.e. OEQ $< 50$ and exercise at least once a week for 30 minutes at a time over the last four weeks). Seventy-two (28.8%) met the criteria for non-exercisers (i.e. OEQ $< 50$ and do not meet criteria for non-dependent regular exerciser). One individual (0.4%) did not provide enough information to determine her exercise status.

Exercise Dependent Individuals

The mean age of the exercise dependent group was 20.6 years (SD = 3.68). Of the 35 individuals, 77.1% were Caucasian, 5.7% were Native-Canadian, 5.7% were West-Indian, 2.9% were African-Canadian, 2.9% were Asian, 2.9% were bi-racial, and 2.9% were Latin-American. Approximately 3% had a family income less than $30,000. 11.8% were between $30,000 and $44,999, 20.6% were between $45,000 and $59,999, 26.5% had a family income between $60,000 and $74,999, 2.9% were between $75,000 and $89,999, 8.8% were between $90,000 and $99,999, and 26.5% had a family income of more than $100,000.

Whereas 42% of all the participants considered themselves to be regular exercisers, 97.1% of the exercise dependent group reported that they were regular exercisers. The percentage of exercise dependent individuals involved in amateur and professional sports is also greater than that of the overall group, as 40% of those with
exercise dependence were involved in amateur sports and 2.9% were involved in professional sports, compared to 16.4% and 1.2% respectively. Differences also appear evident in the number of individuals who felt as though they were addicted to exercise, as 34.3% of the exercise dependent group said they were addicted to exercise, while only 6% of the entire sample felt the same way. Furthermore, 62.9% felt that they exercised more than others the same age whereas 17.6% of the entire sample felt the same way. Lastly, 60% of those with exercise dependence said it would be difficult to stop exercising for a period of 2 weeks and 28.6% said they would not stop, while 29.6% of all participants said it would be difficult to stop and 6.8% said they would not stop.

**Non-Dependent Regular Exercisers**

The mean age of the non-dependent regular exercising group was 20.5 years (SD = 2.61). Of the 142 individuals, 78.2% were Caucasian, 8.5% were African-Canadian, 3.5% were Native-Canadian, 2.8% were Asian, 1.4% were West-Indian, 1.4% were bi-racial, 1.4% were Middle-Eastern, 0.7% were Latin-American, 0.7% were Indian, and 0.7% were East Indian. Approximately 9% had a family income less than $30,000. 10.3% were between $30,000 and $44,999. 21.3% were between $45,000 and $59,999. 11% had a family income between $60,000 and $74,999. 19.9% were between $75,000 and $89,999. 8.1% were between $90,000 and $99,999, and 20.6% had a family income greater than $100,000.

Approximately 49.3% reported that they were regular exercisers, 16.9% were involved in amateur sports, 0.7% were involved in professional sports, and 2.1% said they were addicted to exercise. Whereas 15.5% felt that they exercised more than others the same age, 52.1% said they exercised the same as others the same age, and 31.7% felt that they exercised less than others the same age. Approximately 58.5% said it would not be difficult to stop exercising for a period of 2 weeks, while 33.8% said it would be difficult to stop, and 4.2% said they would not stop.

**Non-Exercisers**

The mean age of the non-exercising group was 21.2 years (SD = 3.47). Of the 72 individuals, 70.8% were Caucasian, 13.9% were Asian, 5.6% were African-Canadian, 4.2% were Middle-Eastern, 2.8% were bi-racial, 1.4% were Native-Canadian, and 1.4% were East-Indian. Approximately 17.4% had a family income less than $30,000, 11.6%
were between $30,000 and $44,999, 21.7% were between $45,000 and $59,999, 23.2%
had a family income between $60,000 and $74,999, 18.8% were between $75,000 and
$89,999, 1.4% were between $90,000 and $99,999, and 5.8% had a family income greater
than $100,000.

None of these individuals reported that they were a regular exerciser, 4.2% were
involved in amateur sports, none were involved in professional sports, and no-one said
they were addicted to exercise. Whereas 22.2% felt that they exercised the same as others
the same age, 77.8% felt that they exercised less than others the same age. Approximately
87.5% said it would not be difficult to stop exercising for a period of 2 weeks, while 6.9%
said it would be difficult to stop, and 1.4% said they would not stop.

Prevalence of Primary and Secondary Exercise Dependence

Of the 35 individuals who met the criteria for exercise dependence, 21 (8.4% of
all participants and/or 60% of participants with exercise dependence) did not meet the
criteria for eating pathology (i.e. Eating Attitudes Test-26 < 20) and were therefore
identified as having primary exercise dependence. Fourteen individuals (5.6% of all
participants and/or 40% of participants with exercise dependence) met the criteria for
eating pathology (Eating Attitudes Test-26 ≥ 20) and were therefore identified as having
secondary exercise dependence.

Individuals with Primary Exercise Dependence

The mean age of the primary exercise dependent group was 20 years (SD = 2.27).
Of the 21 individuals, 76.2% were Caucasian, 4.8% were African-Canadian, 4.8% were
Asian, 4.8% were West-Indian, 4.8% were bi-racial, and 4.8% were Latin-American.
Approximately 5% had a family income less than $30,000, 10% were between $30,000
and $44,999, 20% were between $45,000 and $59,999, 30% had a family income between
$60,000 and $74,999, 5% were between $90,000 and $99,999, and 30% had a family
income greater than $100,000.

Approximately 95.2% reported that they were regular exercisers, 47.6% were
involved in amateur sports, 4.8% were involved in professional sports, and 28.6% said
they were addicted to exercise. Whereas 61.9% felt that they exercised more than others
the same age, 33.3% said they exercised the same as others the same age. Approximately
9.5% said it would not be difficult to stop exercising for a period of 2 weeks, while 61.9% said it would be difficult to stop, and 23.8% said they would not stop.

**Individuals with Secondary Exercise Dependence**

The mean age of the secondary exercise dependent group was 21.5 years (SD = 5.10). Of the 14 individuals, 78.6% were Caucasian, 14.3% were Native-Canadian, and 7.1% were West-Indian. Approximately 14.3% were between $30,000 and $44,999, 21.4% were between $45,000 and $59,999, 21.4% had a family income between $60,000 and $74,999, 7.1% were between $75,000 and $89,999, 14.3% were between $90,000 and $99,999, and 21.4% had a family income greater than $100,000.

All of the participants reported that they were regular exercisers, 28.6% were involved in amateur sports, none were involved in professional sports, and 42.9% said they were addicted to exercise. Whereas 64.3% felt that they exercised more than others the same age, 28.6% said they exercised the same as others the same age. Approximately 57.1% said it would be difficult to stop exercising for a period of 2 weeks while 35.7% said they would not stop.

**Prevalence of Eating Pathology**

Thirty-seven participants (14.8%) met the criteria for eating pathology. As already mentioned, 14 of these individuals are also exercise dependent.

**Individuals with Eating Pathology**

The mean age of the eating pathology group was 20.7 years (SD = 3.37). Of the 37 individuals, 75.7% were Caucasian, 10.8% were Native-Canadian, 2.7% were African-Canadian, 2.7% were Asian, 2.7% were West-Indian, 2.7% were Lebanese, and 2.7% were Indian. Approximately 10.8% had a family income less than $30,000, 5.4% were between $30,000 and $44,999, 21.6% were between $45,000 and $59,999, 16.2% had a family income between $60,000 and $74,999, 16.2% were between $75,000 and $89,999, 8.1% were between $90,000 and $99,999, and 21.6% had a family income greater than $100,000.

Approximately 64.9% reported that they were regular exercisers, 13.5% were involved in amateur sports, none were involved in professional sports, and 16.2% said they were addicted to exercise. Whereas 27% felt that they exercised more than others the same age, 37.8% said they exercised the same and 35.1% said they exercised less than
others the same age. Approximately 45.9% said it would be difficult to stop exercising for a period of 2 weeks, 21.6% said they would not stop, and 27% said it would not be a problem to stop.

**Individuals without Eating Pathology**

The mean age of the group who did not meet criteria for eating pathology was 20.7 years (SD = 2.98). Of the 213 individuals, 76.1% were Caucasian, 7.5% were African-Canadian, 6.6% were Asian, 2.4% were bi-racial, 1.9% were Native-Canadian, 1.9% were Middle-Eastern, 1.4% were West-Indian, 0.9% were Latin-American, and 0.9% were East-Indian. Approximately 10.4% had a family income less than $30,000, 11.9% were between $30,000 and $44,999, 21.3% were between $45,000 and $59,999, 16.8% had a family income between $60,000 and $74,999, 17.3% were between $75,000 and $89,999, 5.9% were between $90,000 and $99,999, and 16.3% had a family income greater than $100,000.

Thirty-eight percent reported that they were regular exercisers, 16.9% were involved in amateur sports, 1.4% were involved in professional sports, and 4.2% said they were addicted to exercise. Whereas 16% felt that they exercised more than others the same age, 40.8% said they exercised the same and 41.8% said they exercised less than others the same age. Approximately 64.8% said it would not be difficult to stop exercising for a period of 2 weeks, 26.8% said it would be difficult to stop, and 4.2% said they would not stop.

**Comparison of Exercise Dependent, Non-Dependent, and Non-Exercising Individuals**

A number of differences and similarities were found between exercise dependent individuals, non-dependent exercisers, and non-exercisers. For example, differences were found between the average length of each exercise session, \( F(2, 244) = 34.34, p \leq .01 \) (see Table 5). The exercise dependent individuals indicated that they exercised for significantly longer sessions than the non-dependent regular exercisers, \( t(175) = 4.89, p \leq .01 \) and the non-exercisers, \( t(104) = 7.87, p \leq .01 \). The non-dependent regular exercisers also exercised for significantly longer sessions than the non-exercisers, \( t(211) = 5.30, p \leq .01 \) (see Table 6).
Table 5

Summary of the Anova Results

<table>
<thead>
<tr>
<th>Variable</th>
<th>df</th>
<th>MS</th>
<th>F</th>
</tr>
</thead>
<tbody>
<tr>
<td>Length of Each Exercise Session</td>
<td>2</td>
<td>23.59</td>
<td>34.34**</td>
</tr>
<tr>
<td>Number of Times Exercise per Week</td>
<td>2</td>
<td>198.63</td>
<td>140.59**</td>
</tr>
<tr>
<td>Number of Weeks Exercised Over Last 3 Months</td>
<td>2</td>
<td>1539.37</td>
<td>244.63**</td>
</tr>
<tr>
<td>Obligatory Exercise Questionnaire</td>
<td>3</td>
<td>4164.43</td>
<td>105.77**</td>
</tr>
<tr>
<td>Commitment to Exercise Inventory</td>
<td>3</td>
<td>18731.28</td>
<td>56.93**</td>
</tr>
<tr>
<td>Reasons for Exercise Inventory</td>
<td>3</td>
<td>1.95</td>
<td>2.90*</td>
</tr>
<tr>
<td>Eating Attitudes Test – 26</td>
<td>3</td>
<td>738.99</td>
<td>8.31**</td>
</tr>
<tr>
<td>Eating Disorder Inventory – II</td>
<td>3</td>
<td>3523.15</td>
<td>3.65*</td>
</tr>
</tbody>
</table>

Note. These results were obtained by comparing the exercise dependent group (N = 35), the non-dependent regular exercisers (N = 142), and the non-exercisers (N = 72). df = degrees of freedom; MS = mean square.

*p ≤ .05; ** p ≤ .01
Table 6

Summary of the T-Test Results: Length of Each Exercise Session

<table>
<thead>
<tr>
<th>Group</th>
<th>Length of Each Exercise Session</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n</td>
</tr>
<tr>
<td>1. Exercise Dependent</td>
<td></td>
</tr>
<tr>
<td>Non-Dependent</td>
<td>35</td>
</tr>
<tr>
<td></td>
<td>142</td>
</tr>
<tr>
<td>2. Exercise Dependent</td>
<td></td>
</tr>
<tr>
<td>Non-Exercisers</td>
<td>35</td>
</tr>
<tr>
<td></td>
<td>71</td>
</tr>
<tr>
<td>3. Non-Dependent</td>
<td></td>
</tr>
<tr>
<td>Non-Exercisers</td>
<td>142</td>
</tr>
<tr>
<td></td>
<td>71</td>
</tr>
<tr>
<td>4. Primary Exercise Dependent</td>
<td></td>
</tr>
<tr>
<td>Secondary Exercise Dependent</td>
<td>21</td>
</tr>
<tr>
<td></td>
<td>14</td>
</tr>
</tbody>
</table>
These three groups also differed on the number of exercise sessions they participated in per week, $F (2, 243) = 140.59, p \leq .01$ (see Table 5). Exercise dependent individuals were found to exercise more often than their non-dependent counterparts, $t (174) = 7.29, p \leq .01$, as well as their non-exercising counterparts, $t (104) = 14.62, p \leq .01$. The non-dependent regular exercisers were also found to exercise more often than the non-exercisers, $t (210) = 13.78, p \leq .01$ (see Table 7).

All three groups differed on the average number of weeks they have exercised over the past three months, $F (2, 244) = 244.63, p \leq .01$ (see Table 5). The exercise dependent group indicated that they exercised over a longer period of time compared to the non-dependent regular exercisers, $t (175) = 6.72, p \leq .01$ and the non-exercisers, $t (104) = 30.00, p \leq .01$. Significant differences were also found between the non-dependent exercisers and the non-exercisers, $t (211) = 23.73, p \leq .01$, as the non-dependent exercisers indicated that they had exercised over a longer period of time (see Table 8).

Mean scores on the Obligatory Exercise Questionnaire were significantly different between the exercise dependent individuals, non-dependent regular exercisers, and non-exercisers, $F (3, 246) = 105.77, p \leq .01$ (see Table 5). The exercise dependent individuals scored significantly higher than the non-dependent exercisers, $t (175) = 13.71, p \leq .01$, and the non-exercisers, $t (105) = 18.09, p \leq .01$. The non-dependent regular exercisers were also found to score significantly higher than the non-exercisers, $t (212) = 7.52, p \leq .01$ (see Table 9).

Mean scores of the three groups were also found to differ significantly on the Commitment to Exercise Scale, $F (3, 246) = 56.93, p \leq .01$ (see Table 5). The exercise dependent group scored significantly higher than the non-dependent regular exercisers, $t (175) = 11.02, p \leq .01$ and the non-exercisers, $t (105) = 12.73, p \leq .01$. The non-dependent exercisers were also found to score higher than the non-exercisers, $t (212) = 4.48, p \leq .01$ (see Table 10).

Significant differences were also found between the three groups on the Reasons for Exercise Inventory, $F (3, 219) = 2.90, p \leq .05$ (see Table 5). More specifically,
Table 7

Summary of T-Test Results: Number of Exercise Sessions per Week

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Note. ** p ≤ .01
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Note. **p ≤ .01
Table 9

Summary of T-Test Results: Obligatory Exercise Questionnaire

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Note. **p ≤ .01

The eating pathology group included those who met the criteria for eating pathology but not exercise dependence.
Table 10

Summary of T-Test Results: Commitment to Exercise Scale

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Note. **p ≤ .01
The eating pathology group included those who met the criteria for eating pathology but not exercise dependence.
differences were found between the exercise dependent group and the non-dependent regular exercisers, \( t (166) = 2.64, p \leq .01 \) (see Table 11). These differences were evident on the Stress/Mood Management scale, \( t (173) = 2.60, p = .01 \) as well as the Appearance/Weight Management scale, \( t (169) = 2.49, p = .014 \), as the exercise dependent individuals tended to score higher than the non-dependent regular exercisers on both scales (see Table 12).

The exercise dependent individuals and the non-exercisers were also found to display significant differences on the Reasons for Exercise Inventory, \( t (87) = 2.59, p = .01 \) (see Table 11). These differences were evident on the Stress/Mood Management scale, \( t (91) = 3.36, p \leq .01 \). The exercise dependent group scored significantly higher on both scales compared to their non-exercising counterparts (see Table 12).

Significant differences were not found between the non-dependent regular exercisers and the non-exercisers on the Reasons for Exercise Inventory (see Table 11).

Mean scores on the EAT-26 were significantly different between the groups, \( F (2, 246) = 8.31, p \leq .01 \) (see Table 5). T-tests revealed that the exercise dependent individuals scored significantly higher on the EAT-26 compared to the non-dependent regular exercisers, \( t (175) = 3.61, p \leq .01 \) and the non-exercisers, \( t (105) = 3.78, p \leq .01 \). No significant differences were found between the non-dependent regular exercisers and the non-exercisers (see Table 13).

Significant differences were also found between the three groups on the Eating Disorder Inventory - II, \( F (3, 245) = 3.65, p \leq .05 \) (see Table 5). These differences were evident between the exercise dependent group and the non-dependent regular exercisers, \( t (174) = 3.03, p \leq .01 \) (see Table 14). More specifically, the exercise dependent group was found to score significantly higher on scales measuring Drive for Thinness, \( t (174) = 3.62, p \leq .01 \), Interpersonal Distrust, \( t (174) = 2.62, p = .01 \), Maturity Fears, \( t (174) = 2.39, p = .018 \), and Interoceptive Awareness, \( t (174) = 2.39, p = .018 \) (see Table 15).

Differences were not found between the exercise dependent individuals and the non-exercisers on the EDI-2, nor were they evident between the non-dependent regular exercisers and the non-exercisers (see Table 14).
Table 11

Summary of T-Test Results: Reasons for Exercise Inventory

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<td>SD</td>
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Note. *p ≤ .05; ** p ≤ .01
The eating pathology group included those who met the criteria for eating pathology but not exercise dependence.
Table 12

Summary of T-Test Results: Subscales of the Reasons for Exercise Inventory

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Note.  *p ≤ .05.  **p ≤ .01

The eating pathology group included those who met the criteria for eating pathology but not exercise dependence.
Table 13

Summary of T-Test Results: Eating Attitudes Test - 26

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Note. **p ≤ .01
The eating pathology group included those who met the criteria for eating pathology but not exercise dependence.
Table 14

Summary of T-Test Results: Eating Disorder Inventory - 2

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<td>72</td>
<td>48.31</td>
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<td>14</td>
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<td>4.57**</td>
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<td>87.73</td>
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Note: **p ≤ .01

The eating pathology group included those who met the criteria for eating pathology but not exercise dependence.
Table 15

Summary of T-Test Results: Subscales of the Eating Disorder Inventory - 2

<table>
<thead>
<tr>
<th>Subscale</th>
<th>n</th>
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<tr>
<td>Non-Dependent</td>
<td>141</td>
<td>3.28</td>
<td>3.50</td>
<td>2.39*</td>
</tr>
</tbody>
</table>

*Note: *p = .05; **p ≤ .01
Comparison of Individuals with Primary and Secondary Exercise Dependence

A number of t-tests were performed comparing those individuals characterized as suffering from primary exercise dependence and those who were identified as suffering from secondary exercise dependence. Differences were not evident in the average length of each exercise session, the number of exercise sessions per week, or the number of weeks the individual has engaged in exercise over the last three months (see Tables 6, 7, and 8). Differences were also not evident on the Obligatory Exercise Questionnaire or the Commitment to Exercise Inventory (see Tables 9 and 10). However, the mean scores of the two groups differed significantly on the Reasons for Exercise Inventory, \( t(33) = 2.79, p = .01 \), the EAT - 26, \( t(33) = 8.87, p \leq .01 \), and the EDI-2, \( t(33) = 2.70, p = .01 \). Those suffering from secondary exercise dependence scored significantly higher on all three measures (see Tables 11, 13, and 14).

More specifically, those with secondary exercise dependence were found to score significantly higher on the Appearance/Weight Management subscale of the Reasons for Exercise Inventory, \( t(33) = 3.18, p \leq .01 \) (see Table 12). They were also found to score significantly higher on the Body Dissatisfaction subscale, \( t(33) = 2.79, p \leq .01 \), as well as the Drive For Thinness subscale, \( t(33) = 5.87, p \leq .01 \), of the EDI-2 (see Table 15).

Comparison of Individuals with Primary Exercise Dependence and Eating Pathology

Additional analyses comparing those with primary exercise dependence with those with eating pathology (in the absence of exercise dependence) revealed some significant differences. Not surprisingly, these two groups differed on the Obligatory Exercise Questionnaire, \( t(36) = 2.71, p \leq .01 \), and the Commitment to Exercise Scale, \( t(35) = 2.13, p = .01 \) (see Tables 9 and 10). The mean scores of these two groups also differed significantly on the other three measures: the Reasons for Exercise Inventory, \( t(39) = 3.00, p \leq .01 \), the EAT - 26, \( t(42) = 9.82, p \leq .01 \), as well as the EDI-2, \( t(41) = 4.40, p \leq .01 \) (see Tables 11, 13, and 14).

More specifically, it was found that those with primary exercise dependence differ from those with eating pathology on the Appearance/Weight Management subscale of the Reasons for Exercise Inventory, \( t(39) = 4.81, p \leq .01 \), as the eating pathology group tended to score higher on this subscale (see Table 12). Significant differences were also evident on the Asceticism subscale, \( t(41) = 2.52, p = .016 \), the Body Dissatisfaction
subscale, \( t(41) = 4.62, p \leq .01 \), the Bulimia subscale, \( t(41) = 3.01, p \leq .01 \), the Drive for Thinness subscale, \( t(41) = 6.69, p \leq .01 \), the Impulse Regulation subscale, \( t(41) = 2.76, p \leq .01 \), and the Ineffectiveness subscale, \( t(41) = 2.63, p = .01 \), of the EDI-2. Individuals with eating pathology tended to score significantly higher on all of these measures (see Table 15).

**Comparison of Individuals with Secondary Exercise Dependence and Eating Pathology**

Analyses were also performed comparing those with secondary exercise dependence with those who met criteria for eating pathology but not exercise pathology. Significant differences were found on the Obligatory Exercise Questionnaire, \( t(35) = 5.62, p \leq .01 \), and the Commitment to Exercise Scale, \( t(35) = 4.21, p \leq .01 \) (see Tables 9 and 10). However, no significant differences were evident on the Reasons for Exercise Inventory, the EAT-26, or the EDI-2 (see Tables 11, 13, and 14).

**Discussion**

The present study sought to answer a number of questions pertaining to exercise dependence. The prevalence rate of exercise dependence as well as primary and secondary exercise dependence were sought. The similarities and differences between exercise dependent individuals, non-dependent exercisers, and non-exercisers were assessed, as were the similarities and differences between those exhibiting primary and secondary exercise dependence.

**Prevalence of Exercise Dependence**

A number of studies have been published examining the prevalence of exercise dependence. However, the literature is characterized by the lack of use of a consistent definition. Consequently, estimates vary considerably and are unreliable. This study sought to examine the prevalence using a multidimensional definition that accounts not only for behavioral, but for psychological disturbances as well. This study found that 14% of the 250 participants could be characterized as exercise dependent, 57% could be characterized as non-dependent regular exercisers, and 29% could be characterized as non-exercisers.

This estimate of the prevalence of exercise dependence is less than the estimate in many of the studies on exercise dependence, as existing estimates range from 14% to 81%
(Davis, Katzman, Kaptein, Kirsh, Brewer, Kalmbach, Olmsted, Woodside, & Kaplan, 1997; Yates, 1991). An examination of the literature indicates that this estimate may appear small since the criteria for exercise dependence was quite stringent compared to almost all of the studies published. Unlike the current study, most of the literature relied on criteria specifying extreme frequency and duration in the absence of psychological disturbances.

**Prevalence of Primary and Secondary Exercise Dependence**

This study also attempted to estimate the prevalence rates of both primary and secondary exercise dependence using multidimensional definitions. A search of the literature did not produce an estimate of primary exercise dependence. This may have been a result of the widespread notion that excessive exercise is a symptom of an eating disorder and not a distinct disorder in itself. This same literature search produced unreliable and conflicting estimates of secondary exercise dependence, likely due to the use of conflicting definitions. This study found that approximately 8% of participants could be characterized as suffering from primary exercise dependence while 6% could be characterized as suffering from secondary exercise dependence. This estimate appears to be significantly lower than many of the studies which have attempted to estimate the prevalence of secondary exercise dependence, as estimates have been found to range from 14% to 81% (Davis et al., 1997; Yates, 1991). These findings are also inconsistent with those of Davis and Fox (1993) who found that excessive exercise is more often encountered in individuals suffering from an eating disorder compared to a nonclinical population. As already mentioned, the conflicting findings of this study and others is likely the result of the use of a multidimensional set of criteria which may be considered to be more stringent.

**Comparison of Exercise Dependent, Non-Dependent, and Non-Exercising Individuals**

Current research provides conflicting evidence regarding the similarities and differences between exercise dependent individuals, non-dependent regular exercisers, and non-exercisers. Again, this may be due to the lack of use of a consistent definition of exercise dependence as well as researchers combining the non-dependent regular exercisers and the non-exercisers into one group. This study differentiated between all three groups and found a number of interesting differences and similarities.
There has been conflicting evidence regarding the psychological reasons for engaging in exercise. Some propose that individuals exercise excessively because they are dissatisfied with their body (Cockerill & Riddington, 1996). Excessive exercising is also considered to be a compensatory behavior for individuals suffering from eating pathology (Davis & Fox, 1993). Others propose that individuals engage in excessive exercise in order to reduce depression, anxiety, and stress (Anshel, 1991). This study found that the reasons for engaging in exercise do differ for exercise dependent individuals compared to their non-dependent and non-exercising counterparts. In accordance with the literature, those with exercise dependence indicated that they were more likely to exercise in order to relieve stress, regulate their mood, manage their weight, and feel more attractive compared to their non-dependent and non-exercising counterparts. Differences in the reasons for exercising were not found between the non-dependent regular exercisers and the non-exercisers. While this may provide some support for those studies which have grouped these two together, more research is needed to determine how similar these two groups are.

The research literature has often shown that exercise is related to weight concerns and dieting behaviors (Davis & Fox, 1993). This study provides further evidence for this relationship, as there were significant differences between the exercise dependent, non-dependent, and non-exercising individuals on measures of eating pathology. Exercise dependent individuals appeared to experience significantly more eating pathology than the other two groups. Compared to their non-dependent counterparts, the exercise dependent group demonstrated a greater concern with dieting, preoccupation with weight, and pursuit of thinness. They also evidenced a greater sense of alienation, reluctance to form close relationships, wish to retreat to the security of their preadolescent years because of the demands of adulthood, and lack of confidence in recognizing and accurately identifying emotions and sensations of hunger and satiety. These characteristics have been associated with the development of eating pathology (Garner, 1990). Differences were not evident between the non-dependent regular exercisers and the non-exercisers on indicators of eating pathology.

One of the questions this study looked at was whether those with exercise dependence were more active as children compared to their non-dependent and non-
exercising counterparts. Davis et al. (1997) found that the premorbid activity levels of anorexic individuals predicted excessive exercise comorbidity. The possibility of extending these findings to all those suffering from exercise dependence was explored, but somewhat surprisingly, no significant differences were found between the groups.

These findings spawn some further questions. Are those who suffer from exercise dependence similar to individuals with eating pathology as the literature suggests, or do they compose a distinct group? In order to answer this question, analyses were performed comparing those with primary and secondary exercise dependence, primary exercise dependence and eating pathology, and secondary exercise dependence and eating pathology in the absence of exercise pathology.

Comparison of Individuals with Primary and Secondary Exercise Dependence

Findings revealed that the primary and secondary exercise dependent individuals do, in fact, appear to be fairly different. While these two groups did not differ significantly on measures of exercise dependence, those with secondary exercise dependence evidenced significantly more eating pathology than those with primary exercise dependence. More specifically, those with secondary exercise dependence were more likely to evidence body dissatisfaction, an excessive concern with dieting, a preoccupation with their weight, and an extreme pursuit of thinness. These findings are both consistent with and counter to the literature. While a number of studies have found that those with exercise dependence are more preoccupied with their weight and body (Yates, 1992; Cockerill & Riddington, 1996), others have found no differences between those with and without exercise dependence (Davis, 1990). The findings of this study suggest that the discrepant findings in the literature may be a result of the lack of differentiation between primary and secondary exercisers.

Individuals with primary and secondary exercise dependence also gave different reasons for engaging in exercise. Those with primary exercise dependence rated fitness and health management as their primary reasons for exercising, followed by appearance and weight management, stress and mood management, and socializing. Those with secondary exercise dependence rated appearance and weight management as their primary reasons for exercising, followed by fitness and health management, stress and mood management, and socializing. Although overall group differences were meaningful, only
one significant difference was found with respect to the reasons given, as the groups differed significantly on the appearance and weight management reason for exercise. That is, those with secondary exercise dependence were more likely to engage in exercise to help control their weight and improve their appearance. These findings appear to differ from those of Anshel (1991) who found that health and well-being was the most important factor for exercise addicts to engage in exercise, while improved general appearance and weight control were listed fifth out of six possible reasons. While Anshel assessed both male and female exercise addicts and compared them to non-addicted exercisers, he failed to differentiate between those afflicted with primary and secondary exercise dependence. This again may explain some of the differences in the findings of the two studies.

Some research has indicated that those who suffer from secondary exercise dependence may have been more active as children and adolescents than their peers (Davis et al., 1997). As such, this study also sought to assess whether those with secondary exercise dependence were more active as children compared to those with primary exercise dependence. No significant differences were found.

Comparison of Individuals with Primary Exercise Dependence and Eating Pathology

A comparison of individuals with primary exercise dependence and those with eating pathology (in the absence of exercise dependence) indicated that there were some significant differences. Not surprisingly, these two groups differed on measures of exercise pathology. However, these two groups also provided different reasons for exercising, as those with eating pathology were more likely to exercise to help manage their weight and improve their appearance compared to those with primary exercise dependence. As already mentioned, those with primary exercise dependence rated the fitness and health benefits as the most important factor for them.

These two groups also differed on measures of eating pathology, as those with primary exercise dependence did not evidence eating pathology. More specifically, those with eating pathology were more likely to experience body dissatisfaction, an excessive concern with dieting, a preoccupation with their weight, and an extreme pursuit of thinness. They were also more likely to evidence behaviors associated with bulimia, feelings of general inadequacy, insecurity, and worthlessness, as well as feelings of not being in control of one's life. Those with eating pathology were more likely to engage in
self-denial, self-discipline, self-restraint, and self-sacrifice and they may be more impulsive and destructive towards themselves and relationships. These findings provide some evidence that those with primary exercise dependence differ significantly from those with eating pathology. These findings support the identification of a distinct exercise disorder distinct from eating pathology.

Comparison of Individuals with Secondary Exercise Dependence and Eating Pathology

A comparison of individuals with secondary exercise dependence and those with eating pathology (in the absence of exercise pathology) indicates quite a few similarities. The only significant difference found between these two groups was the level of exercise dependence. This provides further evidence supporting the notion that some individuals with exercise pathology are in fact quite similar to those who evidence eating pathology. Perhaps the most significant difference between these two groups of people is that one group is more likely to use exercise as a compensatory behavior.

In conclusion, this study attempted to examine exercise dependence and clarify some of the conflicting findings in the literature. Although some of the groups within this study were fairly small, many of the findings are significant. This provides support for the need for studies with a greater number of participants, as a number of questions regarding the similarities and differences between all of the groups remain. Particular attention should be paid to examining the similarities and differences between primary and secondary exercise dependence, as this study has provided evidence that these two forms of exercise dependence may be quite different. Therefore, they may afflict different types of individuals and may require different treatment plans and preventive actions.

Additional research should continue to examine the similarities and differences between exercise dependent individuals, non-dependent regular exercisers, and non-exercisers. However, this study has provided evidence that these studies need to differentiate between those with primary and secondary exercise dependence, as combining these two groups into one is misleading and confusing.

Future research is needed to examine the relationship between eating pathology and exercise dependence. This study has provided evidence that these studies should be specific and differentiate between primary and secondary exercise dependence. Just as there are different types of eating pathology, and it would be inappropriate to generalize
findings about those suffering from anorexia nervosa to those suffering from bulimia nervosa, it may be inappropriate to generalize findings about exercise dependence. Particular attention should be paid to the relationship between eating pathology and secondary exercise dependence, as this may be helpful when devising treatment plans. For example, is the exercise used as a compensatory behavior for these individuals (i.e. is it a secondary condition to their eating pathology), or are they really comorbid conditions? If the exercise is used as a compensatory behavior, what may lead some individuals to use exercise as a compensatory behavior while others may resort to vomiting or laxative use? Perhaps the excessive exercise was the preceding condition? If so, what may have led to the development of eating pathology? Treatment of those who primarily suffer from an eating disorder may focus more on the familial and social conditions that may have contributed to the development of the disorder. Treatment for those who primarily suffer from exercise dependence may focus more on the social and, possibly, the familial conditions that may have contributed to the dependence.

Lastly, studies on exercise dependence have included males, usually those in their thirties and forties who engage in obligatory running. Future research should look at men of different ages and assess the other forms exercise dependence can take. The prevalence rates of exercise dependence, primary exercise dependence, and secondary exercise dependence in men should also be explored. This could become a particularly interesting question, as approximately 10% of all those who suffer from an eating disorder are men. It would also be interesting to note the similarities and differences between males and females with eating disorders with respect to the prevalence of secondary exercise dependence, as it may be more socially appropriate for men to use exercise as a compensatory behavior compared to their female counterparts. Research should also compare exercise dependent males with their non-dependent and non-exercising counterparts to determine what similarities and differences may exist.
References


Appendix A

University Participant Consent Form

I am a Psychology graduate student from the University of Windsor and I would like you to participate in a study that assesses your thoughts and behaviours regarding exercise and eating.

If you decide to participate in the study, it will take approximately one hour of your time. You will be requested to fill out six questionnaires, involving exercise behaviours and thoughts (e.g. how often do you exercise, how do you feel when you are prevented from exercising) and thoughts and behaviours regarding eating (e.g. bingeing, dieting). Volunteering in this study may educate you about the relationship between exercise and eating. At any point, if you have any questions regarding the study, please feel free to ask me.

Your participation is voluntary and you may withdraw from the study at any time. Your grades will not be affected in any way. Several additional things should be mentioned. As already mentioned, your participation is voluntary; however, you will receive 2 bonus points (i.e. 2%) toward your course grade in 46-115 Introductory Psychology. Second, your responses are anonymous so that individuals cannot be identified. Third, your responses will be kept confidential. If you wish, you may contact the Chairperson of the Departmental Ethics Committee (Dr. D. Shore) at the University of Windsor, Department of Psychology – (519) 253-4232 ext. 2249.

If you have any questions, please contact me (at 254-8728), or my thesis supervisor, Dr. Cheryl Thomas (Department of Psychology – (519) 253-4232 ext. 2252). Once the study has been completed, you may receive a copy of the study results if you wish, by leaving your name and address on a sign-up sheet after completing the questionnaires. Thank you for your cooperation.

Please read and sign the following declaration of informed consent if you agree:

I, ____________________________ (name of participant), have read the description of the study, understand its purpose, and recognize that there are no known or expected discomforts or risks involved in my participation. I understand that my answers will be kept confidential and that my name will not be associated with my answers. I voluntarily consent to participate.

______________________________
(Participant’s Signature)

______________________________
(Date)
Appendix B
Background Information

Please provide answers to the following questions:

Age: _____ years

Sex: _____

How much do you weigh in pounds? _____ or kilograms? _____

What do you consider to be your ideal weight? _____

What is your height in feet and inches (e.g. 5”2) _____ or in centimeters _____

What is your ethnic background?
Caucasian
African-Canadian
Asian
Native-Canadian
Other (please specify) __________________________

What is your family’s combined yearly income?
Under $30,000
$30,000 - $44,999
$45,000 - $59,999
$60,000 – $74,999
$75,000 - $89,999
$90,000 – $99,999
Over $100,000

Do you consider yourself to be a regular exerciser?
Yes
No

On average, how many times per week do you exercise? _____ times per week

Approximately how many weeks over the past three months (i.e. 13 weeks) have you exercised? ________ weeks

What types of exercise activities do you participate in?

What types of gym equipment do you use when you exercise?
On average, how long is each of your exercise sessions (i.e. how long to do you actually engage in exercise)?
1-30 minutes
31-60 minutes
61-90 minutes
91-120 minutes
121+ minutes

Were you physically active when you were a child and/or adolescent?
Yes
No

If so, in what types of activities did you participate? ______________________________________

________________________________________

Do you prefer to exercise alone or with others?
Alone
With others

Do you think that you exercise more, the same, or less than most females your age.
More
Same
Less

How do you feel when you miss an exercise session?
Does not bother me
I feel tense and upset
I never miss an exercise session
Other: ______________________________________

How would you feel about stopping your exercise program for two weeks?
It would not be a problem
It would be difficult
I would not stop
Other: ______________________________________

Do you think that you are addicted to exercise?
Yes
No

Are you involved in any amateur sports activities (including university sports teams)?
Yes
No
If you answered yes, what activities are you involved in?

Are you involved in any professional sports activities?
Yes
No

If you answered yes, what activities are you involved in?

Do you think that you have an eating disorder?
Yes
No

If you think that you have an eating disorder, please describe your experiences.

Have you ever received treatment for an eating disorder?
Yes
No

If you have received treatment, for how long were you in treatment?

What type of eating disorder did/do you have? ____________________________

Were you diagnosed by a psychologist, psychiatrist, or medical doctor?
Yes. (Please specify) ____________________________
No.
Appendix C

The Obligatory Exercise Questionnaire

Listed below are a series of statements about people's exercise habits. Please circle the number that reflects how often you could make the following statements:

1 - NEVER  
2 - SOMETIMES  
3 - USUALLY  
4 - ALWAYS

1. I engage in physical exercise on a daily basis

2. I engage in one or more of the following forms of exercise: walking, jogging/running, or weightlifting.

3. I exercise more than three days per week.

4. When I don't exercise I feel guilty.

5. I sometimes feel like I don't want to exercise, but I go ahead and push myself anyway.


7. When I miss an exercise session, I feel concerned about my body possibly getting out of shape.

8. If I have planned to exercise at a particular time and something unexpected comes up (like an old friend comes to visit or I have some work that needs immediate attention) I will usually skip my exercise for that day.

9. If I miss a planned workout, I attempt to make up for it the next day.

10. I may miss a day of exercise for no good reason.

11. Sometimes I feel a need to exercise twice in one day, even though I may feel a little tired.

12. If I feel I have overeaten, I will try to make up for it by increasing the amount I exercise.

13. When I miss a scheduled exercise session I may feel tense, irritable, or depressed.
14. Sometimes I find that my mind wanders to thoughts about exercising.

15. I have had daydreams about exercising.

16. I keep a record of my exercise performance, such as how long I work out, how far or how fast I run.

17. I have experienced a feeling of euphoria or a “high” during or after an exercise session.

18. I frequently “push myself to the limits.”

19. I have exercised even when advised against such activity (i.e. by a doctor, friend, etc.).

20. I will engage in other forms of exercise if I am unable to engage in my usual form of exercise.
Appendix D

Commitment to Exercise Scale

The following are statements describing attitudes to exercise. Please respond by marking on the line beside each statement the point on the line which best describes your position on the continuum.

1. How important do you think it is to your general well-being not to miss your exercise session?

<table>
<thead>
<tr>
<th>not at all important</th>
<th>very important</th>
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2. Does it upset you if, for one reason or another, you are unable to exercise?

<table>
<thead>
<tr>
<th>never upset</th>
<th>always upset</th>
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3. If you miss an exercise session, or several sessions, do you try to make them up by putting in more time when you get back?

<table>
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<th>never</th>
<th>always</th>
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4. Do you have a set routine for your exercise sessions, e.g. the same time of day, the same location, the same number of laps, particular exercises, and so on?

<table>
<thead>
<tr>
<th>no routine</th>
<th>strict routine</th>
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5. Do you continue to exercise at times when you feel tired or unwell?

<table>
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<tr>
<th>never</th>
<th>always</th>
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6. Do you continue to exercise even when you have sustained an exercise-related injury?

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<tr>
<th>never</th>
<th>always</th>
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7. Do you feel “guilty” that you have somehow “let yourself down” when you miss your exercise session?

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<tr>
<th>not at all</th>
<th>a great deal</th>
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8. Are there times when you turn down an invitation to an interesting social event because it interferes with your exercise schedule?

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<th>never</th>
<th>always</th>
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Appendix E

Reasons for Exercise

People exercise for a variety of reasons. When people are asked why they exercise, their answers are sometimes based on the reasons they believe they should have for exercising. What we want to know are the reasons people actually have for exercising. Please respond to the items below as honestly as possible. To what extent is each of the following an important reason that you have for exercising. Use the scale below, ranging from 1 to 7, in giving your answers (if you never exercise, please skip this section).

1. To be slim
2. To improve my muscle tone
3. To cope with sadness, depression
4. To improve my cardiovascular fitness
5. To improve my appearance
6. To meet new people
7. To redistribute my weight
8. To lose weight
9. To improve my strength
10. To cope with stress, anxiety
11. To improve my over-all health
12. To be sexually desirable
13. To socialize with friends
14. To improve my over-all body shape
15. To maintain my current weight
16. To improve my endurance, stamina
17. To increase my energy level
18. To increase my resistance to illness and disease
19. To be attractive to members of the opposite sex
20. To have fun
21. To alter a specific area of my body
22. To improve my flexibility, coordination
23. To improve my mood
24. To maintain my physical well-being
25. To do what is socially expected
Appendix F

EAT-26

Please indicate on the line at the left the answer which applies best to each of the numbered statements. All of the results will be strictly confidential. Most questions relate to food or eating, although other types of questions have been included. Please answer each question carefully.

1 = Always   2 = Very Often   3 = Often   4 = Sometimes   5 = Rarely   6 = Never

1. Am terrified about being overweight.
2. Avoid eating when I am hungry.
3. Find myself preoccupied with food.
4. Have gone on eating binges where I feel I may not be able to stop.
5. Cut my food into small pieces.
6. Aware of the caloric content of the food that I eat.
7. Particularly avoid foods with a high carbohydrate content (e.g. bread, potatoes, rice, etc.).
8. Feel that others would prefer if I ate more.
9. Vomit after I have eaten.
10. Feel extremely guilty after having eaten.
11. Am preoccupied with a desire to be thinner.
12. Think about burning calories when I exercise.
13. Other people think I am too thin.
15. Take longer than others to eat my meals.
16. Avoid eating foods with sugar in them.
17. Eat diet foods.
18. Feel that food controls my life.
19. Display self control around food.
20. Feel that others pressure me to eat.
21. Give too much thought and time to food.
22. Feel uncomfortable after eating sweets.
23. Engage in dieting behaviour.
24. Like my stomach to be empty.
25. Enjoy trying rich new foods.
26. Have the impulse to vomit after meals.
Appendix G

Eating Disorder Inventory

This is a scale which measures a variety of attitudes, feelings and behaviours. Some of the items relate to food and eating. Others ask you about your feelings about yourself. There are no right or wrong answers so try very hard to be completely honest in your answers. Results are completely confidential. Read each question and place an (X) under the column which applies best for you. Please answer each question very carefully. Thank you.

1=Always 2=Usually 3=Often 4=Sometimes 5=Rarely 6=Never

1. I eat sweets and carbohydrates without feeling nervous.

2. I think that my stomach is too big.

3. I wish that I could return to the security of childhood.

4. I eat when I am upset.

5. I stuff myself with food.

6. I wish that I could be younger.

7. I think about dieting.

8. I get frightened when my feelings are too strong.

9. I think that my thighs are too large.

10. I feel ineffective as a person.

11. I feel extremely guilty after overeating.

12. I think that my stomach is just the right size.

13. Only outstanding performance is good enough in my family.

14. The happiest time in life is when you are a child.
15. I am open about my feelings.
16. I am terrified of gaining weight.
17. I trust others.
18. I feel alone in the world.
19. I feel satisfied with the shape of my body.
20. I feel generally in control of things in my life.
21. I get confused about what emotion I am feeling.
22. I would rather be an adult than a child.
23. I can communicate with others easily.
24. I wish I were someone else.
25. I exaggerate or magnify the importance of weight.
26. I can clearly identify what emotion I am feeling.
27. I feel inadequate.
28. I have gone on eating binges where I have felt that I could not stop.
29. As a child, I tried very hard to avoid disappointing my parents and teachers.
30. I have close relationships.
31. I like the shape of my buttocks.
32. I am preoccupied with the desire to be thinner.
33. I don’t know what’s going on inside me.
34. I have trouble expressing my emotions to others.
35. The demands of adulthood are too great.
36. I hate being less than best at things.
37. I feel secure about myself.
38. I think about bingeing (overeating).
39. I feel happy that I am not a child anymore.
40. I get confused as to whether or not I am hungry.
41. I have a low opinion of myself.
42. I feel that I can achieve my standards.
43. My parents have expected excellence of me.
44. I worry that my feelings will get out of control.
45. I think my hips are too big.
46. I eat moderately in front of others and stuff myself when they’re gone.
47. I feel bloated after eating a small meal.
48. I feel that people are happiest when they are children.
49. If I gain a pound, I worry that I will keep gaining.
50. I feel that I am a worthwhile person.
51. When I am upset, I don’t know if I am sad, frightened or angry.
52. I feel that I must do things perfectly or not do them at all.
53. I have the thought of trying to vomit in order to lose weight.
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54. I need to keep people at a certain distance (feel uncomfortable if someone tries to get too close).

55. I think that my thighs are just the right size.

56. I feel empty inside (emotionally).

57. I can talk about personal thoughts or feelings.

58. The best years of your life are when you become an adult.

59. I think my buttocks are too large.

60. I have feelings I can’t quite identify.

61. I eat or drink in secrecy.

62. I think that my hips are just the right size.

63. I have extremely high goals.

64. When I am upset, I worry that I will start eating.

65. People I really like end up disappointing me.

66. I am ashamed of my human weaknesses.

67. Other people would say that I am emotionally unstable.

68. I would like to be in total control of my bodily urges.

69. I feel relaxed in most group situations.

70. I say things impulsively that I regret having said.

71. I go out of my way to experience pleasure.

72. I have to be careful of my tendency to abuse drugs.
73. I am outgoing with most people.
74. I feel trapped in relationships.
75. Self-denial makes me feel stronger spiritually.
76. People understand my real problems.
77. I can't get strange thoughts out of my head.
78. Eating for pleasure is a sign of moral weakness.
79. I am prone to outbursts of anger or rage.
80. I feel that people give me the credit I deserve.
81. I have to be careful of my tendency to abuse alcohol.
82. I believe that relaxing is simply a waste of time.
83. Others would say that I get irritated easily.
84. I feel like I am losing out everywhere.
85. I experience marked mood shifts.
86. I am embarrassed by my bodily urges.
87. I would rather spend time by myself than with others.
88. Suffering makes you a better person.
89. I know that people love me.
90. I feel like I must hurt myself or others.
91. I feel that I really know who I am.
Appendix H

Debriefing Form

Title of project: An Examination of Exercise Dependence and its Relation with Eating Pathology

Researcher: Dory Becker

Thank-you for participating in my study. As you may already know from my title, I am interested in gaining a better understanding of what exercise dependence is and how it is related to eating difficulties. Someone who is exercise dependent can be described as someone who exercises excessively (frequency and duration) and experiences withdrawal-like symptoms when prevented from exercising. As such, exercise often interferes with the social and occupational aspects of these individuals’ lives. Eating pathology is evidenced by a variety of behaviours and thoughts, including bingeing, purging, dieting, as well as a poor body image and self-concept. I have formulated a number of questions which I hope to be able to answer with the help of this study. I am interested in discovering the prevalence rate of exercise dependence in university females. I am hoping to explore behavioural, motivational, and cognitive differences between people who are exercise dependent, regular exercisers who are not dependent on exercise, and non-exercisers. I am also interested in finding out how many exercise dependent individuals also exhibit some form of eating pathology. I am hoping that these results will shed light on the relatively unexplored relationship between exercise habits and eating habits. Findings could have implications for the treatment and prevention of exercise dependence.

If you have any concerns about your own exercise and/or eating behaviour (or those of someone close to you), the following are the phone numbers of a few campus and community agencies which may be of service to you:

**University of Windsor Psychological Services Centre**  253-4232 ext. 7012

**University of Windsor Health Services Centre**  253-4232 ext. 7002

**The Bulimia and Anorexia Nervosa Society (BANA)**  253-7421
VITA AUCTORIS

Dory Becker was born in 1973 in Toronto, Ontario. She graduated from York Mills Collegiate Institute in 1992. From there she went on to study at York University where she obtained a B.A. in Psychology in 1997. She is currently working towards a Doctor of Philosophy in Clinical Psychology at the University of Windsor.