Competitiveness and addictive behaviors: exploring the role of competitiveness and gender in exercise dependence, disordered eating, and alcohol use

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COMPETITIVENESS AND ADDICTIVE BEHAVIORS: EXPLORING THE ROLE OF
COMPETITIVENESS AND GENDER IN EXERCISE DEPENDENCE, DISORDERED
EATING, AND ALCOHOL USE

by

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Competitiveness and Addictive Behaviors: Exploring the Role of Competitiveness and Gender in Exercise Dependence, Disordered Eating, and Alcohol Use

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Holly Serrao

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Abstract

The current study explored whether or not trait competitiveness existed as an underlying factor contributing to the higher rates of exercise dependence, disordered eating, and alcohol use among athletes. Additionally, the study examined whether certain gender differences occurred, such that the relationship between competitiveness and disordered eating would be stronger for female athletes, the relationship between competitiveness and alcohol use would be stronger for male athletes, and the relationship between competitiveness and exercise dependence would be gender neutral.

Data were collected on 286 athletically involved college students from four colleges in the Northeast. Participants were asked to complete a web-based survey that assessed degree of athletic involvement, level of competitiveness, exercise dependence, disordered eating, and alcohol use. Three separate univariate analyses of variance were performed with competitiveness as the predictor variable, exercise dependence, disordered eating, and alcohol use as the separate dependent variables, and gender as the moderator. The results revealed that, while female athletes did show higher rates of disordered eating and male athletes did exhibit greater alcohol use, gender did not moderate the relationship between competitiveness and either of these variables. Moreover, competitiveness was not found to be a significant main effect for disordered eating or alcohol use. Gender was, however, found to moderate the relationship between competitiveness and exercise dependence, with competitive female athletes exhibiting higher rates of this behavior than competitive male athletes.
Possible explanations for these findings lied in the smaller than desired sample size and the lack of variation in level of athletic involvement within the current sample. Implications for future research involve obtaining a larger and more varied sample, as well as exploring whether variables other than competitiveness may contribute to the gender differences and higher rates of disordered eating and alcohol use among athletes.
Chapter 1

Introduction

“Now-a-days people don’t get ill because of a lack of certain things, but because of an overabundance of them (Sjoberg, 2003, p. 267).” This statement conveys the impetus behind the proposed research. In today’s society, there appears to be an abundance of certain resources that previous generations found scarce. Consequently, a problem of increasing importance lies not in developing ways for people to attain such resources, but in limiting their intake of them (Sjoberg, 2003). Simply put, the more easily attainable certain substances and behaviors are, the more likely it will be for people to become dependent on them (Sjoberg, 2003). Three areas that are facing problems of dependency are exercise, food intake, and alcohol use (e.g. Adams & Kirkby, 2002; Hasin, Stinson, Ogburn, & Grant, 2007; Lucas, Beard, O’Fallon, & Kurland, 1991; Striegel-Moore, Silbersetein, Grunberg, & Rodin, 1990). With the means and resources for these behaviors becoming more readily accessible to a growing portion of the American population, the problem of developing three related conditions known as exercise dependence, disordered eating, and excessive alcohol use is becoming all the more common, especially among athletes (Blaydon & Lindner, 2002; Hausenblas & Carron, 1999; Hildebrand, Johnson, & Bogle, 2001; Johnson, 1994; Kobb, 2006; Leichliter, Meilman, Presley, & Cashin, 1998; Nelson & Wechsler, 2001). Moreover, these three behaviors are often found to co-occur (Greenberg, Lewis, & Dodd, 1999; Holderness, Brooks-Gunn, & Warren, 1994; Klein et al., 2004; Zmijewski & Howard, 2003). Because they can have dangerous physical and psychological repercussions, it is
important to understand their causes and to devise suitable methods of treatment for them.

One way to gain additional knowledge about the origins and causes of such behaviors is by determining an underlying predisposing factor. In this fashion, psychologists may be better able to understand, detect, and treat such disorders. The proposed study provides an attempt to uncover such a factor. It is hypothesized that trait competitiveness exists as a common denominator among all three forms of behavioral disorders. Studies illustrating the prevalence of competitive dispositions in both athletes as well as those suffering from the above mentioned disorders will be used to support such a supposition (e.g. Burckle, Ryckman, & Gold, 1999; Frederick, 2000). In other words, the current study proposes that the more competitive an individual is, the more likely she/he will be to develop exercise dependence, problematic alcohol use, and disordered eating. Thus, it could be that, when transferred to other areas of one’s life, the very competitiveness that propels an individual towards intense exercise and athletic competition can also predispose her/him towards developing unhealthy and obsessive behaviors. The goal of the current research is therefore to determine whether competitiveness exists as an underlying factor linking together this group of behaviors among athletes.
Chapter II

Literature Review

A review of the existent literature on each of these three disordered behaviors will be conducted, as well as proposed reasons for their overlap. Following this portion of the literature review, a description of competitiveness will be presented, specifically addressing how it will be operationally defined for the proposed study and why it is hypothesized to be an underlying factor among this behavioral cluster. Finally, implications for research and treatment will be supplied.

Exercise Dependence

Research shows that following a consistent exercise schedule can enhance an individual’s cognitive, physiological, and social functioning, thereby having a positive impact on her/his overall wellbeing (Shephard & Bouchard, 1994, Terry, Szabo, & Griffiths, 2004). Studies have also shown the positive effects that exercise can have in treating such conditions as depression, anxiety, obesity, and other health related concerns (Shephard & Bouchard, 1994; Terry et al., 2004). However, much of the research to date has neglected the cases in which exercise itself becomes the culprit, rather than the cure, of one’s personal ailments. When performed to an extreme degree, exercise can actually have many negative consequences and can even develop into an addiction (Adams & Kirkby, 2002; Aidman & Woolard, 2003; Bamber, Cockerill, & Carroll, 2000; Davis, 2000; Griffiths, 1997; Hausenblas & Downs, 2002a; O’Dea & Abraham, 2002; Pasman & Thompson, 1989). This negative form of exercise is known as exercise dependence and is said to occur when individuals take their exercise regime to an unhealthy level
participating in physical activities in excess of what is warranted or healthy (Adams & Kirkby, 2002).

This disorder is also commonly referred to as an “obsessive compulsion” to exercise or as an “exercise addiction” (Blaydon & Lindner, 2002), and individuals suffering from this condition have been described as, “…those who work out at the gym for hours at a time, those who always seem to be at the gym, and those who routinely cancel events with family, friends, and coworkers so that they can complete their strenuous workout routines” (Zmijewski & Howard, 2003, p.184). For these types of people, exercising becomes their top priority and therefore receives precedence over other important aspects of their lives. Because exercise dependence can have harmful effects and has been found to co-occur with other disordered behaviors (namely, disordered eating and alcohol use), a greater understanding of its origins and consequences is warranted (O’Dea & Abraham, 2002; Zmijewski & Howard, 2003).

Although it has not yet received a formal diagnosis in the Diagnostic and Statistical Manual-IV-R, exercise dependence does fit with many of the criteria that are used to diagnose substance and behavioral addictions (American Psychiatric Association, 2000; Ogden, Veale, & Summers, 1997). Among them are salience, which is said to occur when exercise begins to dominate one’s thoughts, feelings, and other behaviors; mood modification, otherwise known as the subjective feeling or “high” one derives upon performing a behavior; narrowing of one’s behavioral repertoire, thereby leading to a stereotyped pattern of exercise; subjective awareness of a compulsion to exercise; tolerance, which takes place when one requires increasing amounts of exercise to achieve the same physical and/or psychological rewards; withdrawal, or unpleasant feelings or
physical effects that arise should one stop her/his exercise routine; *conflicts*, which can be interpersonal, intrapersonal, or social; and finally *relapse or rapid reinstatement*, which represents the tendency to revert back to one’s previous level of exercise after stopping for a period of time (Griffiths, 1997). Thus, although exercise dependence does not yet appear in the DSM-IV-R, it can easily be translated to an addictive disorder based on the above-mentioned criteria.

Despite exercise’s addictive properties, there remains a dearth of literature on the topic. One reason for this apparent lack of recognition by the scientific community may lie in the fact that a precise physiological basis has not yet been uncovered, thereby making the disorder difficult to measure (Crabbe, 2002). However, there are theories that refute this claim and pinpoint specific physiological correlates for exercise dependence. According to some researchers, exercise does, in fact, stimulate certain brain regions such as the ventral tegmental area and the nucleus accumbens (Basson, 2001; Adams & Kirkby, 2002). The nucleus accumbens is the major target area of the mesolimbic dopaminergic reward pathway, which receives dopamine, and therefore stimulates reward. Research has found that exercises such as running can result in the release of high levels of endorphins, thereby increasing the amount of dopamine and producing feelings of euphoria (Adams & Kirkby, 2002; Pattison, 2005). Hence, engaging in vigorous exercises can, in a sense, result in experiencing a “natural high” (Cox & Orford, 2004; Pattison, 2005). Endorphins also work to manipulate serotonin levels, thereby resulting in effects similar to those caused by antidepressants (Pattison, 2005). This dual impact involving an increase in pleasant feelings and a decrease in unpleasant ones may help to explain exercise’s physically addictive tendencies.
Moreover, once the brain’s reward center has been activated in such a fashion, it becomes more sensitive to future increases of endorphin levels, thereby making the brain more susceptible to other types of rewards, such as drugs, alcohol, and more intense exercise that can stimulate it in a similar fashion (Beh, Mathers, & Holden 1996; Pattison, 2005; Werme, Lindholm, Thoren, Franck, & Brene, 2002). Hence, when a person refrains from exercising and the brain does not become stimulated in such a way, she/he may become more likely to engage in other addictive behaviors or to relapse back to the previous behavior. An experiment performed with Lewis rats (e.g. rats bred for addictive tendencies) supported such a theory. In this study, when rats that had previously been trained to run up to six miles per day were later prevented from running, they experienced brain activity similar to that which is experienced during withdrawal from cocaine, alcohol, morphine, or nicotine and became more likely to ingest ethanol (Werme et al., 2002). This study provides evidence that, like chemical addictions, exercise dependence does seem to have a physiological basis and therefore can have many addictive properties.

In addition to these physiological explanations, psychological reasons for exercise dependence have been uncovered as well. Research has shown that exercise has certain mood regulating properties that can promote addiction (Davis, 2000). Moderate amounts of exercise have been found to decrease depression, anxiety, neuroticism, and stress, as well as improve alertness and energy (Powers, Woody, & Sachs, 1999). In fact, Rosa, De Mello, Negrao, and DeSouza-Fromigoni (2004) found that after exercising, individuals showed significant declines in Profile of Mood State (POMS) trait-anxiety scores, with individuals in the exercise dependent group showing reductions in anger and total mood
disorders as well. Sedentary individuals showed little or no mood change. Other studies have supported these negative correlations between exercise and depression (Harris, Cronkite, & Moos, 2006; Martinsen, 2006). Research has also shown that the number of criteria met for exercise dependence is directly correlated to clinical anxiety (Klein et al., 2004). It could be that because exercise has been found to regulate anxiety levels, individuals suffering from anxiety may find relief from their symptoms once beginning an exercise routine. However, such individuals may then begin to depend upon and rely on exercise in order to manage their symptoms, thereby creating the possibility of becoming addicted to the very activity that was used to manage their anxiety. Thus, in addition to its physiological components, such negatively reinforcing psychological properties could be what motivate individuals to exercise at such extreme levels as well.

Athletes have been found to be particularly at risk for developing symptoms of exercise dependence (Blaydon & Lindner, 2002; Matthews, 1998; Pierce, McGowan, & Lynn, 1993; Veale, 1987; Yates, Edman, Crago, & Crowell, 2003). Blaydon and Lindner (2002) found that as athletic involvement increased (i.e. from amateur to professional athletes) so too did the severity of exercise dependent symptoms. Pierce et al. (1993) further demonstrated that rates of exercise dependence increase with level of athletic involvement. These researchers examined exercise addiction among a sample of ultra-marathoners, marathoners, 5K runners, and recreational runners and found that addiction scores were positively correlated with running intensity such that ultra-marathoners attained the highest addiction scores followed by marathoners, 5K runners, and recreational runners, respectively. Studies such as these provide evidence for the existence of exercise dependence among athletes. Despite these findings, the reasons
why athletes are prone to exercise dependence still remain largely unknown. The present study hypothesizes that competitiveness may exist as an underlying personality trait that predisposes athletes towards exercise dependence.

Although few gender differences for exercise dependence have been found, research has recently discovered that withdrawal symptoms from a lack of exercise occur more commonly in women. These symptoms included exercise cravings, feeling bloated, moodiness, depression, tenseness or restlessness, and anxiety (Zmijewski & Howard, 2003). Thus, although clear-cut data has not been obtained regarding differences in the prevalence of exercise dependence in women versus men, it does seem that women may suffer from more severe symptoms upon terminating their exercise routine. Studies have also shown that during adolescence, males and females engage in exercise for different reasons. In one study comparing males and females in an unstructured exercise setting, women claimed to adhere to exercise in order to enhance their feelings of self-worth and to improve their physical appearance more so than men did (Douthitt, 1994). In conjunction with these findings, Harter (1990) claims that physical appearance is perhaps the strongest consistent contributing factor for perceived global self-worth among women. Thus, although the number of men and women suffering from exercise dependence may be relatively equal, their reasons for engaging in such excessive exercise routines and the effects they experience when these routines are halted may be very different.

In sum, although it has not yet received a formal diagnosis in the DSM-IV-R, exercise dependence bears similar characteristics to those of other addictive behaviors. Furthermore, exercise dependence appears to be prevalent among those who are
athletically involved, with increasing levels of involvement indicating increasing rates of dependence. However, despite its prevalence, the underlying causes for this addiction still remain largely unknown (Adams & Kirkby, 2002; Aidman & Woolard, 2003). The goal of the present study is to therefore deepen our understanding of this disorder by exploring one possible underlying cause, as well as the possible reasons for its connection with athletic involvement.

**Disordered eating**

Research has clearly shown that individuals can develop problematic behaviors with respect to eating (Burckle et al., 1999; Hausenblas & Carron, 1999; Kobb, 2006; Sundgot-Borgen, 1993). Two common types of eating disorders are anorexia nervosa and bulimia nervosa, and a common reason cited for engaging in disordered eating for both men and women is dissatisfaction with one’s body (Keel, Baxter, Heatherton, & Joiner, 2007; Pritchar, Milligan, Elgin, Rush, & Shea, 2007; Rozin, Bauer, & Catanese, 2003). Anorexia Nervosa involves the refusal to maintain a normal body weight (e.g. greater than 15% below normal), intense fear of gaining weight, disturbed body image, significant weight loss, and amenorrhea in women (American Psychiatric Association, 2000; Estok & Rudy, 1996). Similar to the biological components of exercise dependence, anorexics have been found to demonstrate elevated levels of endorphins, thereby impacting their mood levels (De la Torre, 1995). Bulimia Nervosa is characterized by uncontrollable binging and purging, as well as an awareness of the abnormality of such a pattern. Bulimia also involves feelings of lacking control over one’s eating behavior, depressed mood, and self-deprecation (American Psychiatric Association, 2000). There is a third form of disordered eating that combines symptoms
of anorexia and bulimia nervosa. Eating Disorders Not Otherwise Specified (EDNOS) includes disordered eating patterns, such as restrictive eating, which do not meet the criteria for Anorexia or Bulimia Nervosa but retain certain characteristics of both disorders, such as abnormal compensatory behaviors to maintain a body weight and an unhealthy restriction of one’s diet without amenorrhea (American Psychiatric Association, 2000). Thus, while diagnosable, the behaviors associated with EDNOS may not appear as severe and/or obvious as the others.

Unlike exercise dependence, the rates of eating disorders show clear differences between men and women (Pritchard et al., 2007; Rozin et al., 2003). Although both genders claim to strive for a certain sociocultural ideal regarding body image, the body types being sought after are quite different (Cox & Orford, 2004). For boys, the ideal is a more muscular physique characterized by a large chest and shoulders and a slim waist. For girls, the ideal body is thin, and usually not as muscular (McCabe & Ricciardelli, 2004). These ideals become readily apparent for adolescents during their pubescent years. At the onset of puberty, females begin to experience certain bodily changes that can alter their physical appearance. Among them are an increase in body fat and broadening of the hips. Because both of these changes are in contrast to society’s ideal female physique, the onset of puberty can lead to greater body dissatisfaction in women, and subsequently an increased risk for disordered eating.

For males on the other hand, the onset of puberty is marked by an increase in muscle definition and shoulder width, both of which are viewed as being complementary to society’s ideal male physique (McCabe & Ricciardelli, 2004). During this time, boys are more likely to adopt strategies aimed at gaining muscle, such as taking food
supplements and adopting rigorous exercise routines, rather than engaging in strategies aimed at losing weight (McCabe & Ricciardelli, 2004). Even among overweight men, diet restriction is not known to be a common method of weight loss. Rather, men usually opt for athletic-based programs to lose weight (Wolfe & Smith, 2002). Hence, due to their natural bodily changes and society’s current ideals, females and males have been found to adopt different weight loss strategies, with women becoming more likely to restrict their diets and develop more disordered eating habits than their male counterparts (McCabe & Ricciardelli, 2004; Kobb, 2006; Zmijewski & Howard, 2003). Such high incidence rates for disordered eating habits among women have been found to extend into adulthood as well (Blaydon & Lindner, 2002; Tata, Fox, & Cooper, 2001).

Although eating disorders occur less frequently in men, recent studies have demonstrated that they are in fact present in that group. In a sample of college age men, three percent met clinical diagnosis for binge eating and self-induced vomiting, two percent met clinical diagnosis for bulimia nervosa, and nine percent reported at least some form of disordered eating. Out of this entire sample of male students, none had sought treatment for their eating concerns (O’Dea & Abraham, 2002). Moreover, studies suggest that athletic involvement may be a risk factor in disordered eating among males, such that the more athletically involved a man is, the greater chance he has for developing an eating disorder (Weltzin et al., 2005). Thus, although men may be less likely to develop eating disorders than women, disordered eating among male athletes does occur. Furthermore, men displaying signs of eating disorders are also less likely to seek treatment, thereby making the situation quite dangerous (Striegel-Moore, Leslie, Petrill, Garvin, & Rosenheck, 2000).
As previously alluded to, studies have also shown that a higher percentage of athletes, compared to non-athletes, exhibit eating disorder symptoms (Blaydon & Lindner, 2002; Estok & Rudy, 1996; Hausenblas & Carron, 1999; Hays, 1999; Kobb, 2006; Petrie, 1996; Petrie & Rogers, 2001; Smolak, Murnen, & Ruble, 2000; Sundgot-Borgen, 1993). Hausenblas and Carron (1999) for example performed a meta-analysis of 92 studies and found small but significant effect sizes, which ranged from $d = -.01$ to $d = .30$ with an overall aggregated effect size of $d = .12$ ($SD = .22$, $p < .05$), when comparing both male and female athletes to non-athletes with respect to bulimia and anorexia indices. Smolak et al. (2000) performed a meta-analysis of 34 studies to determine the relationship between athletic participation and eating problems in females only; their findings further confirmed that athletes suffered from eating problems more often than non-athletes both in the general population ($d = .07$, $z = 2.09$, $p < .01$) and among college students ($d = .15$, $z = 5.29$, $p < .001$). Moreover, when disordered eating occurs in athletes, the effects can be extremely damaging. Because of the physical stress placed on their bodies by sports alone, athletes require the proper amounts of nutrients to remain healthy and to perform at peak physical condition (Kobb, 2006). By severely restricting their diets, athletes are at greater risk for a host of physiological symptoms including loss in bone mass, stress fractures, spine curvatures, osteoporosis, and even death (Kobb, 2006).

In addition to the high incidence rates for athletes in general, female athletes in particular have been found to show greater weight concern and a greater desire for weight reduction, as well as a greater risk of developing disordered eating than both their male counterparts and their non-athletic peers (Hinton & Kubas, 2005; Petrie, 1996; Sundgot-
Borgen, 1993). In fact, research has found that the percentage of female athletes with eating disorders nearly doubles that of males (Blaydon & Lindner, 2002). A recent study determined five distinct factors that were found to predict the occurrence of disordered eating among female athletes. These factors include a drive for thinness and performance, societal pressure on eating, performance perfection, social pressure on body shape, and team influences (Hinton & Kubas, 2005). Hence, there do seem to be significant societal pressures on women to adhere to thin body shapes, and the subjective experience of these pressures appears to be a precursor for eating disorders in female athletes (Weinberg & Gould, 2003). Because of these dangerous repercussions, both for male and female athletes, a deeper understanding of the causes of disordered eating, especially among athletes, is warranted.

_Problematic alcohol use_

The final behavior making up this cluster is alcohol use. As with exercise dependence and disordered eating, alcohol use has been found to occur at higher rates among athletes than among non-athletes (Grossbard, Geisner, Neighbors, Kilmer, & Larimer, 2007; Hildebrand et al., 2001; Leichliter et al., 1998; Martens, Dams-O’Conner, & Beck, 2006; Nelson & Wechsler, 2001; Wechsler, Davenport, Dowdall, Grossman, & Zanakos, 1997). Because alcohol use has become a problem of increasing severity, especially among athletes, a great deal of research has been devoted to determining its incidence rates. One study by Wechsler et al. (1997) compared the drinking habits of 17,251 athletes and non-athletes from 140 colleges and discovered that rates of binge drinking were higher for students who were more involved in athletics. For men, 61% of those involved in athletics reported binge drinking, as compared with 55% of those who
reported being only somewhat involved, and 43% of those who were not involved. Trends were similar for women with 50% of those involved in athletics reporting binge drinking, compared to 46% of those somewhat involved, and 36% of those who were not involved. Leichliter et al. (1998) performed a study examining the drinking behaviors of 51,483 students from 125 institutions, and results also revealed that male and female college athletes consumed more alcohol than their non-athlete counterparts. These two large-scale national studies suggest that the rates of alcohol abuse increase with athletic involvement such that, the more athletically involved one is, the more likely she/he is to engage in problematic alcohol use.

Smaller-scale studies have substantiated this evidence as well. Hildebrand et al. (2001) compiled data from 1,287 students at one Southeastern university and found that college athletes and former high school athletes abused alcohol and engaged in more alcohol-related risk behaviors than non-athletes, and Grossbard et al. (2007) found that intramural athletes at a large West Coast college campus consumed significantly more drinks per week, had higher typical and peak blood alcohol concentration levels, and reported significantly more negative alcohol-related consequences than non-athletes. In sum, the research clearly indicates that individuals participating in college athletics drink more than other students. Thus, understanding factors that predict such use in this group is warranted.

Although research has consistently found that athletes engage in drinking more often than non-athletes, the reasons for these findings are less clear. Some posit that American society’s strong ties between alcohol and sports are to blame (Crompton, 1993; Leichlter et al., 1998). One need only to watch a televised sporting event or attend a live
sport competition to view the many commercial advertisements presented for alcoholic beverages in order to obtain evidence for this supposition. Beyond this, alcohol can serve as a means of both celebration and consolation following sporting events. Thus, regardless of whether a team has won or lost, alcohol is often an integral component of any sport competition. Therefore, rather than serving as a protective factor against alcohol abuse, heavy sport involvement may actually increase an individual’s use of alcohol.

In addition to these societal influences, some posit that there may also be unique aspects of an athlete’s personality that predispose her/him to engage in abusive drinking (e.g., Fischer, Anderson, & Smith., 2004; Sher, Bartholow, & Wood, 2000); it could be that some of these traits are the same as those that attract her/him to athletics and exercise as well. Competitiveness may be one such personality trait. In other words, although competitiveness may be responsible for an individual becoming affiliated with and succeeding in athletics, it may also be related to excessive alcohol use (Martens et al., 2006). Drinking games present one such example of the strong ties between competitiveness and alcohol use. Researchers have speculated that drinking games simulate actual athletic competition in that they consist of teams, winners, losers, and spectators (Zamboanga, Calvert, O’Riordan, McCollum, 2007). In fact, studies have found that competitiveness is often cited as a main reason for participating in these games (Johnson & Sheets, 2004; Zamboanga et al., 2007). Grossbard et al. (2007) have also found that participation in drinking games is related to greater alcohol consumption among the student athlete population. Hence, while athletes may demonstrate their competitiveness on the playing fields, they may also express such competitiveness in
their drinking behaviors, such as in the case of drinking-related games. These drinking games could contribute to increased alcohol consumption among this population.

Like restrictive eating, alcohol abuse has demonstrated clear gender differences. Studies have consistently found that males drink more than females (Nelson & Wechsler, 2001; Wechsler et al., 1997). Athletically involved men have also been found to engage in more binge, or heavy episodic, drinking than athletically involved females (Leichliter et al., 1998). Based on these findings, it is logical to assume that society may endorse or accept male drinking more so than female drinking. Rutledge and Sher (2001) agree with the proposition that cultural norms are more supportive of male drinking. They suggest that in contemporary society male drinking is promoted more strongly in the media and therefore is more widely accepted. Weinberg and Gould (2003) cite peer pressure and a desire to adhere to stereotypical “macho” male behavior as possible reasons for gender differences in alcohol use. Society’s body image norms may also be partially to blame. Because drinking heavy quantities of alcohol can be counteractive to attaining a thin physique, females may actually be deterred from this behavior more so than men would. Thus, it may be more common for athletically involved men rather than women to demonstrate their competitiveness via drinking-related activities.

To summarize, heavy alcohol use has been found to occur frequently among athletes. Moreover, it has been determined that male athletes engage in this type of drinking behavior more commonly than non-athletes and female athletes. The goal of the present study is to elucidate the reasons for the relationship between drinking and athletic involvement, as well as between drinking, exercise dependence, disordered eating, and
athletic involvement, so as to better understand their co-occurrence and relationship to athletics.

Co-occurrence of exercise dependence, disordered eating, and alcohol use

Recent studies have found evidence for the existence of functional similarities between substance-related and other addictive behaviors at the biological, psychological, and social levels (Christo et al., 2003). The current study proposes that exercise dependence, disordered eating, and problematic drinking are three behaviors with such functional similarities. Research has shown that decreases in a target addictive behavior may be associated with increases in an associated addictive behavior, which can lead to a new, or double-addiction (Christo et al., 2003). Hence, rather than simply treating the presenting addiction, researchers and clinicians should aim at uncovering and treating the underlying reasons behind these overlapping addictions.

A commonly-cited example of a “double-addiction” is that of exercise dependence and disordered eating. Zmijewski and Howard (2003) found significant correlations between the Exercise Dependence Questionnaire (EDQ) and the Dieting ($r = .52, p < .01$) and Bulimia and Food Preoccupation ($r = .41, p < .01$) subscales of the Eating Attitudes Test (EAT). A related study demonstrated correlations between running intensity and disordered eating with high-intensity runners scoring higher on eating disorder measures than medium-intensity, low-intensity, and non-runners (Estok & Rudy, 1996). Excessive exercise has also been found to be a common occurrence in those suffering specifically from anorexia nervosa, with one particular study finding that 48% of women with anorexia showed symptoms of exercise dependence (Klein et al., 2004). Finally, Exercise Fixation (a sub-factor of the Obligatory Exercise Questionnaire;
Thompson & Pasman, 1991) has been found to demonstrate strong positive correlations with the Eating Disorders Inventory-2 (EDI-2; Garner, 1991) further demonstrating a link between exercise dependence and disordered eating (Ackard, Brehm, & Steffen, 2002). Positive correlations have been demonstrated between the use of alcohol and these disorders as well (Piran & Robinson, 2006). With respect to disordered eating, research has shown that women diagnosed specifically with either anorexia nervosa or bulimia nervosa demonstrated a greater risk for developing alcohol use disorders than non-symptomatic women (Franko et al., 2005). Anderson, Simmons, Martens, Ferrier, and Sheehy (2006) have also demonstrated significant correlations between the EAT and all of the Drinking Motives Measures (DMM; Cooper, Russell, Skinner, & Windle, 1992; Cooper, 1994) subscales. Research has further shown that women with eating disorders are more likely to experience alcohol-related problems, such as neglecting one’s responsibilities and feeling physically or psychologically dependent, than those without eating disorders (Dunn, Larimer, & Neighbors, 2002). Even women who did not meet clinical diagnosis for disordered eating, but still engaged in sub-clinical weight loss behaviors (e.g. purging) were found to drink more alcohol and experience more alcohol-related negative consequences than non-symptomatic women (Anderson, Martens, & Cimini, 2005).

With regards to the relationship between exercise dependence and alcohol use, Greenberg et al. (1999) have demonstrated significant correlations between these two behaviors in college students ($r = .09, p < .01$). Martin, Serrao, Rocha, Eisenberg, and Martens (2007) also demonstrated that three EDQ subscales (e.g. Exercise for Weight Control, Positive Reinforcement, and Stereotyped Behavior) were significantly related to
the number of drinks ingested per week ($r = .15, p < .01; r = .13, p < .05$; and $r = .13, p < .05$, respectively). These studies provide evidence for the claim that exercise may have cross-sensitization properties with alcohol.

Thus, there appear to be clear empirical connections between exercise dependence, disordered eating, and problematic drinking. In addition, there appear to be positive correlations between athletic involvement and this group of disordered behaviors. Finally, the prevalence of two of these disorders (e.g. disordered eating and alcohol use) appears to differ between men and women. However, the reasons for the co-occurrence of such behaviors, along with their relationship to athletic involvement and apparent gender differences, still remain unclear. Grilo, Sinha, and O’Mally (2002) suggest that such co-occurrences could indicate the possibility of common or shared factors in the etiology of such problems. The goal of the current study is to therefore discern a common factor among such disordered behaviors which can help to explain, not only their co-occurrence, but their relationship to athletics and gender as well. It is hypothesized that competitiveness exists as such a factor.

**Competitiveness**

It has been said that competitiveness “…contribute[s] to optimal performance through increased effort, intensity, and perseverance towards [race] goals (Martín & Ecklund, 1994, p. 263).” Consequently, a certain degree of competitiveness should be conducive and even necessary for athletic participation. In fact, in a qualitative study in which 10 NCAA Division I coaches were interviewed, high levels of competitiveness were noted as being the most important factor responsible for an athlete’s progress (Giacobbi, Roper, Whitney, & Butryn, 2002). Another study performed by Gould,
Dieffenbach, and Moffett (2002) found that competitiveness was one of the most common characteristics among Olympic champions. However, the current study proposes that while a high level of competitiveness can be helpful when applied to sport performance, it may be detrimental when translated to other areas of life, such as exercise, eating, and alcohol use.

The current study will be looking at the relationship between competitiveness and disordered behaviors a sample of college students who are athletically involved. Hence, there must be reason to justify the proposition that, within the athlete population, increased levels of competitiveness can lead to increased levels of exercise dependence, disordered eating, and alcohol use. Past research has elucidated the differences between levels of competitiveness in athlete and non-athlete populations (e.g. Caron, William, & Stacy, 1997; Gill, Dzewaltowski, & Deeter, 1988). Such research has continually demonstrated that athletes show higher levels of trait competitiveness than non-athletes. For example, competitiveness scores have been found to be the strongest discriminators between competitive sport participants and non-participants (Gill et al., 1988). Finkenberg and Moode (1996) further demonstrated that athletes more so than non-athletes viewed sports as a means of enhancing their levels of competitiveness. However, because the current study will be focusing on the student-athlete population alone, evidence for differences in levels of competitiveness within groups of athletes, as well as evidence for increased levels of competitiveness among those with disordered behaviors, will be cited as justification for the current study’s hypothesis.
Competitiveness Defined

For the current study, competitiveness will be operationally defined as “striving to increase or maintain one’s level of capability in all activities in which a standard of excellence is thought to exist and where the execution of such activities can either succeed or fail” (Hackhausen, 1967 as cited in Fabian & Ross, 1979, p.16). Such a definition can be applied to exercise dependence, disordered eating, and problematic alcohol use, thereby qualifying them as competitive behaviors. First, for each of these behaviors, it seems that a certain standard of excellence is striven for. In terms of exercise dependence, a desire to exercise the longest and hardest, as well as to achieve a desired body weight may be the goal. In the case of disordered eating, it seems that society usually sets the standard for an ideal body image, resulting in individuals unhealthily restricting their diet to achieve this standard. Finally, with respect to alcohol use, standards concerning the amount of alcohol to drink and the speed with which to drink it are often attempted to be upheld, especially when drinking-related games and competitions are taken into consideration (Grossbard et al., 2007). Additionally, for each of these behaviors, it is possible that an individual can either succeed or fail at achieving the respective standard. For example, she/he can attain or fall short of one’s desired exercise goals, achieve or fail to achieve her/his desired weight, and win or lose a drinking-related competition. Each of these examples can be used to justify the inclusion of exercise dependence, disordered eating, and alcohol use as competitive activities.

Relationship between competitiveness and athletic involvement

Although research has not yet examined the relationship between competitiveness and this particular group of disordered behaviors among athletes, studies have shown that
rates of competitiveness increase with increased athletic involvement (e.g. Gill, Williams, Dowd, Beaudoin, & Martin, 1996; Wartenberg & McCutcheon, 1998). Gill et al. (1996) found that competitive college athletes scored higher on measures of competitiveness than did adult recreational athletes (e.g. running club members, exercise class participants, senior game participants, and members of a cardiac rehabilitation program) who in turn scored higher than college non-athletes. Wartenberg and McCutcheon (1998) compared hockey players to hockey fans and found differences between the two groups in terms of SOQ scores. Although both groups of people could be classified as being athletically involved, the actual sport participants (i.e. the hockey players) can be thought of as demonstrating greater athletic involvement than the sport fans. Results showed that the hockey players had higher levels of competitiveness than the fans, providing further support for the idea that level of athletic involvement and competitiveness are positively correlated.

Relationship between competitiveness and variables related to athletic involvement

Associations have also been found between different levels of athletic involvement and certain variables that may be related to competitiveness among the athlete population. Competitiveness has been said to “…reflect the degree to which the general achievement motive is directed to sport (Martin & Ecklund, 1994, p. 264).” It can be logical to assume that if one’s goals are more directed toward sport, then she/he would devote more energy to sports and subsequently become more athletically involved as well. Hence, it seems probable that trait competitiveness would have positive correlations with increased athletic involvement. Additionally, if increasing levels of athletic involvement and goal-directed behavior result in a greater amount of energy
being dedicated to sport performance, it would make sense for athletic involvement, and hence competitiveness, to be associated with greater interest and better sport performance as well. Research by Martin and Ecklund (1994) shows support for the relationship between competitiveness and performance success within an athletic population. These researchers found that faster runners were more competitive than slower runners. The researchers posit that faster runners are more goal-directed and seek out more competitive races than the slower runners; therefore, it may be logical to assume that they may devote more time and energy to their sport and hence, be more competitive and athletically involved than the slower runners. This study can therefore be used to depict the possible relationship between competitiveness, athletic involvement, and performance.

Frederick-Recascino and Schuster-Smith (2003) examined the relationship between competitiveness and interest/energy devoted to sport. They studied a sample of bicycle racers and fitness exercisers and found that sport competitiveness was associated with interest and enjoyment, as well as the amount of exercise engaged in (i.e. energy devoted to exercise). Again, it seems logical to assume that those who are more interested in and find more enjoyment in exercise would engage in more exercise and hence be more athletically involved as well. Since competitiveness was related to interest and energy devotion, and interest and energy devotion can signify greater athletic involvement, it is once again logical to assume that, among athletes, competitiveness is related to increased levels of athletic involvement. The above research therefore lends support to the idea that the more athletically involved one is, the more competitive she/he is and consequently, the more energy, interest, and possibly enjoyment, one may attain from and devote to exercising. Therefore, degrees of competitiveness may fluctuate not
only between athletes and non-athletes, but also within the athletic population according to one’s level of athletic involvement.

Relationship between competitiveness and disordered behaviors

As previously noted, associations have been found between competitiveness and disordered eating (Blaydon & Lindner, 2002; Burckle et al., 1999; Kobb, 2006; Striegel-Moore et al., 1990) and competitiveness and alcohol use (Hildebrand et al., 2001; Martens et al., 2006; Serrao, Martens, Rocha, & Martin, 2007). In terms of disordered eating, Striegel-Moore et al. (1990) found that women with eating disorders scored higher on competitiveness than non-symptomatic women. Faer, Hendriks, Abed, and Figueredo (2005) provide evidence for the idea that disordered eating in females may actually arise from high levels of intrasexual competitiveness with regards to mates and status. It therefore seems as though a relationship exists between competitiveness and disordered eating such that, the more competitive one’s personality is, the more likely she/he is to develop disordered eating symptoms.

In terms of alcohol use, Zamboanga et al. (2007) found that female college students cited competitiveness as one of the main motives for engaging in drinking-games. Furthermore, this motive was found to be positively correlated to intoxication level among the students. Grossbard et al. (2007) extended the research on drinking game participation among athletes and found that participation in drinking-related games served as a mediator between athletic status and measures of consumption and consequences of alcohol use. Grossbard et al. (2007) further highlights the many similarities that exist between drinking games and athletic competitions, such as the performance of motor skills, the necessity of good hand-eye coordination, and a “team
oriented” atmosphere. Johnson and Sheets (2004) looked at personality factors associated with participation in drinking games and found the “desire for competition and thrills” to be among the main motivating factors, as well as the mediator between involvement in drinking games and greater alcohol consumption and negative consequences. Hence, it could be that athletes engage in drinking games due in part to their high levels of trait competitiveness as well as to the games’ resemblance to actual sport competitions. This participation could then be partially to blame for the higher levels of alcohol use and negative alcohol-related consequences experienced among athletes.

Unlike disordered eating and problematic alcohol use, research has not specifically looked at trait competitiveness in relation exercise dependence. Although there is no published research to date examining this relationship, it is plausible that the two factors are related. As previously noted, athletic involvement has been found to be positively correlated with level of competitiveness, and evidence has been found for positive correlations between athletic involvement and exercise dependence (Blaydon & Lindner, 2002; Hausenblas & Downs, 2002a; Pierce et al., 1993). It would therefore seem logical that since athletes are more competitive than non-athletes and have also been found to demonstrate high levels of exercise dependence, then exercise dependence and competitiveness may be correlated as well. Furthermore, individuals who are dependent on exercise demonstrate the compulsion to exercise harder, faster, and longer than either they have previously done or than others have done before (Fabian and Ross, 1979). This intense need to continuously outperform in some way their own or other’s previous level of exercise insinuates a competitive drive. Thus, while existent literature
has not thoroughly examined this relationship, there is reason to believe that, like
disordered eating and problematic alcohol use, exercise dependence is also positively
correlated with trait competitiveness.

Relationship between competitiveness, disordered behaviors, and athletic involvement

In sum, research has found that levels of competitiveness can vary within the
athletic population such that the more athletically involved one is the more competitive
she/he will be. Research has also found that competitiveness is correlated with both
disordered eating and alcohol use, and there is reason to believe that it is correlated with
exercise dependence as well. Furthermore, research has shown that these disorders occur
more frequently among athletes than non-athletes. There is therefore evidence to assume
that, because competitiveness is correlated with athletic involvement and disordered
behaviors, and because these disordered behaviors occur frequently among athletes,
higher levels of competitiveness can be related to higher rates of disordered behaviors
among the athletic population. The hypothesis of the current study is that higher rates of
exercise dependence, disordered eating, and excessive drinking among athletes may be
due to an underlying level of competitiveness that, while suitable for the athletic
environment, may not be conducive to other life domains.

Gender differences in competitiveness

As is the case with excessive exercise, restrictive eating, and binge drinking,
specific gender differences have been found in terms of competitiveness. As Tesser’s
(1985) self-evaluation maintenance model posits, “…[we] engage in social comparisons
to evaluate, enhance, verify, and improve ourselves…[and] the need for social
comparison information is especially strong in situations that emphasize competition”
In today’s society, men and women may have different standards of social comparison. These different means of evaluation can result in men and women adopting different methods to “enhance, verify, and improve” themselves. Kagen and Moss (1960) further corroborate this view. They propose a developmental view of competitiveness, claiming that from the time of birth all children learn to be competitive for adaptive reasons. However, as one grows older, competition evolves from achievement to aggression and finally to more socially acceptable behavior (Fabian & Ross, 1979).

Because men and women differ with respect to certain socially acceptable behaviors, competitiveness can eventually manifest itself differently between the two genders. As a result, men and women may engage in different types of behaviors in order to prove their self-worth. The current study posits that while highly competitive men and women will be equally as likely to engage in excessive exercise, competitive women will be more likely to develop disordered eating patterns and competitive men will be more likely to partake in problematic alcohol use. Societal norms and values will be discussed as possible reasons for such a distinction.

A study by Lynn (1993) provides evidence for society’s influence on the different behaviors adopted by competitive men and women. Lynn surveyed men and women from 20 different countries and found that with regards to money, men were generally more competitive in nature than women. He surmises that the reason for such a difference was due in part to societal norms that reinforce men for earning money more so than they do for women. The proposed study posits that the same trend will hold true for alcohol use and disordered eating. In American society, alcohol use has strong ties to
athletic participation (Martens et al., 2006). Consequently, for athletes, competitiveness becomes apparent not only on the playing field, but in situations that involve alcohol intake. In our society, “binge drinking” and “being able to hold one’s liquor” are often viewed as sources of male pride (Weinberg & Gould, 2003). Thus, it is logical to assume that alcohol use among athletically involved men is more acceptable than among women.

Although both men and women in our society experience the pressure to drink, females experience an increasing pressure to be thin as well. Some posit that appearance, rather than accomplishment, is used to demonstrate success and desirability among women. Consequently, physical appearance can often become a source of competition among females (Brownmiller, 1985 as cited in Burckle et al., 1999). In fact, physical appearance has been cited as one of the most common domains of competitiveness among women (Burckle et al., 1999). In a society that values thinness, it would therefore make sense for disordered eating to be more prevalent among competitive women. Moreover, research has shown that these pressures begin to exert their influence as early as one’s adolescent years. Studies have shown that whereas adolescent girls engage in problematic behaviors in order to remain slim or lose weight, pubertal boys demonstrate the desire to build muscle and even gain weight (McCabe & Ricciardelli, 2004). Consequently, it could be that women would become more prone to a combination of exercise dependence and disordered eating in order to achieve such thinness, while men would be more likely to become involved in excessive exercise alone, and not disordered eating, in order to achieve a more muscular physique.

Yates et al. (2003) provided evidence for this assumption by finding that competitive female athletes obtained higher scores than men on self-loathing items that
were specifically related to body image concerns. Hence, for female athletes intense competitiveness may become transferred from the playing field to body image concerns. Consequently, in order to achieve their desired body weight and to appear thinner and more toned than others, restrictive eating and excessive exercise may occur. Because society does not place as much pressure on men to be thin, they may not be as likely to develop symptoms of disordered eating. They could, however, be equally as likely to demonstrate exercise dependence due to exercise’s ability to enhance muscle growth, which is conducive to their ideal physique (Cox & Orford, 2004). This assumption also provides evidence for the idea that female athletes, although known to drink more than female non-athletes, would be less prone to engage in binge drinking than male athletes. Because of the high caloric consumption it incurs, excessive drinking can result in significant weight gain, thereby being counterproductive to a female’s body image goals.

Hence, due to society’s divergent gender norms, competitiveness can reveal itself in different ways for men and women. For females, intense competitiveness may be more likely to become manifested in behaviors such as disordered eating and exercise dependence (Burckle et al., 1999). For men on the other hand, this same level of competitiveness would be more likely to be exhibited through a combination of heavy drinking and excessive exercise. Thus, while individuals may seek out and excel at athletics due, in part, to their high degree of competitiveness, this intense competitiveness may have severe negative impacts on other areas of their lives. When translated to body image concerns, non-competitive exercise, and alcohol use, the effects of such competitiveness can become detrimental and result in addictive behaviors such as exercise dependence, disordered eating, and heavy alcohol use. Competitiveness can
therefore become looked upon as a double edge sword – healthy and promoted in some respects, yet dangerous and shunned in others.

Hypothesis

The above research has consistently shown that athletes tend to engage in more alcohol use than non-athletes, with males consistently drinking more than females overall (Hildebrand et al., 2001; Leichliter et al., 1998). Studies have also shown that athletes tend to engage in more disordered eating than non-athletes (Blaydon & Lindner, 2002; Estok & Rudy, 1996), with females in this case being more prone to eating disorders than males (Blaydon & Lindner, 2002; Estok & Rudy, 1996; Zmijewski & Howard, 2003). Finally, research has shown that athletes are more likely to become exercise dependent than non-athletes (Blaydon & Lindner, 2002), without demonstrating significant gender differences in prevalence rates. Furthermore, exercise dependence, eating disorders, and alcohol use are often found to co-occur among athletes and non-athletes alike (Greenberg, et al., 1999). Uncovering an underlying link between these three disorders, as well as for their relationship with athletic involvement, could help researchers and clinicians to further understand, identify, and treat individuals suffering from such disordered behaviors.

The current study proposes that trait competitiveness exists as an underlying link behind these disorders, such that the more competitive an individual is the more likely she/he will be to engage in disordered eating, alcohol use, and excessive exercise. Hence, a competitive disposition, which could be a factor responsible for peoples’ attraction to and success at athletics may also, in its extreme form, be responsible for the occurrence of such addictive behaviors. It is further proposed that such relationships will differ for
males and females. The present research hypothesizes that for females the relationship between competitiveness and eating disorders will be stronger, and for males the relationship between competitiveness and alcohol use will be stronger. The relationship between competitiveness and exercise dependence is proposed to be gender neutral such that no specific differences are expected to be found between the rates of exercise dependence in men versus women (see Figure 1).

Figure 1: Proposed Relationships among Study Variables
Design

Three separate univariate analyses were used to demonstrate whether competitiveness predicts exercise dependence, disordered eating, and alcohol use, as well as whether or not gender moderates the relationship between these variables. Three separate regression equations were solved using exercise dependence, disordered eating, and problematic alcohol use as the dependent variables, respectively. In each equation, the predictor variables were competitiveness, gender, and their interaction.

Equation 1: $y_{\text{exercise dependence}} = A + b_1_{\text{gender}} + b_2_{\text{competitiveness}} + b_3_{\text{gender*competitiveness}}$

Equation 2: $y_{\text{disordered eating}} = A + b_1_{\text{gender}} + b_2_{\text{competitiveness}} + b_3_{\text{gender*competitiveness}}$

Equation 3: $y_{\text{alcohol use}} = A + b_1_{\text{gender}} + b_2_{\text{competitiveness}} + b_3_{\text{gender*competitiveness}}$

Competitiveness, along with all three dependent variables were continuous in nature, whereas gender was categorical. If the model is supported, significant positive correlations should be attained between the dependent and predictor variables for all three equations. However, the regression lines were predicted to differ with respect to gender. For disordered eating, it was predicted that females would demonstrate a steeper slope than males. For alcohol use, it was hypothesized that males would show a steeper slope than females. For exercise dependence, the slope for males and females was not predicted to differ significantly, as denoted by the single line in Figure 1.

Huberty and Morris (1989) justify the use of a single variable, univariate design for the given study for several reasons. First, each of the dependent variables was conceptually independent from one another, and therefore different models were hypothesized to occur for each equation. Although exercise dependence, disordered
eating, and binge drinking have frequently been found to co-occur, the current study proposed that the interaction between gender and competitiveness would affect each dependent variable in a different way. Thus, it was not the goal of the present study to determine if fewer outcome variables could be chosen to base the interpretation on, as is often the goal of MANOVA (Huberty & Morris, 1989). Rather, the aim was to compare the different patterns of results for each of the dependent variables.

Secondly, each of the outcome variables has previously been studied in univariate contexts, a criterion which rules out the possibility of a MANOVA test (Huberty & Morris, 1989). In other words, relationships between gender and certain forms of competitiveness with exercise dependence, disordered eating, and alcohol use have previously been supported separately. However, research has not yet elucidated the relationship between the interaction of gender and competitiveness with each of these outcome variables. The current study proposed that such an interaction would result in a different pattern of results for each dependent variable and would differ from the effects of each independent variable tested in isolation. For each regression equation, the interaction between competitiveness and gender was tested first; if the interaction was not found to be significant, each independent variable was then tested separately.

Participants

Participants in the proposed study were made up of 284 college students from four colleges in the Northeastern United States who are athletically involved. Power analysis suggested a sample size of 335 participants, and data were collected on 369 students. However, 85 participants were omitted from the final analysis because they did not meet certain inclusion criterion.
In order to attain a sample of athletes with a wide range of athletic abilities and exercise levels, students were recruited from intramural sport teams and varsity sport teams. Inclusion criteria consisted of college students between the ages of 18 and 25 who are athletically involved. Participants were excluded if they fell outside this age range or indicated that they “do not exercise” on the question pertaining to athletic status.

**Demographic Statistics.** The final sample consisted of 146 males (51.4%) and 138 females (48.6%) participating in this study. Participants ranged from 17 years of age to 25 years of age, with a mean age of 20. There were 239 Caucasian participants (84.8%), 17 African American participants (6%), 9 Asian/Pacific participants (3.2%), and 11 Hispanic participants (3.9%). Six participants (2.1%) categorized themselves as “other,” with five of them listing their exact origins as follows - Puerto Rican/African American, Hispanic/African American, “mixed,” Portuguese, and White/Korean. Fifty-eight (20.4%) of the participants were freshman, 76 (26.8%) were sophomores, 75 (26.4%) were juniors, 65 (22.9%) were seniors, and 10 (3.5%) listed themselves as “other” (i.e. alumni, non-matriculated student, etc.).

In terms of athletic status, 22 (7.7%) were elite athletes competing at the national or international level, 172 (60.6%) were varsity athletes, 16 (5.6%) were recreational athletes playing club sports, 55 (19.4%) were recreational athletes playing on intramural or other organized team sports, 4 (1.4%) were recreational athletes participating in informal competition, 2 (.7%) participated in sports during high school, 10 (3.5%) exercised regularly, and 3 (1.1%) exercised occasionally. No participants categorized themselves as not exercising at all. Despite the differences in how some of the
participants chose to categorize themselves, all of these students were participating in either a varsity sport or intramural or club sport team at the collegiate level.

*Power Analysis.* The sample size (N = 335) for this study was chosen to provide a power of the test statistic at or above 80%. In order to achieve the necessary sample size, Cohen’s (1992) methods for power analysis were performed. No studies exist that have directly evaluated the relationship between each of the dependent variables (exercise dependence, disordered eating, and problematic drinking) with respect to competitiveness and gender. However, recent literature has explored similar relationships and can therefore be used to obtain an estimate of the effect size that could be anticipated in the proposed study.

With regards to exercise dependence, findings regarding gender differences have varied; however, the majority of past research has reported no significant gender differences in terms of this disorder (Furst & Germone, 1993; Greenberg et al., 1999; Tata et al., 2001; Terry et al., 2004; Zmijewski & Howard, 2003). Zmijewski and Howard (2003) did however find that women scored higher than men on the “exercise for weight control and health reasons” subscales ($r^2 = .026, p < .05$). Although no studies to date have looked at the relationship between competitiveness and exercise dependence, there are studies that have examined the effects of level of athletic involvement on this disorder. For example, Blaydon and Lindner (2002) found that level of athletic involvement was significantly correlated with EDQ scores ($r^2 = .04, p = .014$). Although conceptually distinct, studies have shown that competitiveness and athletic involvement are associated with each other (Finkenberg & Moode, 1996; Gill et al., 1988; Gill et al., 1996; Wartenberg & McCutcheon, 1998).
In terms of disordered eating, gender differences have been found to exist, with females consistently demonstrating significantly higher rates of eating disorder symptoms than males. Zmijewski and Howard (2003) demonstrated that women’s scores were higher on the EAT subscales of “Dieting” and “Bulimia and Food Preoccupation” subscales \((r^2 = .024\) and \(r^2 = .018, p < 0.05\), respectively). With regards to competitiveness, Burckle et al. (1999) demonstrated significant positive correlations between hypercompetitiveness and generalized competitiveness and disordered eating \((r^2 = .16, p < .01, r^2 = .04, p < .01\) respectively).

Finally, with respect to alcohol use, several studies have demonstrated that men drink more than women. Leichliter et al. (1998) found that men drink more on average than women \((r^2 = .043, p < 0.001)\). Greenberg et al. (1999) supported these findings \((r^2 = 0.03, p < 0.05)\). Reagan, Wetherill, and Fromme (2007) found that, in the general population, males exhibit greater frequency in drinking than females \((\beta = 0.39, \beta = 0.31,\) respectively, \(p < 0.03\)), as well as consume a greater quantity of alcohol per drinking occasion \((\beta = 0.45, \beta = 0.24,\) respectively, \(p < 0.02\)). With respect to a possible relationship between competitiveness and alcohol use, correlations have been found specifically between the SOQ and alcohol use in terms of “number of binge drinking episodes in the past two weeks” \((r^2 = 0.05, p < .01)\), “number of peak drinking episodes” \((r^2 = .05, p < .01)\) and “alcohol-related negative consequences” \((r^2 = 0.03, p < .05;\) Serrao, et al., 2007).

The \(r^2\) values from the above calculations ranged from \(r^2 = .024\) to \(r^2 = .16\). In terms of exercise dependence, the median effect size for gender was .026 and for competitiveness was .040 (see Table 1). For disordered eating, the median effect size for
gender was .021 and for competitiveness was .100 (see Table 2). Finally, with respect to alcohol use, the median effect size for gender was .037 and for competitiveness was .043 (see Table 3).

Although there is no published literature to date examining an interaction between competitiveness and gender with respect to each of these dependent variables, similar studies in the field of counseling psychology can be used to estimate an effect size for this interaction. A recent meta-analysis reviewed publications in the Journal of Counseling Psychology over a period of 20 years and discovered a total of 1,724 reported interaction tests. The effect sizes from these tests were found to vary from .0001 to .058 with a median effect size of .030 (Haase, Martens, Ferrier, & Corbett, 2005). This average estimated effect size can therefore be used in the current study in order to complete the power analysis and estimate the proposed sample size.

Because the main hypothesis lies in detecting significance in the interaction of gender and competitiveness for each of the dependent variables, the effect size of .030 was used as an estimate of strength of association for the current study, and the methods of Cohen and Cohen (1983) were employed to investigate the power of analysis at different sample sizes using this $r^2$ value. Furthermore, tests of interactions have been found to result in smaller effect sizes, and hence necessitate larger sample sizes in order to attain significance (Haase et al., 2005). Thus, using the effect size of the interaction should result in a larger and more realistic estimation of the necessary sample size for the proposed study.

Because separate regression equations were computed for each dependent variable, the alpha level was divided over the three equations. Therefore, a Bonferroni
correction was carried out in which the proposed alpha level of .05 was divided by three. This correction resulted in an alpha level of .0167. Hence, in order to attain the sample size that would result in the maximum amount of power, the effect size for the interaction of .03 at an alpha level of .0167 was used to calculate the number of participants needed in order to achieve a power of .80. For the current study, a sample size of 335 participants was estimated to yield a greater than 80% chance of correctly rejecting the null hypothesis at \( r^2 = .030 \) and alpha = .0167.

Table 1: Exercise dependence

<table>
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<th>EFFECT SIZE ((r^2))</th>
<th>POWER (%)</th>
<th>SAMPLE SIZE ((n))</th>
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<tr>
<td>GENDER .026</td>
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<td>387</td>
</tr>
<tr>
<td>COMPETITIVENESS .040</td>
<td>.800</td>
<td>250</td>
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<tr>
<td>GENDER*COMPETITIVENESS .030</td>
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<td>335</td>
</tr>
<tr>
<td>AVERAGE EFFECT SIZE .032</td>
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<td>314</td>
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</table>

Table 2: Disordered eating

<table>
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<th>POWER (%)</th>
<th>SAMPLE SIZE ((n))</th>
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<tbody>
<tr>
<td>GENDER .021</td>
<td>.800</td>
<td>481</td>
</tr>
<tr>
<td>COMPETITIVENESS .100</td>
<td>.801</td>
<td>97</td>
</tr>
<tr>
<td>GENDER*COMPETITIVENESS .030</td>
<td>.800</td>
<td>335</td>
</tr>
<tr>
<td>AVERAGE EFFECT SIZE .050</td>
<td>.801</td>
<td>199</td>
</tr>
</tbody>
</table>
Table 3: Alcohol use

<table>
<thead>
<tr>
<th></th>
<th>EFFECT SIZE ($r^2$)</th>
<th>POWER (%)</th>
<th>SAMPLE SIZE ($n$)</th>
</tr>
</thead>
<tbody>
<tr>
<td>GENDER</td>
<td>.037</td>
<td>.801</td>
<td>271</td>
</tr>
<tr>
<td>COMPETITIVENESS</td>
<td>.043</td>
<td>.800</td>
<td>232</td>
</tr>
<tr>
<td>GENDER*COMPETITIVENESS</td>
<td>.030</td>
<td>.800</td>
<td>335</td>
</tr>
<tr>
<td>AVERAGE EFFECT SIZE</td>
<td>.037</td>
<td>.800</td>
<td>270</td>
</tr>
</tbody>
</table>

Instrumentation

Competitiveness. The major independent variable in this study will be competitiveness. Competitiveness was assessed using the Sport Orientation Questionnaire (SOQ; Gill & Deeter, 1987; see appendix 1). This scale was developed in order to measure different forms of achievement orientations in athletes and assesses “…competitive orientation as a multidimensional, sport-specific achievement construct and has greater psychometric strength [than the COI] as a competitive-orientation measure (Gill, Kelley, Martin, & Caruso, 1991, p. 278).” The SOQ contains 25 items measured on a five point scale ranging from “strongly disagree” (1) to “strongly agree” (5). Scores range from 25 to 125.

The SOQ consists of three subscales – Win Orientation, Goal Orientation, and the Competitiveness subscale. It has been posited that the three subscale scores may have differing influences on sport behaviors and different relationships among certain constructs (Gill & Deter, 1987). The Competitiveness subscale was the only subscale used in the current study. This subscale consists of 13 items and assesses the degree to which an individual desires to enter the sport achievement setting, to strive for success, to put forth effort, to achieve goals, and to meet competitive challenges (Gill & Deeter,
Sample items include “I am a competitive person” and “I look forward to the opportunity to test my skills in competition.” The Competitiveness subscale has demonstrated acceptable internal consistency ($\alpha = .94$ to .95) and test-retest reliability ($\alpha = .89$; Ryska, 2003).

Taken as a whole, the SOQ has demonstrated strong reliability and validity (Gill & Deeter, 1987; Hanrahan & Biddle, 2002; Wartenberg & McCutcheon, 1998). The internal consistency was reported at $\alpha = .94$. Alpha coefficients across three different samples have been found at .94, .86, and .80, for each of the three scales, respectively. The SOQ has also been found to accurately discriminate between athletes and non-athletes, especially in terms of the competitiveness subscale (Wartenberg & McCutcheon, 1998). Gill and Deeter (1987) compared college students who were enrolled in competitive physical education classes with those enrolled in non-competitive physical education classes and found significant differences in terms of their SOQ scores, $F(3, 231) = 9.37, p < .001$, with males scoring higher on the competitive and win orientation subscales and females scoring higher on the goal orientation subscale. Gill and Deeter (1987) extended their research to high school students and found a significant difference between students who participated in athletics and those who did not.

Exercise dependence. The Exercise Dependence Questionnaire is perhaps the most popular tool for measuring exercise dependence (Ogden et al., 1997; see appendix 2). It addresses several key components of exercise dependency such as the motivation to continue exercising based on fear of withdrawal, experience of positive reward following exercise, a desire to control weight and body shape, the need for social contact, and a desire for physical health. The EDQ also reflects the recognition that one’s level of
exercise is interfering with her/his social and family life, that one’s exercise behaviors have become rigid and excessive, and that she/he perceives little control over the problem (Ogden et al., 1997).

The EDQ consists of 29 exercise-related items that are rated on a 7-point Likert scale ranging from “strongly disagree” (1) to “strongly agree” (7). It has no indicative cut-off point, and scores may range from 203 (high exercise dependence symptomology) to 29 (low exercise dependence symptomology). Sample items include “I feel guilty about the amount I exercise” and “The rest of my life has to fit around my exercise.” The EDQ consists of eight subscales: (a) Interference with Social/Family/Work Life, (b) Positive Reward, (c) Withdrawal Symptoms, (d) Exercise for Weight Control, (e) Insight into the Problem, (f) Exercise for Social Reasons, (g) Exercise for Health Reasons, and (h) Stereotyped Behavior (Ogden et al., 1997). The entire EDQ has demonstrated acceptable internal consistency with a coefficient alpha of .84 (Ogden et al., 1997), and the alpha levels of the subscales range from $\alpha = .52$ (stereotyped behavior) to $\alpha = .81$ (interference with social/family/work life; Ogden et al., 1997). The EDQ has been validated against the EAT and was found to significantly differentiate between high and low EAT scores (Ogden et al., 1997). It has also been validated against the POMS, suggesting a significant relationship between exercise dependence and negative mood states (Aidman & Woolard, 2003; Ogden et al., 1997). The EDQ has been validated against other exercise addiction inventories as well, such as the Exercise Dependence Scale (EDS; $r = 0.69$, $p < 0.001$; Hausenblas & Downs, 2002b).

Disordered eating. The Eating Attitudes Test-26 (EAT-26; Garner, Olmsted, Bohr, & Garfinkel, 1982; see appendix 3) was used to measure the occurrence of
disordered eating habits. The EAT-26 is a 26 item self-report questionnaire that is used to assess characteristics associated with generalized disordered eating symptoms. The items are rated on a 4-point frequency-based scale with answers ranging from “never” (1) to “always” (6). Scores can range from 26 to 156. The EAT-26 contains three subscales that enable it to measure a range of disordered eating behaviors. These subscale are Dieting, which pertains to an aspiration for thinness and an avoidance of foods that have high fat contents (i.e. “Am preoccupied with the thought of having fat on my body”); Bulimia and Food Preoccupation, which refers to a preoccupation with food and subsequent bulimic behaviors (i.e. “Have the impulse to vomit after meals”); and Oral Control, which refers to the exertion of self-control around food in order to refrain from eating (i.e. “Display self-control around food”). Because the current study did not seek to assess particular types of eating disorders but rather, to measure general disordered eating symptoms, the sum of scores on all three subscales, rather than the individual totals for each subscale, was used.

The EAT-26 has demonstrated acceptable psychometrics in several studies. In terms of internal consistency, coefficient alpha estimates have been reported at .90 for a sample of anorexics and .83 for a sample of female undergraduates (Garner et al., 1982). Internal consistency for the subscales has been demonstrated in a sample of female undergraduates as well and has been found to range from .70 to .88 (Doninger, Enders, Burnett, 2005). Finally, convergent validity has been demonstrated by comparing the EAT-26 to participants’ body mass index ($r = .24 -.25$), as well as to the Eating Disorder Inventory-2’s (EDI-2) Body Dissatisfaction subscale ($r = .14 - .65$), and Drive for Thinness subscale($r = .18 - .88$; Garner et al., 1982).
Alcohol use. The Daily Drinking Questionnaire (DDQ; Collins, Parks, & Marlatt, 1985; see appendix 4) is a self-report measure used to assess level of drinking. The DDQ asks participants to indicate their daily alcohol consumption over the past 30 days for each day of the week. From this information, it is possible to calculate the average number of drinks an individual has had in the past month. Thus, it involves estimating one’s typical number of drinks on each day of the week over a specific time period (e.g. 30 days). Based on this information, it is possible to calculate various quantity-frequency measures of alcohol use such as peak drinking episodes (i.e. most number of drinks within the past week), average alcohol intake, and heavy episodic drinking (i.e. 5 or more drinks in one sitting for males and 4 or more drinks in one sitting for females). The DDQ has demonstrated acceptable validity; it has been found to be correlated with alcohol-related problems, drinking motives, and changes in alcohol consumption following alcohol-related interventions (e.g., Larimer et al., 2001; Marlatt et al., 1998).

The main purpose of the DDQ for the current study lied in assessing the presence of heavy or problematic drinking. In order to assess this outcome, the DDQ was used to allow the researcher to deduce each participant’s average alcohol intake per week. Two separate quantity-frequency items were included to assess the presence of heavy episodic drinking and peak drinking. These three variables were then combined to form one continuous drinking-related outcome variable known as problematic alcohol use.

Athletic Status. Participants were asked to rate their level of athletic involvement according to the following categories: a) elite athlete (national or international), b) varsity athlete, c) recreational athlete (club sports), d) recreational athlete (intramural or other organized teams), e) recreational athlete (informal competition…e.g. pickup hoops), f)
exercise regularly, g) exercise occasionally, i) do not exercise. Such a measure was used to accurately discriminate between different levels of athletic involvement in past research (Serrao et al., 2007; see appendix 5).

Demographic variables. Demographic information including age, education level, socioeconomic status, and race/ethnicity were also collected from the participants.

Procedure

Participants were recruited via email. The principal investigator sent emails to athletic directors, coaches, and intramural and varsity sport team members from several colleges requesting participation of student athletes in this study. Each of these methods of contact instructed the students to submit their email addresses to the principal investigator should they be interested in participating. A link to the study’s webpage was then sent to all interested and qualified individuals.

The remainder of the study was administered online using a program known as Psychdata. The first page consisted of a consent form describing the purposes of the study. In addition, the consent form included the contact information of the researcher. In order to consent to participate in the study, students were asked to click on a button stating “I agree.” After performing this step, participants were directed to the demographic questionnaire, followed by the other measures involved in the study. In its entirety, the study took approximately 25-30 minutes to complete. Upon completion of the questionnaires, students were asked to provide their name and email address in order to receive compensation for their participation. The compensation entailed entering one’s name in a raffle for a chance to win one of ten $50 cash prizes. This step was optional
and students were informed that their identifying information would not be linked to their study responses.

*Statistics and Data Analysis*

Data from participants’ responses on each measurement scale was saved automatically via *Psychdata* and then transcribed into SPSS in order to perform the statistical analyses. Separate univariate analysis was used to analyze the given data. In line with the goal of the proposed study, this procedure determined whether and to what extent competitiveness, gender, and their interaction predicted one’s degree of exercise dependence, disordered eating, and alcohol use. Therefore, three separate regression analyses were computed with competitiveness and gender, as well as their interaction, as the predictor variables and exercise dependence, disordered eating, and alcohol use as the dependent variables, respectively. Each analysis therefore entailed testing whether each of the addictive behaviors was significantly predicted by level of competitiveness, gender, and/or the interaction between the two. For each analysis, the significance test for the interaction and that of the individual predictor variables were performed at the same time. However, the test for the main effects was entered at step 1, and the interaction test at step 2.

An $F$ test was then used to test each coefficient for significance. For each of the three regression equations, if $F$ exceeded the appropriate critical value, it was concluded that the combination, or interaction, of competitiveness and gender significantly predicted the presence of exercise dependence, disordered eating, and alcohol use. Once the overall $F$ test was performed, the next step was to calculate the effect size, or degree of relationship between each of the disorders and the predictor variable. In other words, the
aim was to use the semi-partial $r^2$ in order to assess what percent of the variance in exercise dependence, disordered eating, and alcohol use was accounted for by competitiveness, gender, and the interaction between the two variables.

Although each of the outcome variables has previously been studied in univariate contexts (e.g. Grossbard et al., 2007; Hausenblas & Downs, 2002a; Johnson & Sheets, 2004; Striegel-Moore et al., 1990; Yates et al., 2003) research has not yet elucidated the relationship between the interaction of gender and competitiveness with each of these outcome variables. The current study proposed that such an interaction between these two predictors would result in a different pattern of results for each dependent variable. In accordance with the study’s hypothesis, it was predicted that competitiveness would significantly predict the presence of exercise dependence, disordered eating, and alcohol use. Gender was predicted only to contribute additional variance to disordered eating and alcohol use. In other words, for those athletes with highly competitive dispositions, the presence of disordered eating and alcohol use would differ depending on one’s gender. Namely, the relationship between competitiveness and alcohol use would be stronger among men than women, and the relationship between competitiveness and disordered eating would be stronger among women than men.

Exercise dependence, on the other hand, was expected to be gender neutral, with no significant interaction effect for gender. However, if a significant interaction occurred between competitiveness and gender for exercise dependence, the tests for the individual predictor variables would then be examined in order to determine whether competitive males or females showed higher symptoms of exercise dependence.
In order to analyze the results of this study, several steps took place. Each of these steps will be presented in the following section. First, the means, standard deviations, and correlation coefficients for each variable will be examined. Then, the procedures for dealing with missing data will be discussed, followed by an examination of the normality for each variable. Next, the internal consistency of each of the scales will be presented. Finally, the results of the separate univariate analyses will be presented in order to depict the relationships between each of the dependent variables (i.e. alcohol use, exercise dependence, and disordered eating) and independent variables (i.e. competitiveness, gender, and the interaction between competitiveness and gender).

**Missing Data**

Out of the sample of 369 students, 83 had at least 10 percent of their total data set missing and were therefore omitted from the analysis. Once these cases were deleted, there were 286 participants with complete data. However, two more subjects were omitted for being outside the designated age range. The resulting sample therefore consisted of 284 participants.

**Data Screening**

The data were screened for normality and linearity prior to analysis. The skewness and kurtosis values were examined for each variable (See Table 4).
### Table 4

*Descriptive Statistics, Skew, Kurtosis, and Reliability of Independent and Dependent Variables*

<table>
<thead>
<tr>
<th>Variable</th>
<th>Mean</th>
<th>St. Dev.</th>
<th>Variance</th>
<th>Skew</th>
<th>Std. Error</th>
<th>Kurtosis</th>
<th>Std. Error</th>
<th>ɑ</th>
</tr>
</thead>
<tbody>
<tr>
<td>ALC</td>
<td>0.000</td>
<td>.151</td>
<td>6.486</td>
<td>1.590</td>
<td>.145</td>
<td>6.628</td>
<td>.288</td>
<td>.813</td>
</tr>
<tr>
<td>EDQ</td>
<td>100.96</td>
<td>20.100</td>
<td>404.10</td>
<td>-.290</td>
<td>.145</td>
<td>.640</td>
<td>.288</td>
<td>.860</td>
</tr>
<tr>
<td>EAT</td>
<td>27.16</td>
<td>19.120</td>
<td>365.660</td>
<td>-1.826</td>
<td>.145</td>
<td>5.752</td>
<td>.288</td>
<td>.932</td>
</tr>
<tr>
<td>SOQ</td>
<td>44.05</td>
<td>10.070</td>
<td>69.486</td>
<td>1.759</td>
<td>.145</td>
<td>4.665</td>
<td>.288</td>
<td>.934</td>
</tr>
</tbody>
</table>

ALC = Alcohol Problems; EDQ = Exercise Dependence Questionnaire; EAT = Eating Attitudes Test-26; SOQ = Competitiveness Subscale of Sport Orientation Questionnaire

The statistics for each variable are based on a sample size of 284. The skewness was found to range from -1.826 (disordered eating) to 1.759 (competitiveness) with a standard error of .145, and the kurtosis was found to range from .640 (EDQ) to 6.628 (problematic alcohol use) with a standard error of .288, respectively. The critical ratios of these values (Z = estimates/standard errors) range from 2.00 to 23.00, all significant within the range of .05 < p < .00001. In order to get a better idea of the degree of non-normality (Cohen, Cohen, West & Aiken, 2003), normal probability plots (p-p plots) and histograms of the three dependent variables are shown in Figure 2.
Figure 2

Histograms and Normal Probability Plots for the Exercise Dependence, Disordering Eating, Alcohol Use, and Competitiveness Variables
As can be seen in these histograms and p-p plots, the data for disordered eating alcohol use, and competitiveness are all skewed. Because this non-normality could mask the relationships between the variables and hinder the ability to discover the hypothesized results, the Rank Transformation Method was used (Conover & Iman, 1982; Conover, 1999). While this method will be discussed in a subsequent section, analysis on the transformed variables revealed that the results were found to yield the same conclusions as the original analyses and were not adversely affected by the non-normality of the data.

Correlation Coefficients among the Study Variables

Correlation coefficients were examined between each of the independent and dependent variables (See Table 5). From the correlation matrix presented in Table 5, it is evident that the relationships between the variables of interest did not all occur in the predicted fashion. In terms of the independent variable, competitiveness, there were few significant results. The correlation between competitiveness and disordered eating was not significant \( r = .003, p > .05 \), and neither was the relationship between competitiveness and problematic alcohol use \( r = .005, p > .05 \). The relationship
between competitiveness and exercise dependence however, was positive as well as significant ($r = .144, p < .01$).

In terms of the relationships between each of the disordered behaviors and gender, all relationships were significant. However, they did not all occur in the hypothesized direction. As predicted, male athletes in this sample were found to engage in problematic alcohol use significantly more than female athletes ($r = -.228, p < .01$), and female athletes reported more symptoms of disordered eating than male athletes ($r = .214, p < .01$). However, although the relationship between gender and exercise dependence was also significant ($r = .121, p < .05$), it indicated that females engaged in more dependent exercise than males, which does not agree with the prediction that this behavior would be gender neutral. Finally, disordered eating and exercise dependence were the only two dependent variables that had a positive significant relationship ($r = .273, p < .01$).

Table 5

*Correlation Coefficients among Exercise Dependence, Disordered Eating, Alcohol Use, Competitiveness and Gender*

<table>
<thead>
<tr>
<th></th>
<th>Gender</th>
<th>ALC</th>
<th>EDQ</th>
<th>EAT-26</th>
<th>SOQ</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender</td>
<td>Pearson Correlation</td>
<td>( - )</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ALC</td>
<td>Pearson Correlation</td>
<td>-.228**</td>
<td>( - )</td>
<td></td>
<td></td>
</tr>
<tr>
<td>EDQ</td>
<td>Pearson Correlation</td>
<td>.121*</td>
<td>.082</td>
<td></td>
<td></td>
</tr>
<tr>
<td>EAT-26</td>
<td>Pearson Correlation</td>
<td>.214**</td>
<td>-.020</td>
<td>.273**</td>
<td>-</td>
</tr>
<tr>
<td>SOQ</td>
<td>Pearson Correlation</td>
<td>-.041</td>
<td>.005</td>
<td>.144**</td>
<td>.003</td>
</tr>
</tbody>
</table>

** \( p < 0.01 \)  * \( p < 0.05 \) level  \( N = 284 \)
Thus, the correlation analyses show that only a few of the predicted relationships among the variables held true. Male athletes were found to drink more alcohol than female athletes, and female athletes were found to engage in more disordered eating behaviors than males. Additionally, exercise dependence and disordered eating were found to be significantly positively correlated, which is in line with past research findings (e.g. Ackard, Brehm, & Steffen, 2002; Estok & Rudy, 1996; Klein et al., 2004; Zmijewski & Howard, 2003). However, rather than occurring at equal rates for males and females as predicted, exercise dependence was found to occur at higher rates in female athletes. Finally, although the relationship between competitiveness and each of the dependent variables was in the expected direction indicating that, as competitiveness increases, so too do the rates of each of these disordered behaviors, only the relationship between competitiveness and exercise dependence was found to be significant.

Reliability Analysis

Alpha coefficients were calculated to analyze the internal consistency for each measure. Overall, the reliability for each of the scales was excellent, ranging from .860 (exercise dependence) to .934 (competitiveness; see Table 4). For the alcohol use variables, the mean number of drinks per week was 12.66, the mean number of peak drinks (i.e. most number of drinks on one occasion) was 7.167, and mean number of binge drinking episodes (i.e. 4 drinks on occasion for women and 5 drinks for men) was 3.77.

Multiple Regression Analyses

Three separate multiple regression analyses were used to examine the relationships between the independent and dependent variables (Huberty & Morris,
Because three separate analyses took place, a Bonferroni correction was used in order to split the standard significance level of .05 over the three equations. This resulted in using a significance level of .0167.

*Exercise Dependence.* The impact of the interaction term on exercise dependence was found to be significant at the Bonferroni adjusted $p < .0167$, $F(3, 280) = 14.399$, $p < .0167$, $R^2 = .049$ (see Table 6). An examination of the unstandardized regression coefficients for each term shows that the regression of exercise dependence on competitiveness with gender held constant was -.934, and the regression of exercise dependence on gender when competitiveness was held constant was 34.238.

Table 6

*Source Table of the Multiple Regression Analysis of Exercise Dependence*

<table>
<thead>
<tr>
<th>Source</th>
<th>Type III Sum of Squares</th>
<th>df</th>
<th>Mean Square</th>
<th>F</th>
<th>Sig.</th>
<th>Partial Eta Squared</th>
<th>Regression Coefficient</th>
</tr>
</thead>
<tbody>
<tr>
<td>Corrected Model</td>
<td>9617.010(b)</td>
<td>3</td>
<td>3205.670</td>
<td>8.569</td>
<td>.000</td>
<td>.084</td>
<td></td>
</tr>
<tr>
<td>Intercept</td>
<td>91656.027</td>
<td>1</td>
<td>91656.027</td>
<td>245.012</td>
<td>.000</td>
<td>.467</td>
<td>134.504</td>
</tr>
<tr>
<td>Gen x Comp</td>
<td>5386.439</td>
<td>1</td>
<td>5386.439</td>
<td>14.399</td>
<td>.000</td>
<td>.049</td>
<td>.896</td>
</tr>
<tr>
<td>SOQ</td>
<td>2753.395</td>
<td>1</td>
<td>2753.395</td>
<td>7.360</td>
<td>.007</td>
<td>.026</td>
<td>-.934</td>
</tr>
<tr>
<td>Gender</td>
<td>3885.347</td>
<td>1</td>
<td>3885.473</td>
<td>10.387</td>
<td>.001</td>
<td>.036</td>
<td>34.238</td>
</tr>
<tr>
<td>Error</td>
<td>104744.483</td>
<td>280</td>
<td>374.078</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>3009022.000</td>
<td>284</td>
<td>4404.007</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Corrected Total</td>
<td>114361.493</td>
<td>283</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

a  Computed using alpha = .05  
b  R Squared = .084 (Adjusted R Squared = .074)
As can be seen in Figure 3, the slope of the regression line for female athletes appears to be steeper than the line for male athletes, and the slope for male athletes appears to be negative. Thus, female athletes’ rates of exercise dependence increase with their levels of competitiveness, while male athletes’ rates of exercise dependence appear to decrease, and the relationship between competitiveness and exercise dependence for female athletes appears to be stronger.

Figure 3

*Scatterplot for the Relationship between Exercise Dependence, Competitiveness, and Gender*

A follow-up analysis of the simple main effects of gender was then conducted to determine the specific nature of the effect of competitiveness on exercise dependence for male and female athletes separately. In order to perform this analysis, the data was split into two separate files, resulting in separate data sets for male and female athletes. Exercise dependence was then regressed on competitiveness for male and female athletes separately. For male athletes, the simple slope of exercise dependence on competitiveness was $b = -0.038$, $F(1, 144) = 0.062$, $p = 0.803$, $R^2 = 0.000$, indicating that for
male athletes, there was no relationship between competitiveness and exercise dependence. For female athletes on the other hand, the simple slope of exercise dependence on competitiveness was $b = .858$, $F(1, 136) = 23.427$, $p < .05$, $R^2 = .147$, indicating that for female athletes, exercise dependence increases significantly as competitiveness increases.

*Disordered Eating.* In the case of disordered eating, the interaction term was not significant (See Table 7), so it was dropped from the analysis in order to re-estimate the contribution of the main effects (Pedhazur, 1997). After dropping the interaction term, it can be seen in Table 8 that, when unfettered by the multicolinear interaction vector, gender was significantly related to disordered eating, $F(2, 281) = 13.518$, $p < .0167$, $R^2 = .046$, while competitiveness was not, $F(2, 284) = .042$, $p = .838$, $R^2 = .000$. As supported in the correlation analysis, the positive value of the unstandardized regression coefficient for gender also shows that female athletes seem to have higher rates of disordered eating than male athletes.
Table 7

Source Table of the Multiple Regression Analysis of Disordered Eating

<table>
<thead>
<tr>
<th>Source</th>
<th>Type III Sum of Squares</th>
<th>df</th>
<th>Mean Square</th>
<th>F</th>
<th>Sig.</th>
<th>Partial Eta Squared</th>
<th>Regression Coefficient</th>
</tr>
</thead>
<tbody>
<tr>
<td>Corrected Model</td>
<td>5440.239(b)</td>
<td>3</td>
<td>1813.431</td>
<td>5.79</td>
<td>.002</td>
<td>.053</td>
<td></td>
</tr>
<tr>
<td>Intercept</td>
<td>8007.623</td>
<td>1</td>
<td>8007.623</td>
<td>22.869</td>
<td>.000</td>
<td>.076</td>
<td>33.415</td>
</tr>
<tr>
<td>SOQ</td>
<td>551.841</td>
<td>1</td>
<td>551.841</td>
<td>1.576</td>
<td>.210</td>
<td>.006</td>
<td>-.418</td>
</tr>
<tr>
<td>Gen x Comp</td>
<td>689.488</td>
<td>1</td>
<td>689.488</td>
<td>1.969</td>
<td>.162</td>
<td>.007</td>
<td>.321</td>
</tr>
<tr>
<td>Gender</td>
<td>115.074</td>
<td>1</td>
<td>115.074</td>
<td>.329</td>
<td>.567</td>
<td>.001</td>
<td>-5.892</td>
</tr>
<tr>
<td>Error</td>
<td>98042.256</td>
<td>280</td>
<td>350.151</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>313010.000</td>
<td>284</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Corrected Total</td>
<td>103482.545</td>
<td>283</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

a Computed using alpha = .05
b R Squared = .053 (Adjusted R Squared = .042)
Table 8

*Source Table of the Regression Analysis of Disordered Eating after Dropping the Interaction Term*

<table>
<thead>
<tr>
<th>Source Type</th>
<th>Type III Sum of Squares</th>
<th>df</th>
<th>Mean Square</th>
<th>F</th>
<th>Sig.</th>
<th>Partial Eta Squared</th>
<th>Regression Coefficient</th>
</tr>
</thead>
<tbody>
<tr>
<td>Corrected</td>
<td>4750.850(b)</td>
<td>2</td>
<td>2375.403</td>
<td>6.761</td>
<td>.001</td>
<td>.046</td>
<td></td>
</tr>
<tr>
<td>Intercept</td>
<td>9693.650</td>
<td>1</td>
<td>9693.650</td>
<td>27.589</td>
<td>.000</td>
<td>.089</td>
<td>13.993</td>
</tr>
<tr>
<td>SOQ</td>
<td>14.770</td>
<td>1</td>
<td>14.770</td>
<td>.042</td>
<td>.838</td>
<td>.000</td>
<td>.023</td>
</tr>
<tr>
<td>Gender</td>
<td>4749.751</td>
<td>1</td>
<td>4749.751</td>
<td>13.518</td>
<td>.000</td>
<td>.046</td>
<td>8.189</td>
</tr>
<tr>
<td>Error</td>
<td>9831.744</td>
<td>281</td>
<td>351.359</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>313010.000</td>
<td>284</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Corrected</td>
<td>103482.549</td>
<td>283</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

a  Computed using alpha = .05
b  R Squared = .046 (Adjusted R Squared = .039)

Figure four is presented to further illustrate the lack of a significant interaction between gender and competitiveness for disordered eating. Although the relationship between competitiveness and disordered eating does seem to differ between male and female athletes, with female athletes showing a positive relationship between competitiveness and disordered eating and male athletes a negative relationship, the difference does not appear to be strong enough to warrant a significant interaction. This finding is supported by the aforementioned regression analysis.
Alcohol use. In terms of alcohol intake, the interaction term (i.e. gender-competitiveness) did not have a significant impact on problematic alcohol use, $F(3,283) = .080, p = .777, R^2 = .000$ (See Table 9), so it was then dropped from the analysis in order to interpret the main effects. As can be seen in Table 10, competitiveness still did not have a significant relationship with alcohol use, $F(2, 281) = .006, p = .938 R^2 = .000$, while gender did, $F(2, 283) = 15.368, p < .0167, R^2 = .052$. Furthermore, as supported in the correlation analysis, the negative value of the unstandardized regression coefficient for gender also shows that male athletes were found to have significantly higher rates of alcohol use than female athletes.
Table 9

*Source Table of the Multiple Regression Analysis for Alcohol Use*

<table>
<thead>
<tr>
<th>Source</th>
<th>Type III Sum of Squares</th>
<th>df</th>
<th>Mean Square</th>
<th>F</th>
<th>Sig.</th>
<th>Partial Eta Squared</th>
<th>Regression Coefficient</th>
</tr>
</thead>
<tbody>
<tr>
<td>Corrected Model</td>
<td>95.723</td>
<td>3</td>
<td>31.908</td>
<td>5.135</td>
<td>.002</td>
<td>.052</td>
<td></td>
</tr>
<tr>
<td>Intercept</td>
<td>.085</td>
<td>1</td>
<td>.085</td>
<td>.014</td>
<td>.907</td>
<td>.000</td>
<td>1.251</td>
</tr>
<tr>
<td>Gen x Comp</td>
<td>.498</td>
<td>1</td>
<td>.498</td>
<td>.080</td>
<td>.777</td>
<td>.000</td>
<td>-.009</td>
</tr>
<tr>
<td>SOQ</td>
<td>.362</td>
<td>1</td>
<td>.362</td>
<td>.058</td>
<td>.810</td>
<td>.000</td>
<td>.011</td>
</tr>
<tr>
<td>Gender</td>
<td>2.020</td>
<td>1</td>
<td>2.202</td>
<td>.325</td>
<td>.569</td>
<td>.001</td>
<td>-.781</td>
</tr>
<tr>
<td>Error</td>
<td>1739.866</td>
<td>280</td>
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<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
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<td>284</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Corrected Total</td>
<td>1835.589</td>
<td>283</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

a  Computed using alpha = .05
b  R Squared = .052 (Adjusted R Squared = .042)
Table 10

*Source Table of Regression Analysis for Alcohol Use after Dropping the Interaction*

**Term**

<table>
<thead>
<tr>
<th>Source</th>
<th>Type III Sum of Squares</th>
<th>df</th>
<th>Mean Square</th>
<th>F</th>
<th>Sig.</th>
<th>Partial Eta Squared</th>
<th>Regression Coefficient</th>
</tr>
</thead>
<tbody>
<tr>
<td>Corrected Model</td>
<td>95.225(b)</td>
<td>2</td>
<td>47.612</td>
<td>7.688</td>
<td>.001</td>
<td>.052</td>
<td></td>
</tr>
<tr>
<td>Intercept</td>
<td>.016</td>
<td>1</td>
<td>.016</td>
<td>.085</td>
<td>.771</td>
<td>.000</td>
<td>1.177</td>
</tr>
<tr>
<td>SOQ</td>
<td>.038</td>
<td>1</td>
<td>.038</td>
<td>.006</td>
<td>.938</td>
<td>.000</td>
<td>-.001</td>
</tr>
<tr>
<td>Gender</td>
<td>95.183</td>
<td>1</td>
<td>95.183</td>
<td>15.368</td>
<td>.000</td>
<td>.052</td>
<td>-1.159</td>
</tr>
<tr>
<td>Error</td>
<td>1740.364</td>
<td>281</td>
<td>6.193</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>1835.589</td>
<td>284</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Corrected Total</td>
<td>1835.589</td>
<td>283</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

a  Computed using alpha = .05,  
b  R Squared = .052 (Adjusted R Squared = .045)

Figure five is presented in order to further illustrate the relationship between gender, competitiveness, and alcohol use. As can be seen in this figure, the relationship between competitiveness and alcohol use does appear to differ between male and female athletes, with male athletes showing a slightly positive relationship between competitiveness and alcohol use and female athletes a slightly negative relationship; however, this differences does not appear to be strong enough to warrant a significant interaction effect. Thus, as supported by the aforementioned regression analysis, gender does not appear to moderate the relationship between competitiveness and alcohol use; however, as previously noted, when competitiveness is removed from the equation and gender is included as a main effect, male and female athletes do show differences in their degree of alcohol use.
Figure 5

Scatterplot for the relationship between Alcohol Use, Competitiveness, and Gender

Rank Transformations

As previously mentioned, the Rank Transformation Method was used to account for the non-normality of the data (Conover & Iman, 1982; Conover, 1999). This method provides a way of transforming the data so as to ascertain whether the previously mentioned results (i.e. Tables 6-10) were disturbed by the non-normal distributions of the residuals of the regression models. The results of these rank transformation analyses on the variables of alcohol and eating disorders are presented in Table 11. As can be seen by these analyses, the conclusions based on the original data for the alcohol problems and eating disorder variables did not change as a result of this transformation. In other words, the non-significant results that were found in the original data analysis are most likely not due to a failure to meet distributional assumptions.
In the case of exercise dependence, the variable did not appear to be seriously disturbed, so no transformations were done and the analysis was performed on the original data (see the Histogram and p-p plot for exercise dependence in Figure 1).

Table 11

Results of Regression Analyses using Rank Order Transformations for Disordered Eating and Alcohol Use

<table>
<thead>
<tr>
<th>Source</th>
<th>Dependent Variable</th>
<th>Type III Sum of Squares</th>
<th>df</th>
<th>Mean Square</th>
<th>F</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender</td>
<td>Rank of ALC</td>
<td>72334.729</td>
<td>1</td>
<td>72334.729</td>
<td>11.189</td>
<td>.001</td>
</tr>
<tr>
<td></td>
<td>Rank of EAT</td>
<td>100098.371</td>
<td>1</td>
<td>100098.371</td>
<td>15.549</td>
<td>.001</td>
</tr>
<tr>
<td>SOQ</td>
<td>Rank of ALC</td>
<td>6964.630</td>
<td>1</td>
<td>6964.630</td>
<td>1.077</td>
<td>.300</td>
</tr>
<tr>
<td></td>
<td>Rank of EAT</td>
<td>7584.578</td>
<td>1</td>
<td>7584.578</td>
<td>1.178</td>
<td>.279</td>
</tr>
<tr>
<td>Gen x</td>
<td>Rank of ALC</td>
<td>5422.513</td>
<td>1</td>
<td>5422.513</td>
<td>.839</td>
<td>.361</td>
</tr>
<tr>
<td></td>
<td>Rank of EAT</td>
<td>6515.272</td>
<td>1</td>
<td>6515.272</td>
<td>1.102</td>
<td>.315</td>
</tr>
<tr>
<td>Comp</td>
<td>Rank of EAT</td>
<td>1810102.320</td>
<td>280</td>
<td>6464.651</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Error</td>
<td>Rank of ALC</td>
<td>1802583.488</td>
<td>280</td>
<td>6437.694</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Corrected</td>
<td>Rank of ALC</td>
<td>1893394.500</td>
<td>283</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>Rank of EAT</td>
<td>1907709.500</td>
<td>283</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Summary of the Analyses

To summarize the statistical analysis of the data in this study, certain hypotheses were confirmed while others were not. The interaction between competitiveness and gender was significant for exercise dependence. Rather than being gender neutral as predicted, the slope of the regression line between exercise dependence and competitiveness for female athletes was positive and steeper than the slope for male
athletes, which appeared to be negative. Furthermore, after analyzing the main effects, it was determined that there was in fact no significant relationship between competitiveness and exercise dependence for males. In the case of disordered eating, female athletes were found to have significantly higher rates of this behavior as well; however, neither competitiveness nor the gender-competitiveness interaction had a significant impact. Finally, problematic alcohol use was found to occur at significantly higher degrees for male athletes as expected, yet again neither competitiveness nor the interaction term was significant for this behavior. In short, while male and female athletes did have significant differences with respect to each of these behaviors, gender only interacted with competitiveness in the case of exercise dependence. Moreover, while positive correlations were found to occur between competitiveness and each of these disordered behaviors, the relationship was only significant for exercise dependence, and this relationship was moderated by one’s gender.
Chapter V
Discussion

The current study aimed to examine several health-related variables that have been found to occur at high rates among student athletes. Namely, the goal was to determine whether gender, competitiveness, and the interaction between gender and competitiveness were significantly related to exercise dependence, disordered eating, and alcohol use. All three of these dependent variables have previously been found to occur at higher rates among athletes than non-athletes (e.g. Blaydon & Lindner, 2002; Estok & Rudy, 1996; Grossbard et al., 2007) and the current study was therefore an attempt to uncover a possible underlying reason for this trend. The hypothesis was that the more competitive an individual athlete is, the more likely she/he would be to experience each of these three disordered behaviors. Furthermore, it was predicted that these relationships would differ between male and female athletes, such that the relationship between competitiveness and alcohol use would be stronger for male athletes, the relationship between competitiveness and eating disorders would be stronger for female athletes, and the relationship between competitiveness and exercise dependence would be similar for both male and female athletes.

Discussion of Results

The findings from the present study did not fully support the research hypotheses. A significant interaction between gender and competitiveness was only found to occur for exercise dependence. This finding suggests that the relationship between competitiveness and exercise dependence is conditional upon one’s gender. However, the current study predicted that female and male athletes would both engage in equal degrees of exercise
dependent behaviors as it would be conducive for both groups in achieving their ideal physique. Instead, for male athletes the relationship between competitiveness and exercise dependence was found to be non-significant, while for female athletes the relationship was found to be significant and positive, indicating that as competitiveness increases for female athletes so too do rates of exercise dependence.

The finding that female athletes have higher rates of exercise dependent behaviors than males does agree with some of the existing literature. For example, Zmigewksi and Howard (2003) found that women experience withdrawal symptoms from a lack of exercise more commonly than males. Research has also found correlations between self-worth, physical appearance, and exercise in women, which would seem to support the idea that females would be more prone to exercise dependence in order to enhance or maintain their feelings of self-worth (Douthitt, 1994; Harter, 1990). However, none of these aforementioned studies looked at competitiveness as a possible moderating factor in the relationship between gender and exercise dependence, thereby making the present study unique in its purpose and design. Thus, an explanation for the moderating effect of gender is warranted.

Gender norms related to body image and ideal physique may be able to partially explain this interaction. As previously mentioned, the ideal female body type in this culture tends to be thin and slightly muscular. In order for women to achieve this type of physique, many may engage in intense exercise and disordered eating. Furthermore, research has also shown that females tend to base their self-worth on physical appearance, a relationship that has not been found to be as strong for men (Douthitt, 1994; Harter, 1990). Finally, studies have found that females engage in intrasexual
competitiveness regarding their physical appearance (Faer et al., 2005). Thus, if a female’s self-worth is dependent on her physique, and intense exercise could help her achieve this physique, it would make sense that exercise dependence occurs at high rates among females. Moreover, as females have been known to engage in competitiveness with regards to their physical appearance, and athletes tend to be more competitive than non-athletes, it would make sense that female athletes with more competitive mentalities engage in higher rates of exercise dependent behaviors. Because males have not been found to base their self-worth as much on physical appearance or to feel competitive with regards to their appearance and physique, it also seems logical that the relationship between competitiveness and exercise dependence is not as pronounced for male athletes.

In the case of disordered eating and alcohol use, while significant interactions were not found, the results did confirm that there were significant gender differences for each of these behaviors among athletes. Male athletes were found to drink more than female athletes, and female athletes exhibited higher rates of disordered eating than male athletes. Hence, these gender differences did occur in the predicted fashion and were in accordance with much of the current literature. For example, studies have shown that rates of disordered eating for female athletes are greater than for male athletes (Blaydon & Lindner, 2002; Hinton & Kubas, 2005; Petrie, 1996; Sundgot-Borgen, 1993). Many studies site societal pressures on women to be thin as one of the main causes for this discrepancy (Hinton & Kubas, 2005; Weinberg & Gould, 2003). Studies have also found that male athletes tend to drink more than female athletes, again citing societal pressures and a culture that endorses male alcohol use more so than female alcohol use as contributing factors (Leichliter et al, 1998; Rutledge and Sher, 2001; Weinberg and
Thus, the gender differences found in this study for disordered eating and alcohol use did occur in the predicted fashion and were in agreement with current research.

Contrary to predictions however, gender was not found to moderate the relationship between competitiveness and disordered eating or competitiveness and alcohol use, nor was competitiveness significantly related to either disordered eating or alcohol use on its own. With regards to the lack of a main effect for competitiveness with disordered eating and alcohol use, it could be that disordered behaviors such as these are not in line with “perseverance towards one’s [athletic] goals” nor would they necessarily “contribute to optimal performance (Martin & Ecklund, 1994, p. 263),” both of which are aspects of the definition of competitiveness. In fact, behaviors such as food restriction, bingeing and purging, and excessive alcohol use could actually impede and even be in direct opposition to an athlete’s athletic goals and performance. Thus, it seems that an underlying mechanism other than competitiveness is contributing to the higher rates of disordered eating and alcohol use among athletes.

With regards to the interaction effects, the current study predicted that female athletes with highly competitive personalities would have higher rates of disordered eating than competitive male athletes. This hypothesis was based on past research which has shown that female athletes tend to have higher rates of eating disorders than male athletes (e.g. Blaydon & Lindner, 2002; Hinton & Kubas, 2005; Petrie, 1996; Sundgot-Borgen, 1993), that competitiveness may be related to higher rates of disordered eating (Blaydon & Lindner, 2002; Burckle et al., 1999; Kobb, 2006; Striegel-Moore et al., 1990), and that athletes are more competitive than non-athletes (Caron et al., 1997; Gill et
al., 1988). The current study also predicted that male athletes with highly competitive personalities would have higher rates of alcohol use than competitive female athletes. This hypothesis was based on past research findings that male athletes tend to have higher rates of alcohol use than female athletes (Leichliter et al., 1998), that competitiveness may be related to higher rates of alcohol use (Hildebrand et al., 2001; Martens et al., 2006; Serrao et al., 2007), and that athletes tend to be more competitive than non-athletes (Caron et al., 1997; Gill et al., 1988). However, neither of these predictions was found to hold true. Instead, the current research findings indicate that competitiveness does not interact with gender to produce unique effects on disordered eating and alcohol use for males versus females.

Several explanations may exist for these findings. First, it could be that an interaction between gender and competitiveness actually does exist, but was not detected for certain reasons. First, the sample size may not have been large enough to detect a significant interaction. The power analysis called for a sample of 335 participants in order to detect a significant interaction; however, the final sample size only consisted of 284 individuals. Thus, if the interaction effects for disordered eating and alcohol use were weaker than for exercise dependence, a larger sample size may have been necessary to detect a significant relationship.

It could also be the case that the sample was not varied enough in terms of one’s level of athletic involvement. For example, Serrao et al. (2007) found that competitiveness was significantly related to problematic alcohol use in a sample of college athletes. However, the majority of the sample in this study consisted of recreational athletes (i.e. club or intramural sports; 45 %); only 6.8 % of the sample

68
categorized themselves as being elite or varsity athletes. The current study’s sample on the other hand, consisted of 7.7% elite athletes and 60.6% varsity athletes; only 26.4% were recreational athletes. Thus, the two samples were very different in terms of level of athletic involvement, and it could be that the current study’s sample was too restrictive to detect this main effect. It may be that both the main effect of competitiveness as well as the interaction between gender and competitiveness become apparent only in those with lower levels of athletic involvement or that there was not enough variation among athletic involvement in the current study to detect such a relationship. Thus, it is possible that athletic involvement is related to competitiveness and that consequently, competitiveness levels do not vary enough in this sample of highly athletically involved individuals in order for a relationship or interaction to be detected. Perhaps the varsity and elite athletes who made up the majority of the sample in this study all had high degrees of trait competitiveness or exhibited similar degrees of alcohol use and disordered eating, and therefore, the full spectrum of these variables was not represented. In a sample of club and intramural athletes, these variables may be more varied, thereby making relationships between them more apparent. If this were the case, level of athletic involvement could exist as a confounding variable and would therefore have to be controlled for in future studies.

Finally, it could be that male and female athletes at corresponding levels of competitiveness do not actually differ in their degrees of disordered eating or alcohol use, and the current data is therefore an accurate depiction of these relationships. In other words, the relationship between competitiveness and disordered eating and competitiveness and alcohol use may not be moderated by gender after all. When testing
for main effects, it became apparent that while there were significant gender differences for each of these addictive behaviors, competitiveness was not related to either behavior on its own. Thus, there may be an underlying factor other than competitiveness that can help to explain the higher incidence rates of alcohol use and disordered eating among athletes, as well as the gender differences that occur among these two behaviors in the athletic population.

As previously alluded to, self-worth has been found to be related to body image in females and not males. Thus, self-worth rather than competitiveness may be contributing to the higher rates of disordered eating in female athletes. If males tend to use alcohol to increase their feelings of self-worth moreso than females, this factor could help to explain the gender differences for alcohol use in the student-athlete population as well. Of course, future studies would be needed to test the possibility of an interaction between gender and self-worth for these two variables. Thus, it is possible that either competitiveness does not in fact have any bearing on these forms of addictive behaviors and that another factor is at work, or as previously mentioned, it could be that the sample may have been too restrictive to detect such a relationship should it actually exist.

Clinical Implications

Despite the fact that not all hypotheses were confirmed, the results of this study could have important clinical implications for those working with college athletes. Previous studies have shown that exercise dependence, disordered eating, and alcohol use occur at higher rates among athletes than non-athletes (Blaydon & Lindner, 2002; Estok & Rudy, 1996; Grossbard et al., 2007). In light of these findings, it could be beneficial for coaches or sport psychologists to be aware of the frequency of these behaviors in their
athletes. Increased awareness can help alert coaches to any possible or impending problems with respect to these disordered behaviors, particularly with respect to the apparent gender difference found among these behaviors. In other words, coaches of female sports may wish to be more alert to signs of disordered eating and exercise dependence among their athletes, and coaches of male sports may wish to increase their awareness of signs of problematic alcohol use. Enhancing the relationships between the counseling centers and athletic departments of colleges and universities could prove to be beneficial in order to both educate and treat such behaviors should they occur.

In terms of exercise dependence, this study presents the first findings linking exercise dependence with competitiveness. While past research found correlations between exercise dependence and variables that were related to competitiveness, such as athletic involvement (Blaydon & Lindner, 2002; Hausenblas & Downs, 2002a; Pierce et al., 1993), the current study found that competitiveness itself is related to exercise dependence, although this relationship was found only for females. Thus, rather than assuming that the most competitive athletes may be less prone to developing unhealthy behavioral habits due to their strong athletic commitments, it might be helpful for coaches to be aware of the fact that the more competitive, particularly female, athletes may actually be more likely to develop problematic behaviors such as exercise dependence than their less competitive teammates.

**Limitations**

There are several limitations to the present study that warrant explanation. One potential limitation concerns the study’s reliance on self-report data. Self-report data can be subject to participant bias, particularly with respect to reporting certain pathogenic
weight control methods and disordered eating behaviors (Sundgot-Borgen, 1993). This under-reporting may arise from participants wanting to be viewed in a more positive light. In other situations, individuals may have an unrealistic view of themselves with respect to certain habits or characteristics. Despite this limitation, the majority of the research measuring the constructs of exercise dependence, disordered eating, and alcohol use has been self-report in nature.

A second limitation lies in the naturalistic study design. Because the study is not strictly experimental in nature, causal relations between the variables of interest cannot be inferred. For example, levels of competitiveness cannot be manipulated in the participants in order to observe possible behavior change. Therefore, it is not possible to determine from the given study the direction of the relationship (i.e. whether high levels of trait competitiveness result in higher rates of exercise dependence, disordered eating, and alcohol use or vice versa). Rather, only correlational relationships can be inferred. There may also be other factors responsible for athletes exhibiting higher rates of these disorders such as the personality traits of impulsivity and sensation seeking (Fischer, 2007; Sher et al., 2000), or self-worth. However, it was beyond the scope of this study to measure the influence of these traits; future studies may wish to investigate these and other possible variables.

A third limitation of the present study deals with external validity. The sample used for the current study was a convenience sample consisting only of college students from colleges in the northeastern United States; therefore, results cannot be generalized to individuals outside this age range, geographical location, or outside of the college population.
Finally, as previously alluded to there were difficulties regarding the study’s sample size. The power analysis suggested a sample of 335 in order to detect significance. Although data was gathered from 369 students, after accounting for missing data and ineligible participants the final sample only consisted of 284 participants. As previously mentioned, this smaller than desired sample size could have hindered the ability to detect significance relationships among the variables of interest. Additionally, the sample size may have been too restrictive in terms of athletic involvement and other key variables, and this lack of variability could have also masked certain important relationships that may have actually existed.

Future Research

Despite these limitations, the results of this study can make important contributions to the existing literature regarding addictive behaviors and college athletes. From this study, it is evident that gender is related to exercise addiction, disordered eating, and alcohol use among athletes. Therefore, research should continue studying these constructs in order to gain a better understanding of the nature of these addictive behaviors in college athletes, including the possible reasons for the gender differences that seem to occur.

Studies may also wish to explore the relationship among gender, competitiveness and addictive behaviors in populations other than college athletes. It might be interesting to discern whether these relationships differ in older or younger sport participants, or among athletes that are not in the college population. It might also be interesting to examine sport specific differences in the relationships among these variables, as well as whether or not the relationship changes depending on one’s level of athletic involvement.
Based on the different sample compositions with respect to athletic involvement between the current study and a previous study looking at the relationship between competitiveness and alcohol use in athletes, it seems that athletic involvement may have an effect on this relationship. Such questions were beyond the scope of this study, but could provide illuminating answers in research concerning addictive behaviors and sport psychology. Finally, because significant findings were not found with respect to the gender-competitiveness interaction for disordered eating and alcohol use, researchers may wish to continue exploring other possible explanations for the higher incidence rates of these behaviors in the athletic population and for the gender differences that occur among these behaviors in the athletic population.
References


Cohen, Cohen, West & Aiken, 2003


Appendix

Appendix 1

Sport Orientation Questionnaire

The following statements describe reactions to sport situations. We want to know how you usually feel about sports and competition. Read each statement and indicate how much you agree or disagree with each statement on the scale. There are no right or wrong answers; simply answer as you honestly feel. Do not spend too much time on any one statement. Remember, choose the answer that describes how you usually feel about sports and competition.

<table>
<thead>
<tr>
<th>Statement</th>
<th>Strongly agree</th>
<th>Slightly agree</th>
<th>Neither agree nor disagree</th>
<th>Slightly disagree</th>
<th>Strongly disagree</th>
</tr>
</thead>
<tbody>
<tr>
<td>1) I am a determined competitor.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2) Winning is important.</td>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>3) I am a competitive person.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4) I set goals for myself when I compete.</td>
<td></td>
<td></td>
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<tr>
<td>5) I try my hardest to win.</td>
<td></td>
<td></td>
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<tr>
<td>6) Scoring more points than my opponent is very important to me.</td>
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</tr>
<tr>
<td>7) I look forward to competing.</td>
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<tr>
<td>8) I am most competitive when I try to achieve personal goals.</td>
<td></td>
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</tr>
<tr>
<td>9) I enjoy competing against others.</td>
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<tr>
<td>10) I hate to lose.</td>
<td></td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>11) I thrive on competition.</td>
<td></td>
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<td></td>
<td></td>
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</tr>
<tr>
<td>12) I try hardest when I have a specific goal.</td>
<td></td>
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<td></td>
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<tr>
<td>13) My goal is to be the best athlete possible.</td>
<td></td>
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<tr>
<td>14) The only time I am satisfied is when I win.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>15) I want to be successful in sports.</td>
<td></td>
<td></td>
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<tr>
<td>16) Performing to the best of my ability is very important to me.</td>
<td></td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>17) I work hard to be successful in sports.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>18) Losing upsets me.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>19) The best test of my ability is competing against others.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>20) Reaching personal performance goals is very important to me.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>21) I look forward to the opportunity to test my skills in competition.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Statement</td>
<td>Score 1</td>
<td>Score 2</td>
<td>Score 3</td>
<td>Score 4</td>
</tr>
<tr>
<td>---</td>
<td>---------------------------------------------------------------------------</td>
<td>---------</td>
<td>---------</td>
<td>---------</td>
<td>---------</td>
</tr>
<tr>
<td>22</td>
<td>I have the most fun when I win.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>23</td>
<td>I perform my best when I am competing against an opponent.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>24</td>
<td>The best way to determine my ability is to set a goal and try to reach it</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>25</td>
<td>I want to be the best every time I compete.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Appendix 2

Exercise Dependence Questionnaire

Age___ Sex____ Height____ Weight____

We would like to know how much you exercise. Please consider exercise as being any structured activity which increases your heart rate e.g. running, cycling, aerobics, weight training and complete the following sentence:

I exercise for ____ hours per week.

Below are a series of statements that people have used to describe their attitudes to exercise. Please rate each of the statements by circling the appropriate number for how much it describes your attitude to your own exercise over the past month. Please use the following scale:

<table>
<thead>
<tr>
<th>Strongly Disagree</th>
<th>Strongly Agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 2 3 4 5 6 7</td>
<td>1 2 3 4 5 6 7</td>
</tr>
</tbody>
</table>

1. My level of exercising makes me tired at work 1 2 3 4 5 6 7

2. After an exercise session I feel happier about life 1 2 3 4 5 6 7

3. If I cannot exercise I feel irritable 1 2 3 4 5 6 7

4. The rest of my life has to fit in around my exercise 1 2 3 4 5 6 7

5. After an exercise session I feel less anxious 1 2 3 4 5 6 7

6. I exercise to look attractive 1 2 3 4 5 6 7

7. I sometimes miss time at work to exercise 1 2 3 4 5 6 7

8. After an exercise session I feel that I am a better person 1 2 3 4 5 6 7

9. If I cannot exercise I feel agitated 1 2 3 4 5 6 7

10. I exercise to meet other people 1 2 3 4 5 6 7
11. I hate not being able to exercise  
12. I exercise to keep myself occupied  
13. If I cannot exercise I feel I cannot cope with life  
14. I exercise to control my weight  
15. I have little energy for my partner, family and friends  
16. Being thin is the most important thing in my life  
17. I feel guilty about the amount I exercise  
18. I exercise to be healthy  
19. After an exercise session I feel thinner  
20. My level of exercise has become a problem  
21. I make a decision to exercise less but cannot stick to it  
22. I exercise for the same amount of time each week  
23. After an exercise session I feel more positive about myself  
24. My weekly pattern of exercise is repetitive  
25. My pattern of exercise interferes with my social life  
26. I exercise to feel fit  
27. My exercising is ruining my life  
28. I exercise to prevent heart disease and other illness  
29. If I cannot exercise I miss the social life
Appendix 3

**Eating Attitudes Test - 26**

Please check a response for each of the following statements:

<table>
<thead>
<tr>
<th>Statement</th>
<th>Always</th>
<th>Usually</th>
<th>Often</th>
<th>Sometimes</th>
<th>Rarely</th>
<th>Never</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Am terrified about being overweight</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
</tr>
<tr>
<td>2. Avoid eating when I am hungry</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
</tr>
<tr>
<td>3. Find myself preoccupied with food</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
</tr>
<tr>
<td>4. Have gone on eating binges where I feel that I may not be able to stop</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
</tr>
<tr>
<td>5. Cut my food into small pieces</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
</tr>
<tr>
<td>6. Aware of the calorie content of foods that I eat</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
</tr>
<tr>
<td>7. Particularly avoid food with a high carbohydrate content (i.e. bread, rice, potatoes, etc.)</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
</tr>
<tr>
<td>8. Feel that others would prefer if I ate more</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
</tr>
<tr>
<td>9. Vomit after I have eaten</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
</tr>
<tr>
<td>10. Feel extremely guilty after eating</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
</tr>
<tr>
<td>11. Am preoccupied with a desire to be thinner</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
</tr>
<tr>
<td>12. Think about burning up calories when I exercise</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
</tr>
<tr>
<td>13. Other people think that I am too thin</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
</tr>
<tr>
<td>14. Am preoccupied with the thought of having fat on my body</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
</tr>
<tr>
<td>15. Take longer than others to eat my meals</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
</tr>
<tr>
<td>16. Avoid foods with sugar in them</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
</tr>
<tr>
<td>17. Eat diet foods</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
</tr>
<tr>
<td>18. Feel that food controls my life</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
</tr>
<tr>
<td>19. Display self-control around food</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
</tr>
<tr>
<td>20. Feel that others pressure me to eat</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
</tr>
<tr>
<td>21. Give too much time and thought to food</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
</tr>
<tr>
<td>22. Feel uncomfortable after eating sweets</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
</tr>
<tr>
<td>23. Engage in dieting behavior</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
</tr>
<tr>
<td>24. Like my stomach to be empty</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
</tr>
<tr>
<td>25. Enjoy trying new rich foods</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
</tr>
<tr>
<td>26. Have the impulse to vomit after meals</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
</tr>
</tbody>
</table>
Appendix 4

**Daily Drinking Questionnaire**

Directions: Please indicate the number of drinks that you typically consumed on each day of the week over the past 30 days, and how many total hours you spent consuming alcohol. A drink is considered a 12oz beer (i.e., most bottled or canned beer), a 5oz glass of wine (i.e., a regular-sized glass of wine), or a 1.25oz (one shot) drink of hard alcohol. Keep in mind that some drinks have more than one shot of hard alcohol. For example, a Long Island Ice Tea has 4 shots of hard alcohol so it would count as 4 drinks.

Please also indicate over how many hours you drink these drinks. If you do not typically drink on a particular day, please enter a 0 in both spaces provided:

1) Monday:  
   Over how many hours do you drink these drinks?

2) Tuesday:  
   Over how many hours do you drink these drinks?

3) Wednesday:  
   Over how many hours do you drink these drinks?

4) Thursday:  
   Over how many hours do you drink these drinks?

5) Friday:  
   Over how many hours do you drink these drinks?

6) Saturday:  
   Over how many hours do you drink these drinks?

7) Sunday:  
   Over how many hours do you drink these drinks?

8) In the past 30 days, what is the most number of drinks you have had on any one occasion?

9) On that occasion, over how many hours did you consume alcohol?

10) In the past 2 weeks, how many times have you had 5 or more drinks at one sitting (if you are a male), or 4 or more drinks in one sitting (if you are a female)?
Appendix 5

Athletic Status

How would you define your typical level of athletic involvement over the past 12 months? Please select only one response:

☐ Elite Athlete (national or international level)
☐ Varsity Athlete
☐ Recreational Athlete (club sports)
☐ Recreational Athlete (intramural or other organized teams)
☐ Recreational Athlete (informal competition...e.g. pickup hoops, arm wrestling)
☐ Participated in school-sanctioned sport during high school (i.e. former hs athlete)
☐ Exercise Regularly
☐ Exercise Occasionally
☐ Do not Exercise