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Eating Pathology, Supplement Use, and Nutrition Knowledge in Collegiate Athletes

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EATING PATHOLOGY, SUPPLEMENT USE, AND NUTRITION KNOWLEDGE IN COLLEGIATE ATHLETES

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ABSTRACT

Eating Pathology, Supplement Use, and Nutrition Knowledge in Collegiate Athletes

by

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Eating pathology (e.g., body dissatisfaction, binge eating, purging, restrictive eating) and substance use (e.g., dietary supplements, legal and illegal drugs) proliferate university settings in the United States. Within university settings, athletes appear to be at particularly high risk for eating pathology and supplement use due to the external pressures to be attractive, the need to perform at optimal levels, and the specific characteristics of sports in which they participate. Furthermore, the degree to which athletes understand what constitutes healthy eating and exercise habits is understudied and may relate to eating pathology and supplement use. To build on existing research, the overarching purpose of this study was to explore eating pathology, supplement use, and nutrition knowledge in a large sample of male and female Division I athletes. Specifically, I examined 1) base rates and the strength of the relationships between eating pathology, supplement use, level of nutrition knowledge, and the source of nutrition knowledge; 2) differences in base-rates of the aforementioned variables by sex and sport; and 3) differences in the strength of the relationships by sex. Results indicated that, for the sample as a whole, greater ideal-actual weight discrepancy was associated with using less consumable supplements, more muscle-building supplements and less nutrition

knowledge; and more nutrition knowledge was associated with using more consumable supplements (e.g., energy bars, sport drinks). For men, greater ideal-actual weight discrepancy was associated with more overall eating pathology; more overall eating pathology was associated with using more total, weight loss/fat burning, and muscle-building supplements; more nutrition knowledge was associated with using more total, consumable, and muscle-building supplements. For women, greater ideal-actual weight discrepancy was associated with more eating pathology and using less consumable supplements; more eating pathology was associated with using more weight loss/fat burning supplements; and more nutrition knowledge was associated with the using more consumable supplements. Surprisingly, ideal-actual weight discrepancy was not associated with supplement use regardless of sex. Mean levels of ideal-actual weight discrepancy, supplement use, and nutrition knowledge also differed by sex such that women wanted to weigh less and had more nutrition knowledge than men. Conversely, men wanted to weigh more, and used more total and muscle-building supplements. There were no sex differences in the use of any other supplements, including weight-loss fat burning supplements. When examined by sport and sex, both male and female soccer athletes were more satisfied with their body than men and women playing other sports (respectively). For men, football athletes had less nutrition knowledge than other male athletes. Interestingly, there were no differences in supplement use for men's sports. For women, softball athletes reported more ideal-actual weight discrepancy than women who participated in diving/swimming or dance; basketball athletes used more muscle-building supplements than women who participated in soccer, cheerleading, volleyball, track, diving/swimming, softball, and dance; cheerleaders had less nutrition knowledge than

women participating in soccer; basketball athletes had less nutrition knowledge than women who participated in soccer, volleyball, track, diving/swimming, and softball; and dancers had less nutrition knowledge than women who participated in soccer and diving/swimming. Overall, these results suggest that, regardless of sex, athletes consume large quantities of supplements, report widespread ideal-actual weight discrepancy, and lack basic nutrition knowledge. Given that supplement use in athletes can have a number of negative consequences (e.g., loss of eligibility, deleterious health effects, and loss of fan popularity) and inadequate nutritional knowledge can exacerbate unhealthy eating and exercise behaviors, future research should explore methods of improving access to accurate information and reporting procedures to limit the negative consequences of dietary supplementation.

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CHAPTER 1

INTRODUCTION

Eating pathology (e.g., body dissatisfaction, binge eating, purging, restrictive eating) and substance use (e.g., dietary supplements, legal and illegal drugs) proliferate high school and university settings in the United States (APA, 2000; Schwitzer, Bergholz, Dore, & Salimi, 1998). With regards to eating pathology, a recent study of 186 college women found that about half engaged in disordered eating behaviors (e.g., binge eating, purging, laxative/diuretic use, fasting, excessive exercise) at least one time per week (Berg, Frazier, & Sherr, 2009). Similarly, in a sample of 5,173 non-overweight adolescent females, 85% reported engaging in behaviors aimed at weight control and 29% had a distorted body image (Liechty, 2010). With regards to substance use (including legal and illegal drugs), a nationally representative study of 2,000 college students suggested that 23% of full-time college students meet criteria for a substance related disorder (Califano et al., 2007).

In addition to being rampant in high school and college settings, eating pathology and substance abuse are highly comorbid conditions. For example, in a review of the literature, Greenfield, Back, Lawson, and Brady (2010) found that 40% of individuals with a lifetime eating disorder also had a substance use disorder. Similarly, in a sample of 2,436 inpatients with a primary diagnosis of an eating disorder, 97% were diagnosed with one or more additional Axis I disorders, with 22% meeting criteria for a substance use disorder (Blinder, Cumella, & Sanathara, 2006). Rates of comorbid eating pathology and substance abuse are so high that most addiction treatment programs screen for eating pathology. For example, in a sample of 351 addiction treatment programs, over half

reported screening for eating disorders during their intake assessment (Gordon et al., 2008). Despite the high number of programs screening for comorbid eating disorders, only 48% of the treatment programs sampled admitted patients with low-severity co-occurring eating disorders; less than 30% admitted individuals with co-occurring eating disorders regardless of eating disorder severity; and only 17% admitted and provided treatment for eating disorders during substance abuse treatment (Gordon et al.). Taken as a whole, individuals who struggle with eating pathology are more likely to struggle with substance abuse and vice versa but are unlikely to be treated for both issues concurrently.

Within high school and university settings, one population at particular risk for developing eating pathology and substance abuse is competitive athletes (Holm-Denoma, Scaringi, Gordon, Van Orden, & Joiner, 2009; Ford, 2007b). Theoretically, this is because athletes are under extreme pressure from themselves, coaches, and significant others to improve their athletic performance (Galli & Reel, 2009; Muller, Gorrow, & Schneider, 2009; Muscat & Long, 2008). In addition to risk factors related to developing eating pathology and substance use in general (e.g., developmental stage, age), the consequences of not performing to standard include loss of funding, shame, removal from starting roles, heightened pressure from coaching staff, and embarrassment (Galli & Reel; Mellalieu, Neil, Hanton, & Fletcher, 2009).

Given the pressure, athletes are constantly searching for ways to enhance performance, which often includes the use of legal supplements/vitamins or illegal drugs (e.g., steroids, stimulants) (Pramukova, Szabadosova, & Soltesova, 2011). In a recent study examining eating pathology in 204 female collegiate athletes, for example, approximately half were dissatisfied with their current weight and approximately 88%

believed they were overweight (Greenleaf, Petrie, Carter, & Reel, 2009). In a sample of 236 collegiate athletes from 8 universities in the Big 10 Conference, 88% reported using at least one nutritional supplement and over half reported using two or more (Burns, Schiller, Merrick, & Wolf, 2004). Similarly, in a study of 451 varsity and intramural collegiate athletes, 99% of women and 42% of men reported taking dietary supplements (Muller et al.).

Collegiate athletes also engage in binge drinking and misuse of prescription drugs more frequently than collegiate non-athletes (Ford, 2007b; Ford, 2008). However, rates of illicit drug use appear to vary depending on drug class. For example, in a sample of 392 varsity collegiate athletes and 504 non-athletes, Yusko and colleagues (2008) found that male athletes reported using the following substances more frequently than male non-athletes: banned performance enhancing drugs (18% compared to 8%); nutritional supplements (57% compared to 41%); and smokeless tobacco (41% compared to 17%) (Yusko, Buckman, White, & Pandina, 2008). Similarly, for female athletes, the use of nutritional supplements was more frequent among athletes than non-athletes (22% compared to 14%) (Yusko et al.).

Within athletes, one key factor in determining base-rates of eating pathology and substance use in collegiate samples is sex. In the general population, rates of disordered eating are often higher in women than men (Hoerr, Bokram, Lugo, Bivins, & Keast, 2002) and rates of substance abuse are often higher in men than women (Califano et al., 2007; Ford, 2007a). For example, a large-scale study that included 5,740 participants from 152 public, private, and parochial high schools across 34 states found that approximately 15% of girls reported symptoms consistent with eating disorders (i.e.,

above a score of 20 on the Eating Attitudes Test – 26; EAT-26; Garner & Garfinkel, 1979; Garner, Olmstead, Bohr, & Garfinkel, 1982) compared to 4% of boys (Austin et al., 2008). Girls within this study were also more likely than boys to report vomiting to control their weight (12% compared to 4%), engaging in disordered eating or weight control (25% compared to 11%), and receiving treatment for an eating disorder (4% compared to 1%). With regards to substance abuse, a nationally representative study conducted by the Center on Addiction and Substance Abuse at Columbia University that included 2,000 college students found that approximately 41% of men reported using illicit drugs within the past year compared to 34% of women (Califano et al.).

Although sex differences in athletes are generally less differentiated than in the general public, male athletes generally report less eating pathology than female athletes and higher rates of eating pathology than male non-athletes (Byrne & McLean, 2001). In a sample of 1,445 male and female collegiate athletes, symptoms of binge eating disorder (BED) were present in 23% of female athletes compared to 12% of male athletes (Johnson, Powers, & Dick, 1999). Further, 35% of female athletes compared to 10% of male athletes were considered at risk for developing AN whereas 38% of female and 38% of male athletes were identified as at risk for developing BN. Similarly, in a study examining body dissatisfaction in 60 exercisers (i.e., 30 weightlifters and 30 runners) compared to 30 non-exercisers, female runners and female non-exercisers reported more body dissatisfaction than male runners and male non-exercisers (Pasman & Thompson, 1988). However, within males, exercisers (i.e., weightlifters and runners) were more dissatisfied with their body than non-exercisers (Pasman & Thompson).

A second key factor that appears to influence eating pathology and substance use is the type of sport in which one participates (Crissey & Honea, 2006; Picard, 1999). Specifically, students participating in sports that emphasize leanness and low body weight are at the highest risk for eating pathology (Holm-Denoma et al., 2009; Picard; Sundgot-Borgen & Torstveit, 2010). A nationally representative sample of 7,214 adolescents found that girls engaging in stereotypically masculine sports (i.e., basketball, field hockey, football, ice hockey, soccer, track and field, and wrestling) were less likely to perceive themselves as overweight and were less likely to diet than girls participating in stereotypically feminine sports (i.e., cheerleading/dance, swimming, tennis, and volleyball) (Crissey & Honea). In a sample of 109 female collegiate athletes, women participating in Division I athletics were at a higher risk for disordered eating than women participating in Division III athletics (Picard).

Furthermore, with regard to substance abuse, men participating in hockey, baseball, track, and soccer have been identified as more likely to binge drink than other male athletes. For example, in a large sample of 14,000 athletes from 119 universities in 39 states, Ford (2007a) found that men participating in basketball, hockey, and track were more likely than other male athletes to report marijuana use. Additionally, men participating in basketball and track reported more illicit drug use than other male athletes (Ford, 2007a). For women, those participating in soccer were more likely to report binge drinking, marijuana use, and use of any other illicit drug than other female athletes whereas women participating in track and swimming were less likely to report binge drinking, marijuana use, and use of other illicit drugs than other female athletes (Ford, 2007a).

Understanding eating pathology and substance use in collegiate populations is critical because substances can have harmful consequences to performance, physical health, and psychological well-being. While examining illicit substance use in collegiate populations is of great interest, there are a number of concerns with assessing illicit substance use in athletic populations. The NCAA issues strict consequences, including the loss of eligibility for play and in repeat offenders, permanent ineligibility (NCAA, 2012). The aforementioned consequences often result in athletes under-reporting their intake of illicit substance and empirical research relying on self-reported illicit substance use rather than objective substance use methods (i.e., toxicology reports) has significantly validity concerns. Further, empirical research is difficult because researchers must balance the knowledge of illicit substance use in athletes and the potential harm that could come to the athletes as a result of such use (Kanayama, Hudson, & Pope, 2008) and there are ethical concerns for stigmatization of participants (Striley, 2011). Additionally, admitting to drug use can affect the reputation of the athlete and school. For example, a study of Norwegian sport fans found that fans were in clear opposition of illicit substance use (including anabolic steroids) whereas fans held positive attitudes regarding the use of dietary supplements by Norwegian athletes (Solberg, Hanstad, & Thoring, 2010). A qualitative study interviewing athletes who admitted to sports doping found that being viewed as a "cheater" was the greatest deterent to future performance enhancing substance use (Kirby, Moran, & Guerin, 2011).

Given the highly aversive consequences to athletes who use or are caught using drugs, athletes may be more likely to use and honestly report using substances that improve performance but are legal, such as dietary supplements. While the NCAA does

not explicitly ban dietary supplements, the organization warns athletes of the use of dietary supplements, as they are often poorly regulated and may contain substances that are banned by the NCAA. For example, supplement use may also be associated with dehydration, gout, liver damage, kidney damage, calcium loss, and gastrointestinal effects (Beltz & Doering, 1993) and higher illicit substance use (Stephens & Olsen, 2001; Yussman, Wilson, & Klein, 2006). In a sample of 2,407 adolescents from 32 schools in New York, students who reported using herbal supplements had higher rates of drug use than students not reporting supplement use in every drug category surveyed (alcohol, tobacco, marijuana, hallucinogens, inhalants, cocaine, methamphetamine, steroids, heroin, and IV drugs; Yussman et al.). However, when using supplements, knowledge of their effectiveness or other nutritional requirements may be absent (Burns et al., 2004; Dascombe, Karunaratna, Cartoon, Fergie, & Goodman, 2010).

Consequently, to expand our understanding of this topic, the overarching purpose of this study was to explore the relationships between eating pathology, supplement use, and nutrition knowledge in a large sample of male and female Division I athletes. Specifically, I examined 1) base rates and the strength of the relationships between eating pathology, supplement use, level of nutrition knowledge, and the source of nutrition knowledge; 2) differences in base-rates of the aforementioned variables by sex and sport; and 3) differences in the strength of the relationships by sex.

CHAPTER 2

REVIEW OF RELATED LITERATURE

2.1 Eating Pathology and Substance Use: Descriptive Information

Eating pathology and substance use are highly prevalent in college-aged men and women. Although these disorders are highly comorbid, it is essential to review general diagnostic information for each disorder separately prior to an in-depth review of the literature. Specifically, this section reviews eating pathology and substance use in adolescent and young adult populations because the focus of this project is collegiate athletes (which includes men and women ranging from 18-22) and overlaps with older adolescent/young adult samples.

Eating Pathology

The *Diagnostic and Statistical Manual of Mental Disorders, 4th edition, Text Revision* (DSM-IV-TR) provides diagnostic guidelines for three eating disorder diagnoses: anorexia nervosa (AN), bulimia nervosa (BN), and eating disorder-not otherwise specified (EDNOS). AN is characterized by refusal to maintain a healthy weight (i.e., body weight below 85% of expected weight), intense fear of weight gain, and persistent misperception of the shape and size of one's body (APA, 2000). Alternatively, individuals who struggle with BN engage in binge eating, defined as an episode of overeating during which the individual feels out of control of their consumption. Binge eating episodes are followed by compensatory methods aimed at prevention of weight gain and these episodes occur frequently (i.e., at least 2 times per week for a duration of 3 months). Further, individuals with BN evaluate themselves based on their perceived body weight and shape. The diagnosis of EDNOS is applied when individuals evidence

significant eating disturbances that do not qualify for one of the other established diagnoses (APA, 2000). Binge eating disorder (BED), which is likely to appear in the DSM-V (publication anticipated in 2013), currently falls under the EDNOS diagnosis and is conceptualized as the presence of recurrent binge eating episodes and the lack of self-control surrounding these episodes followed by significant distress without compensatory methods. With the publication of the DSM-V, proposed changes to the diagnostic criteria for eating disorders include reducing the required frequency of binge eating episodes for BN and eliminating the requirement of amenorrhea for AN (Machado, Goncalves, & Hoek, 2013).

The lifetime prevalence of clinically diagnosable eating disorders among adolescents living in Western cultures is approximately 0.5% for AN and 1-3% for BN (Fairburn & Harrison, 2003). Lifetime prevalence for BED is about 5% in the general population (Hudson, Hiripi, Pope, & Kessler, 2007). Eating disorders are more prevalent in women than men with approximately 90% of individuals suffering from AN and BN being women living in Western cultures (APA, 2000).

Although clinically diagnosable rates of eating disorders affect few individuals within the general population over the course of a lifetime (Fairburn & Harrison, 2003), subclinical levels of eating pathology are rampant, particularly in college-aged samples (Schwitzer et al., 1998). Eating pathology is defined as the presence of disordered eating behaviors (e.g., binge eating, purging, restrictive eating) and body image problems (e.g., body dissatisfaction, perceptual distortion) that interfere with the ability to live a fulfilling life (Schwitzer et al.). For example, in a sample of 186 college women, disordered eating behaviors occurred at least one time per week in about 50% of the

sample (Berg et al., 2009). Body dissatisfaction, defined as feelings of unhappiness with one's current body shape or size (Ogden, 2010a), is more prevalent in college-aged women compared to other populations (Klemchuk, Hutchinson, & Frank, 1990). In a recent sample of 282 college men and women, for example, 67% reported body dissatisfaction, defined as sometimes or often thinking about their weight, body image, dieting, or exercising (Paap & Gardner, 2011).

Substance Abuse and Dependence

The DSM-IV-TR (APA, 2000) defines substance abuse as a maladaptive pattern of substance use that leads to clinically significant impairment or distress that is apparent by failure to fulfill major role obligations; use in physically hazardous situations; legal problems; or use despite persistent or recurrent social or interpersonal problems. Substance dependence is more severe than abuse and is characterized by tolerance; withdrawal; use over longer periods of time than intended; persistent desire or unsuccessful efforts to cut down or control use; spending time in activities necessary to obtain, use, or recover from the substance; reduction of important social, occupational, or recreational activities; and continued use despite having persistent physical or psychological problems. With the publication of the DSM-V, proposed changes to the diagnostic criteria of substance abuse and dependence include the elimination of separate abuse and dependence diagnoses, instead diagnosing mild, moderate, or severe substance use disorders (Peer et al., 2013).

Substance use is diagnosed using eleven broad drug classes including alcohol, amphetamines, caffeine, cannabis, cocaine, hallucinogens, inhalants, nicotine, opioids, phencyclidine, and sedatives/hypnotics/anxiolytics. Additionally, an "Other" category

allows for diagnosis of drugs not classified elsewhere including anabolic steroids, over-the-counter drugs, nitrite inhalants, nitrous oxide, and other substances capable of producing intoxication (DSM-IV-TR; APA, 2000). Dietary supplements utilized for weight loss are often classified as amphetamines and may also meet criteria for abuse or dependence (as well as compensatory behavior characterized by BN).

According to the DSM-IV-TR, college-aged adults have the highest prevalence of substance use compared to other age groups, particularly alcohol (APA, 2000). Specifically, a nationally representative survey with 2,000 college students conducted by the Center on Addiction and Substance Abuse (CASA) at Columbia University found that approximately 23% of full-time college students meet criteria for substance abuse or dependence (Califano et al., 2007). In another study examining drug use in 411 college students, 65% used tobacco and 61% used marijuana (O'Grady, Arria, Fitzele, & Wish, 2008). Additionally, 17% used analgesics, 15% used stimulants, 15% used hallucinogens, 10% used ecstasy, 8% used cocaine, and 7% used ecstasy during their lifetime (O'Grady et al.). Generally, substance abuse is more common in men than in women (DSM-IV-TR; APA, 2000). In a sample of 4,580 college students, McCabe et al. (2007) reported that overall, men were 1.2 times more likely than women to use substances.

Although substance abuse and dependence represent use that is consistent with significant distress and impairment, many college-aged adults that use substances do not experience associated problems. In a recent qualitative study with 91 college students, 55% reported use of prescription drugs for the purpose of getting high, having fun, or socializing with friends on at least one occasion (Quintero, 2009). These individuals reported engaging in a number of strategies aimed at reducing the negative consequences

of use including setting limits on the quantity of the drug consumed, taking the drug across spaced time intervals, eating or drinking water along with the drug, not mixing the drug with alcohol, and only using the drug in the presence of trusted friends. However, individuals who report recreational use without associated distress must be identified because research suggests that even recreational levels of substance use may be related to body image concerns within adolescent and adult populations (Gritz & Crane, 1991; Haley, Hedberg, & Leman, 2010; Pisetsky, Chao, Dierker, May & Striegel-Moore, 2008).

2.2 Comorbidity between Eating Pathology and Substance Use

Eating pathology and substance use frequently co-occur. Given the astonishingly high rates of substance use within individuals evidencing eating pathology, attempts to classify the specific relationships that exist among types of eating pathology and substances used is necessary. The ways in which eating pathology and substance abuse co-occur form three primary research perspectives: 1) general trends in research literature by symptom type; 2) research examining eating pathology in individuals diagnosed with a substance abuse problem; and 3) research examining substance use in individuals diagnosed with an eating disorder. Each is reviewed below.

Eating Pathology and Substance Use: General Trends

General Eating Pathology and Substance Use. Among adolescent and adult women, substance use is generally positively associated with disordered eating, regardless of the substance used (Krug et al., 2008; Piran & Robinson, 2006a; Von Ranson, Iacono, & McGue, 2002). In a community sample of 20,211 Canadian women, lifetime illicit drug use was significantly related to higher risk of eating disorders and increased eating pathology was associated with use of more substances (Piran & Gadalla, 2007). In

another study of Canadian women that included 174 without an eating disorder, 38 who engaged in binge eating, and 29 who engaged in severe dieting, those who engaged in binge eating were more likely to use alcohol at severe levels than those without an eating disorder and those who engage in severe dieting (Piran & Robinson, 2006b). Finally, a sample of women with substance-related disorders that included 66 women with a co-occurring eating disorder and 211 women without a comorbid diagnosis, women with co-occurring eating disorders reported more health concerns and were less likely to have received past substance use treatment than those diagnosed with a substance-related disorder alone (Specker, Westermeyer, & Thuras 2000). While a majority of the sample reported developing an eating disorder first (i.e., 42 out of 66) there were no differences among those with a co-occurring eating disorder and those with a substance related disorder alone with regards to course and severity of substance use.

Obesity and Substance Use. Although not an eating disorder per se, the research literature has linked obesity to recurrent substance use. In a study examining the prevalence of bariatric surgery among those admitted to a substance abuse treatment facility over several years, 2-6% of women admitted reported past bariatric surgery to treat obesity. These women who reported past bariatric surgery evidenced greater alcohol use; were more likely to seek treatment for alcohol use; and had higher rates of co-occurring alcohol and illicit drug use (including benzodiazepines) compared to those without a history of bariatric surgery (Saules et al., 2010). Furthermore, almost half of those with past bariatric surgery reported that they initiated heavy substance use after bariatric surgery whereas approximately one third reported that they initiated heavy substance use before bariatric surgery. Additionally, 20% engaged in substance use prior

to bariatric surgery but increased their use after surgery (Saules et al.). When examining the course of substance use with specific drugs in this sample, approximately 62% initiated heavy alcohol use prior to surgery whereas approximately 67% initiated heavy opiate use and 90% initiated heavy benzodiazepine use after surgery.

Eating Pathology in Individuals that Use Substances

Individuals who abuse a wide range of substances (including alcohol, nicotine, and illegal drugs) are at increased risk for unhealthy eating behaviors (Peveler & Fairburn, 1990; Stewart, Brown, Devoulyte, Theakston, & Larsen, 2006). Trends in symptom presentation are discussed separately for alcohol use, stimulant use, and marijuana use (specifically) because they are some of the most robust findings in the literature.

Alcohol. Comprehensive literature reviews suggest that among individuals who binge drink, eating pathology (particularly binge eating) is often present (Conason & Sher, 2006; Ferriter & Ray, 2011). In a sample of 31 women seeking treatment for alcohol use, a quarter also met criteria for a current eating disorder based on responses to the Eating Disorder Examination – Questionnaire (EDE-Q; Cooper & Fairburn, 1987). Additionally, one-third engaged in binge eating within the past 28 days and one-quarter engaged in purging, misuse of laxatives/diuretics, or extreme exercising (Peveler & Fairburn, 1990). Interestingly, within this sample of women, approximately 36% reported being significantly underweight in the past (Peveler & Fairburn). Similarly, in a sample of 58 women seeking treatment for alcohol dependence, two thirds reported binge eating behavior, with 90% of those engaging in 'severe' binge eating (Stewart et al., 2006).

When binge eating is present in those recovering from substances, it often complicates treatment and results in poorer outcomes. For example, in a sample of 35

women participating in outpatient substance abuse treatment, those who engaged in binge eating reported fewer days of abstinence from substances compared to those not binge eating (Cohen et al., 2010).

Stimulants and Amphetamines. In general, individuals who use stimulants and amphetamines often do so in coordination with a desire to lose weight. For example, adolescents and adults frequently report using nicotine (Gritz & Crane, 1991; Haley et al., 2010; Pomerleau et al., 1993) and other stimulants (e.g., methamphetamine) as a means of losing or controlling weight (Brecht, O'Brien, Mayrauser, & Anglin, 2004). In a sample of 350 individuals treated for methamphetamine use who were interviewed following their treatment, 36% of women and 7% of men reported use of methamphetamine for weight loss (Brecht et al.). In fact, in a review of the literature, Greenfield and colleagues argued that women relapse about three times more often than men due to weight concerns (Greenfield et al., 2010).

Marijuana. Individuals who use marijuana may be more likely to engage in unhealthy eating behaviors. In a study of 725 college students, men and women who reported marijuana use were over twice as likely to have an eating disorder than those who did not use marijuana (Page & Scanlan, 1999). Additionally, in a sample of 4,732 adolescent boys and girls, those who were currently dieting were more likely to report marijuana use than those not currently dieting (Crow, Eisenberg, Story, & Neumark-Sztainer, 2006). Even among those not reporting body dissatisfaction, unhealthy eating practices may be found within those using marijuana. Indeed, in a sample of 145 high school students, those who reported marijuana use were more likely to eat high-fat foods (Arcan, Kubik, Fulkerson, Hannan, & Story, 2011).

Substance Use in Individuals with a Primary Diagnosis of Eating Pathology

General Eating Pathology. Research suggests that individuals seeking eating disorder treatment report higher rates of recreational substance use. Recent meta-analyses report that illicit substance use (in general) is associated with eating disorders, particularly those engaging in binge eating (Calero-Elvira et al., 2009; Corcos et al., 2001). Within adolescent samples, most studies report less substance use in individuals with primarily restrictive eating disorder symptoms compared to those with binge eating behaviors (Castros-Fornieles et al., 2010; Stock, Goldberg, Corbett, & Katzman, 2002). However, at least one study reported similar rates of substance use in restrictive and binge eating groups (Corte & Stein, 2000).

In clinical samples of individuals struggling with eating pathology, substance use is highly prevalent (Herzog et al., 2006; Specker et al., 2000) and is most frequently associated with symptoms of BN and least frequently associated with symptoms of AN (Root, Pinheiro, et al., 2010; Root, Pisetsky, et al., 2010; Specker et al.). For example, in a sample of 2,436 women receiving inpatient treatment for eating disorders, Blinder and colleagues (2006) found that individuals with BN and anorexia nervosa, bingeing type (AN-BP) were 7 (BN; 34%) and 4 (AN; 20%) times more likely to evidence a substance use disorder than those with restricting type of AN (5%).

Individuals with eating disorders and subclinical eating disorders, regardless of sex, commonly report using cigarettes (Castro-Fornieles et al., 2010; Krug et al., 2008; Lock, Reisel, & Steiner, 2001) and alcohol (Franko et al., 2005; Root, Pinheiro, et al., 2010; Root, Pisetsky, et al., 2010). With regards to cigarettes, smokers generally report greater weight concerns and the belief that smoking will suppress weight (Clark et al., 2005;

White, McKee, & O'Malley, 2007). Alcohol use is also present at higher frequencies among those with eating disorders or at risk for developing eating disorders (Harrell, Slane, & Klump, 2009; Khaylis, Trockel, & Taylor, 2009; Lundholm, 1989; Striegel-Moore & Huydic, 1993). Specifically, alcohol use disorders are comorbid in 20% to 27% of women diagnosed with eating disorders (Franko et al., 2005; Root, Pinheiro, et al., 2010; Root, Pisetsky, et al., 2010).

Drug use disorders are associated with eating disorders as well, with estimates from 14% to 32%, depending on the diagnosis (Herzog et al., 2006; Root, Pinheiro, et al., 2010). In one study of 731 women with eating disorders, individuals with both AN and BN were more likely than individuals with other eating disorder diagnoses to present with a co-occurring drug use disorder, with about 32% of the sample having a comorbid diagnosis (Root, Pinheiro, et al.). In a sample of 554 women seeking treatment for eating disorders, 17% had a co-occurring drug use disorder. Furthermore, 37% of individuals with an eating disorder and drug use disorder also met criteria for an alcohol use disorder (Herzog et al.).

With regards to specific illicit substances, marijuana (Krahn, Kurth, Demitack, & Drewnowski, 1992; Lock et al., 2001), stimulants (Parkes, Saewyc, Cox, & MacKay, 2008), heroin (Lock et al.), and cocaine (Lock et al.) have all been associated with eating pathology within adolescent and adult populations. In fact, some studies report rates of substance use up to four times higher in those with weight or eating concerns compared to those without weight or eating concerns (Parkes et al.). The most frequently reported drugs in the literature are amphetamines (Herzog et al. 2006; Root, Pinheiro, et al., 2010), cocaine (Herzog et al; Root, Pinheiro, et al.), sedatives (Root, Pinheiro, et al.; Root,

Pisetsky, et al., 2010), and marijuana (Herzog et al.; Root, Pinheiro, et al.). Interestingly, one study that included 13,297 women found higher rates of opioid, stimulant, and hallucinogen use in those with AN compared to those with BN or BED (Root, Pisetsky, et al.). However, those with AN or BN alone were more likely to report cannabis use and a history of opioid, stimulant, or heavy sedative use (Root, Pisetsky, et al.).

Restricting and/or Weight Control Behaviors. Higher rates of alcohol use have been identified in individuals who restrict caloric intake (Giles, Champion, Sutfin, McCoy, & Wagoner, 2009), actively engage in abnormal methods of weight control (Cance, Ashley, & Penne, 2005; Krahn, 1991), and currently diet (Krahn, Kurth, Gomberg, & Drewnowski, 2005). In a sample of 255 college women, for example, rates of alcohol use were similar for those wishing to lose weight and those not wishing to lose weight; however, those wishing to lose weight were more likely to report that their alcohol use lead to physical injury, regretting actions, or forced intercourse than those not wishing to lose weight (Dams-O'Connor, Martens, & Anderson, 2006). In a sample of 1,905 adolescent girls, dieting during the 6th grade was positively related to alcohol use in the 9th grade (Krahn et al., 1996). Another study with 490 collegiate women found that women with a history of alcohol use combined with weight concerns were more likely to initiate cigarette use by the end of college but this was often moderated by the onset of depression (Saules et al., 2004).

Cigarette use is also common among individuals engaging in unhealthy methods of weight loss (Cance et al., 2005; Johnson, Eaton, Pederson, & Lowry, 2009; Neumark-Sztainer, Story, & French, 1996) and individuals with a history of dieting who do not cite weight loss as a primary motivator for use (Austin & Gortmaker, 2001). For example, in

a sample of 4,592 adolescent girls, 40% of girls who engaged in recent laxative use or purging behavior reported smoking cigarettes compared to 19% of girls who did not engage in recent laxative use or purging behavior (Cance et al.). Furthermore, many individuals report that initiation of smoking was due to their desire to control weight (Al Sabbah et al., 2010; Camp, Klesges, & Relyea, 1993; Fulkerson & French, 2003; Garry, Morissey, & Whetstone, 2003; Klesges & Klesges, 1988).

Sex differences within those smoking as a means of weight control generally support the notion that women engage in this method more frequently than men (Garry et al., 2003; Greenfield et al., 2010; Klesges & Klesges, 1988). For example, in a sample of 1,076 male and female college students, faculty, and staff, 39% of female smokers reported smoking as a dieting method compared to 25% of male smokers (Klesges & Klesges, 1988). Camp et al. (1993) also found support for sex differences in a sample of 659 adolescents, with about 46% of Caucasian girls smoking for weight-control compared to 30% of Caucasian boys, 14% of African American boys, and 10% of African American girls.

Although other research has supported the finding that female adolescents reporting dieting or body image dissatisfaction smoke more frequently (French, Perry, Leon, & Fulkerson, 1994), few studies have found this in emerging and young adult populations (Copeland & Carney, 2003; Facchini, Rozenstein, & Gonzalez, 2005; Wechsler, Lee, & Rigotti, 2001). For example, within a sample of 1,705 adolescents, 76 girls and 88 boys reported smoking and girls who reported dieting or body dissatisfaction (fear of weight gain or wanting to be thinner) were twice as likely to smoke as girls who did not report dieting or body dissatisfaction (French et al.). Additionally, in a large sample of 16,862

adolescents, 9% reported experimental cigarette use and 6% were considering cigarette use (Tomeo, Field, Berkey, Colditz, & Frazier, 1999). In this study, girls with weight concerns who were not frequent smokers were more likely to report experimental cigarette use and contemplation of use than those not reporting weight concerns (Tomeo et al.). One study in 506 female smokers found a negative relationship between confidence to quit smoking and concerns about weight gain (Glasgow, Strycker, Eakin, Boles, & Whitlock, 1999), suggesting that concerns regarding weight gain may lead to poorer cigarette cessation treatment outcome.

Adolescents engaging in laxative use or vomiting in order to control their weight are also more likely to use illicit drugs such as marijuana, cocaine, heroin, inhalants, opiates, and amphetamines (Cance et al., 2005). In one study of 4,292 adolescent girls, those who used laxatives or engaged in purging behaviors evidenced rates of ecstasy use five times greater than those who did not engage in unhealthy weight loss practices (Cance et al.). Similarly, in a sample of 454 women diagnosed with AN or BN, Wiederman and Pryor (1996) found a positive relationship between amphetamine use and increased caloric restriction in those with AN.

In sum, dieting, caloric restriction, and contemplation of weight loss are all associated with higher rates of substance use within adolescent and adult populations, particularly with regards to cigarette and alcohol use. A few researchers suggest that smoking for weight control may follow a developmental progression (Charlton, 1984; Wechsler et al., 2001). However, it is unclear why this progression occurs. As reviewed below, binge eating with and without compensatory methods is also associated with higher rates of substance use.

Binge Eating. Given the particularly strong association between alcohol use and binge eating (Benjamin & Wulfert, 2005; Luce, Engler, & Crowther, 2007; Piran & Robinson, 2006a), it is not surprising that individuals with BN and BED generally evidence higher rates of substance use than individuals with AN (Baptista, Sampaio, do Carmo, Reis, & Galvao-Teles, 1996; Bushnell et al., 1994; Gadalla & Piran, 2007; Ross & Ivis, 1999; Wiederman & Pryor, 1996; Wiederman & Pryor, 1997). For example, in a sample of 454 women receiving outpatient therapy for AN or BN, purging behaviors predicted the use of alcohol, cocaine, and cigarettes while binge eating predicted tranquilizer use (Wiederman & Pryor, 1996). In another study with 80 adolescents receiving treatment for BN, 66% of adolescents reported having tried alcohol at least once, 40% reported use more than one time per month and 4% reported use multiple times per week (Fisher & le Grange, 2007). In this sample, 30% reported use of illegal drugs at least once with marijuana the most commonly reported (35%), followed by cocaine (34%) and amphetamines (30%).

In a small sample of 13 women diagnosed with BN and 17 women without an eating disorder, those with BN reported that urges to restrict food and exercise were reduced after drinking alcohol whereas those without an eating disorder did not report this experience (Bruce et al., 2010). Conversely, in a sample of 71 individuals seeking treatment for BN or AN, participants with BN reported that alcohol increased their appetite whereas women with AN reported that alcohol had no influence on their appetite (Bulik et al., 1992). At least one group of researchers suggested that those engaging in binge eating may drink alcohol more frequently as a coping mechanism (Luce et al., 2007). Specifically, in a sample of 383 female college students, those participants with

symptoms of BN and BED were more likely to endorse drinking as a means of coping than participants with subclinical or no eating disorder (Luce et al.).

Individuals with BN are more likely to report higher rates of smoking and decreased appetite associated with cigarette use (Bulik et al., 1992; Welch & Fairburn, 1998). In fact, in a sample of adolescents seeking treatment for full or subclinical BN, approximately 42% reported trying cigarettes and 34% reported regular smoking (Fisher & le Grange, 2007). Within a sample of 20 smokers and 20 non-smokers with BN at a treatment center, smoking was associated with poorer health, greater alcohol consumption, greater psychiatric comorbidity, and less motivation for treatment compared to non-smokers (Sandager et al., 2008).

Higher rates of illicit drug use is present within those with BN diagnoses compared to those with AN (Bulik et al., 1992). Specifically, those with BN are more likely to use marijuana (Bulik et al.; Fischer & le Grange, 2007; Welch & Fairburn, 1996), cocaine (Fischer & le Grange), and amphetamines (Bulik et al.; Fischer & le Grange). One sample of 80 adolescents seeking treatment for BN or subclinical BN found that 30% reported trying illicit drugs (Fischer & le Grange). Although not an illicit substance, caffeine is also frequently used at toxic levels in individuals with bulimia nervosa as a means of weight control (Fahy & Treasure, 1991). Most often it appears to be used in conjunction with laxatives, caffeine pills, drinks, appetite suppressants, and purging behaviors.

Although individuals with BN and BED both engage in more substance use than individuals with no eating disorder, the negative consequences related to use for women with BN appear to be more harmful compared to individuals with BED, AN, or no eating

disorder (Anderson, Martens, & Cimini, 2005; Dansky, Brewerton, & Kilpatrick, 2000; Dunn, Larimer, & Neighbors, 2002). For example, one study with 1,864 college women and 1,149 college men found that women diagnosed with BN experienced more alcohol and drug related consequences than women with no eating disorder (Dunn et al.). There were no differences for women diagnosed with BED compared to women with no eating disorder.

Furthermore, sex differences are present with more women engaging in weight loss strategies than men (Ross & Ivis, 1999). In fact, a study with 1,068 girls and 934 boys between the ages 10 to 20 years found that boys who reported binge eating were more likely to report attempting to gain weight whereas girls who reported binge eating were more likely to report attempting to lose weight (Ross & Ivis). In a study of 404 men and women receiving treatment for BED, men diagnosed with BED were more likely to have a lifetime history of a substance use disorder than women diagnosed with BED (Grilo, White, & Masheb, 2009).

Upon examining the link between binge eating and substance use, some researchers have suggested there is a genetic contribution (Baker, Mazzeo, & Kendler, 2007); however, this has not always been supported within the literature (Kaye et al., 1996). Higher rates of depression (Baker et al.; Bushnell et al., 1994), neuroticism (Baker et al.), mania (Bushnell et al.), and childhood sexual abuse (Baker et al.) have been identified within women with binge eating behaviors suggesting possible personality features that may increase the risk of developing a substance use disorder. For example, one sample of 19 women with co-occurring BN and alcohol use, 29 women with BN recruited from eating disorder clinics, and 24 women without eating disorders were surveyed regarding

their expectancies and reasons for substance use (Bruce, Mansour, & Steiger, 2009). Participants with BN were more likely to believe in eating for alleviating negative affect; alleviating boredom; leading to feeling out of control; and thinness and restricting leading to life improvement compared to a group of healthy controls (Bruce et al.). Furthermore, women in the sample with a comorbid alcohol use disorder reported more alcohol expectancies with regard to positive change; sexual enhancement; physical/social pleasure; social assertiveness; relaxation; and arousal/power than controls or women with bulimia nervosa alone (Bruce et al.).

Obesity. Although the direct relationship between obesity and rates of substance use has not been fully explored, BMI has been linked to substance use (Saules, Levine, Marcus, & Pomerleau, 2007). For example, in a study with 89 women smokers who were overweight, those participants with onset of weight problems in childhood were more likely to evidence unhealthy weight control habits in adulthood including smoking in order to control weight than women with onset of weight problems in adolescence/adulthood (Saules et al.). Within this sample, women with childhood onset of weight problems started smoking at a younger age and evidenced more withdrawal symptoms such as anger, irritability, sadness, and depression upon cigarette cessation compared to those with adolescent/adulthood onset of weight problems (Saules et al.).

Barry and Petry (2009) examined the presence of substance use disorders and BMI in a sample of 41,654 adults and found that men in the *Overweight* or *Obese* range (BMI = 25+) evidenced higher rates of alcohol abuse and dependence than average weight men. The results were the opposite for overweight and obese women, who were less likely to have alcohol abuse in the past year than normal weight women. After controlling for

lifetime and past year drug use disorders and nicotine dependence, BMI was no longer related to lifetime alcohol dependence for men; however, BMI and alcohol dependence in the past year became significant for women such that overweight women were more likely to have nicotine dependence in their lifetime than normal weight women while obese women were more likely to have nicotine dependence in the past year than normal weight women (Barry & Petry, 2009). Conversely, within this sample, nicotine dependence (lifetime and past-year) was less frequent among overweight and obese men than normal weight men.

Thus, similar to the research on general eating pathology, caloric restriction, dieting, binge eating, and BMI are strongly associated with non-clinical levels of substance use. Similarly, clinical rates of substance use, such as levels of use consistent with substance related disorders are associated with clinical and subclinical eating disorders.

2.3 Eating Pathology and Substance Use in Athletic Populations

Comprehensive literature reviews report that athletes participating in competitive sports that emphasize leanness and low body weight evidence higher rates of disordered eating than controls (Holm-Denoma et al., 2009; Sundgot-Borgen & Torstveit, 2010) and higher rates of illicit substance use are often present within athletic groups (Ford, 2007b; Ford, 2008; Yusko et al., 2008). Additionally, student athletes may be at an even greater risk for excessive exercising, strict dieting, and steroid use when body image concerns are present (Greenleaf et al., 2009; Kanayama, Barry, Hudson, & Pope, 2006).

Research examining the prevalence of eating pathology and substance use in athletes form three primary research perspectives; 1) eating pathology and substance use in athletes versus non-athletes, 2) sex differences in eating pathology and substance use in

athletes, and 3) differences in eating pathology and substance use by sport involvement. Each is reviewed below.

Eating Pathology and Substance Use in Athletes

Eating Pathology. Base-rates of eating pathology are frequently higher among collegiate athletes than in the general population and collegiate non-athletes (Holm-Denoma et al., 2009). In a sample of 204 women representing 17 Division I sports (including those with starting positions [i.e., 68%] and those on scholarship [i.e., 89%]), more dissatisfaction with body size and shape, greater dietary restraint, and higher levels of guilt were associated with more symptoms of BN (Greenleaf, Petrie, Reel, & Carter, 2010). Additionally, approximately half of participants were dissatisfied with their current weight and approximately 88% believed they were overweight and wished to lose an average of 13 lbs (Greenleaf et al., 2009). Within this sample, approximately 2% met criteria for an eating disorder and an additional 25% evidenced subclinical symptoms of an eating disorder (Greenleaf et al., 2009).

Concern over weight gain was also present in 107 women playing collegiate tennis who had an average BMI of 21.5 (i.e., Normal range; Harris, 2000). The athletes believed they played better when they weighed less, with 8% engaging in abnormal eating patterns and holding abnormal weight attitudes (Harris). Additionally, when compared to athletes with no weight concern, athletes who were more concerned with their weight exhibited more abnormal eating patterns, a larger BMI, and a larger perceived body size (Harris). When the athletes' coaches were surveyed regarding reasons to encourage weight loss in student athletes, they reported that a lack of speed; lack of stamina; conditioning;

appearance; percentage of body fat; injuries; agility; strength; overall weight; mood changes; overall health; speed of recovery; and flexibility were all considered (Harris).

Male athletes also commonly report a negative body image (Atkinson, 2011; Baum, 2006). For instance, Galli and Reel (2009) interviewed 12 men representing swimming, lacrosse, football, baseball, golf, and skiing and found that approximately 80% were dissatisfied with their physique, which they reported as feeling as though they did not measure up to the ideal standard for other men in their respective sport. Despite overwhelming support for feelings of dissatisfaction, 70% simultaneously reported having positive feelings regarding their bodies. This finding suggested that while male athletes were self-critical regarding their body and reported attempts to improve their body, they were also proud of their current physique (Galli & Reel).

Substance Use. Within collegiate populations, athletes are generally more likely to engage in binge drinking (Ford, 2007b; Yusko et al., 2008) and misuse prescription drugs (Ford, 2008). However, prevalence of illicit substance use among athletes is less clear, with some research reporting lower rates of marijuana and other illicit drugs in male athletes compared to male non-athletes (Califano et al., 2007; Ford, 2007a). At least one study reported that within 893 collegiate athletes, male non-athletes were more likely than male athletes to report lifetime cigarette, hallucinogen, and other drug use; high school, lifetime, and past year use of designer drugs; and past year use of marijuana (Yusko et al.). There were no differences in substance use for female athletes compared to female non-athletes (Ford, 2007a).

While male athletes reported less consumption of alcohol than male non-athletes, male athletes were more likely to report lifetime and high school use of banned

performance enhancing drugs and nutritional supplements than male non-athletes (Yusko et al., 2008). Further, Yusko and colleagues reported that within their sample of 893 athletes participating in a mandatory alcohol education program at their university, men participating in athletics were more likely than men not participating in athletics to report lifetime and high school use of banned performance enhancing drugs and nutritional supplements as well as past year use of banned performance enhancing drugs, nutritional supplements, and smokeless tobacco. Thus, examining the class of the substance may be important when determining base-rates of substance use within athletic populations.

Sex Differences in Eating Pathology and Substance Use in Athletes

Eating Pathology. There appear to be sex differences with regards to body dissatisfaction among athletes (Busanich & McGannon, 2010). Among 42 French synchronized swimmers, men and women differed with regards to perception of their weight and body status (Urdapilleta, Aspavlo, Masse, & Docteur, 2010). Specifically, men were more concerned with the front-side of their body, viewing it less realistically with more variability from actual versus ideal front view than women. However, women were more concerned with the backside of their body, judging it as larger than their ideal body size and actual body shape (Urdapilleta et al). Thus, although men and women may have different areas of focus with regards to their body, both sexes have perceptions and ideals that are markedly different than their actual body shape.

Within adolescent athletes there are also sex differences with regards to ideal body shape (Byrne & McLean, 2001). Rosendahl, Bormann, Aschenbrenner, Aschenbrenner, and Strauss (2009) presented evidence from a study of 210 girls and 366 boys attending sports schools in Germany that suggested student athletes often evidence low BMI. In

their sample, there were more underweight athletic boys than underweight boys from non-sports schools. With regards to ideal body, on average, 60% of boys wished to gain approximately 2 kg whereas 70% of girls wished to lose approximately 3 kg. However, the researchers reported that while disordered eating was generally more common in girls than boys, girls not participating in sports engaged in disordered eating more frequently than girls participating in sports. Interestingly, boys who wished to lose weight were five times more likely to engage in disordered eating than boys who were satisfied with their current weight or wished to gain weight.

For some men, desiring a larger size may be related to their perception of athletic competence (MacKinnon et al., 2003). In fact, in a sample of 2,323 football players from 31 different high schools, measured percentage of body fat was predictive of the athletes' perceived athletic competence as well as body image (MacKinnon et al.). In the sample, boys with a lower body fat percentage perceived themselves to be better at sports and were more satisfied with their body. However, when actual athleticism was measured via a strength-training task (i.e., maximum bench press performance), there was no relationship between performance and body image (MacKinnon et al.).

Substance Use. Several studies have identified higher levels of substance use in male athletes compared to female athletes (Buckman, Yusko, Farris, White, & Pandina, 2011; Ford, 2007a; Green, Uryasz, Petr, & Bray, 2001). In a sample of 2,316 collegiate athletes, 54% of men reported binge drinking compared to 39% of women (Ford, 2007a). Further, a large study of 13,914 NCAA athletes from 991 different collegiate programs reported prevalence rates higher among men than women for 6 of 8 drug classes surveyed including anabolic steroids, smokeless tobacco, ephedrine, marijuana, psychedelics, and

cocaine (Green et al.). The most frequently used substances among men were alcohol (range of 68.6% to 94.8% depending on sport affiliation) and marijuana (range of 20% to 58.6% depending on sport affiliation). For women, the most frequently reported substances were alcohol (range of 75.3% to 95.9% depending on sport affiliation) and marijuana (range of 12.1% to 51.5% depending on sport affiliation).

Differences in Eating Pathology and Substance Use by Sport

Eating Pathology. Athletes represent a special group of exercisers and there is substantial data to suggest that at all levels of sports participation, eating pathology persists (Crissey & Honea, 2006; Abbott & Barber, 2011). For instance, in a sample of 132 female track and field athletes, martial artists, and non-athletes, women participating in track and field were identified as having lower BMI than martial artists and non-athletes (Swami, Steadman, & Tovee, 2009). However, they believed their BMI was significantly higher and reported more body dissatisfaction than non-athletes (Swami et al.). Similar results were found in a sample of 136 women training for various sports (i.e., aerobics, basketball, cycling, diving, hockey, kayaking, netball, rowing, soccer, squash, volleyball, and water polo) in Australia (Haase, 2011). Seventy-two percent of the women in this sample believed they were within the normal weight category while 23% believed they were overweight. Overweight women had higher negative perfectionism and had more disordered eating compared to normal weight women (Haase). Similarly, in a sample of 23 women playing volleyball, 26% reported body weight concerns and 35% reported engaging in methods of weight control (Beals, 2002). Within this study all athletes were either Normal weight or Underweight but 48% perceived themselves as slightly or moderately overweight.

With regards to men, Raudenbush and Meyer (2003) reported no significant differences among the athletic groups in their study (track/cross country, soccer, basketball, swimming, and lacrosse) with regards to BMI. However, swimmers and soccer players reported spending more time working out than track/cross country or lacrosse players. Importantly, in this sample, the athletes' actual body physique was significantly less muscular than their ideal, and less muscular than the physique they believed was attractive to the opposite sex. All athletes surveyed wished to increase his muscularity with lacrosse athletes wanting to gain the most muscle.

Substance Use. Differences in substance use are reported among various types of sports affiliation. For instance, one sample identified that men playing hockey and baseball were more likely to binge drink whereas men playing soccer and track were least likely to binge drink (Ford, 2007a). With regards to illicit substance use in men, those participating in hockey were more likely to use marijuana and those participating in basketball and track were least likely to use marijuana (Ford, 2007a). Other illicit drug use was also least likely among men participating in basketball and track (Ford, 2007a). For women, those participating in soccer were most likely to report binge drinking, marijuana use, and other illicit drug use whereas those participating in swimming and track were least likely to report substance use (Ford, 2007a). In summary, when examining rates of substance use and body image concerns separately, higher rates are present within collegiate athletes regardless of sex, when compared to non-athletic groups.

2.4 Supplements and Nutrition Knowledge:

The underexplored aspects of eating pathology and substance use

Due to specialized interest in ensuring athletes are able to perform at their peak, special policies monitor and restrict the use of illicit substances within athletic programs (NCAA, 2010). Therefore rates of illicit substance use within athletes, which is often measured via self-report, is likely to be underreported. For ethical reasons, illicit substance use research is complicated by concerns regarding stigmatizing groups or individuals and for moral concerns (Striley, 2011). Furthermore, if athletes report illicit substance use they face severe consequences including, loss of a year of eligibility and being withheld from competition for one season for the first drug offense (performance enhancing drugs or illicit street drugs) and loss of another year of eligibility and another season of being withheld from competition (for illicit street drugs) or permanent ineligibility (for performance enhancing drugs) for the second offense (NCAA, 2012). Additionally, a study in Norway found that Norwegian sports fans held generally negative beliefs towards athletes using illicit substance use (including anabolic steroids) whereas fans held generally positive views regarding the use of dietary supplements by athletes (Solberg et al., 2010). Consequently, although highly understudied, ergogenic substances such as herbal supplements for improving muscle mass, weight loss, and performance enhancers are more acceptable among sports fans and professionals and may be used in excess within athletic groups (McDowall, 2007; Schwenk & Costley, 2002; Solberg et al.). While the NCAA does not explicitly ban dietary supplements, they warn athletes who consume such products that dietary supplements are poorly regulated and may contain substances that are banned by the NCAA, which may result in a positive

drug test and would result in the aforementioned consequences of a failed drug test (NCAA, 2012).

Despite the apparent health benefits of dietary supplements, they have been found to be associated with alcohol and drug use (Stephens & Olsen, 2001; Yussman et al., 2006). For example, in a sample of 2,006 adolescents, those reporting herbal supplement use were twice as likely to report drinking alcohol in their lifetime and three times more likely to report current alcohol use than those not reporting herbal supplement use (Yussman et al.). With regards to illicit drugs, those reporting herbal supplement use were four to fourteen times more likely to report illicit drug use (including marijuana, inhalants, cocaine, methamphetamine, steroids, heroin, and other IV Drugs) than those not reporting herbal supplement use (Yussman et al.).

Anabolic steroid use among adolescents has also been associated with alcohol and drug use. For example, in a sample of 18,430 adolescents in the UK, smoking, drinking alcohol, and lifetime illicit drug use was more frequent among adolescents using anabolic steroids compared to adolescents not using anabolic steroids (Kokkevi, Fotiou, Chileva, Nociar, & Miller, 2008). Additionally, in a large sample of 21,361 adolescents, Dunn and White (2011) found that lifetime use of anabolic steroids was associated with higher likelihood of using all classes of substances (including tobacco, alcohol, cannabis, hallucinogens, ecstasy, amphetamines, cocaine, and heroin) in the past year compared to those not reporting lifetime use of anabolic steroids.

Similarly, for adults, in a sample of 491 men and women entering the military, those reporting ergogenic supplement use were more likely to drink alcohol, report heavy drinking, and engage in risky situations involving alcohol (such as drinking and driving)

than those not reporting ergogenic supplement use (Stephens & Olsen, 2001). In a sample of 10,396 Finnish men entering the military, anabolic steroid use was associated with higher risk of daily smoking and getting drunk weekly (Mattila, Rimpela, Jormanainen, Sahi, & Pihlajamaki, 2010). Given the apparent relationship between supplement use and illicit substance use and the high likelihood of body image disturbances within athletes, a thorough review of various types of supplements and the prevalence of supplement use is necessary.

Dietary Supplements: Descriptive Information

Dietary supplements are utilized for a number of reasons within athletes (McDowall, 2007). The types of supplements available generally form three primary categories: 1) supplements for performance and endurance, 2) supplements for weight loss and burning fat, and 3) supplements for gaining muscle mass.

Supplements for Performance and Endurance. Several products are marketed as a means of boosting performance on cognitive and physical tasks. These products include, sports drinks (Coso, Estevez, Baquero, & Mora-Rodriguez, 2008; Siegler et al., 2008); caffeine (Astorino & Roberson, 2010; Bazzucchi, Felici, Montini, Figura, & Sacchetti, 2011); amino acids (Beltz & Doering, 1993; Xi, Jiang, Zheng, Lin, & Wu, 2011); vitamins and minerals (Haskell et al., 2010; Kennedy et al., 2010); and creatine (Little, Forbes, Candow, Cornish, & Chilibeck, 2008; Rawson, Stec, Frederickson, & Miles, 2011). For example, in a small sample of 7 cyclists, sports drink consumption was related to increased leg performance on a 120 minute cycling task compared to water consumption (Coso et al.). However, a comprehensive review suggested that many of these supplements are ineffective for their intended uses (Beltz & Doering, 1993).

Supplements for Weight Loss and Fat Burning. Athletes frequently use products containing enzymes that allow for weight loss or increased fat burning. For example, a recent meta-analysis of 15 studies found that when taken with caffeine, green tea may lead to modest decreases in body weight, BMI, and waist circumference (Phung et al., 2010). There are also several products that appear to influence the mechanism responsible for fat burning such as, conjugated linoleic acid (HCA), chitosan, and pyruvate (Egras, Hamilton, Lenz, & Monaghan, 2011).

Supplements for Gaining Muscle Mass. Many athletes choose to supplement their regular dietary intake with excess protein or amino acids (Beltz & Doering, 1993). These supplements are generally thought to increase muscle mass and stimulate the release of growth hormones (Beltz & Doering). However, having excess protein may lead to dehydration, gout, liver or kidney problems, loss of calcium, and ineffective absorption of other essential amino acids (Beltz & Doering). The benefits of creatine and beta-hydroxy-beta-methylbutyrate (HMB) have been better supported in the literature as a means of improving muscle mass (Volek et al., 1999; Jowko et al., 2001). Specifically, in a sample of 40 male emerging adults participating in a 3 week weight training program, men using creatine and HMB supplements daily increased their lean body mass and strength compared to men not using creatine and HMB supplements (Jowko et al.).

Prevalence of Supplement Use

In order to achieve a healthy body and compete at optimal levels of performance, many athletes choose to supplement their dietary intake with legal substances such as vitamins, minerals, and botanicals (Mujika & Burke, 2010). In the United States, an estimated 54% of adults report taking dietary supplements (Bailey et al., 2011) and

supplement use is higher in athletes (McDowall, 2007; Schwenk & Costley, 2002). Specifically, in a sample of 20,470 individuals over 1-year old, vitamins and minerals were most frequently reported (33%), followed by botanical supplements (14%), and amino acids (4%; Bailey et al.). About 95% of high school students reported using an herbal product as a means of feeling better or improving performance (Yussman et al., 2006). Overall, one study with 333 high school students, found similar rates of multivitamin or mineral use in boys and girls with about 42% reporting use, followed by 17% of boys and 9% of girls reporting use of protein supplements (Bell, Dorsch, McCreary, & Hovey, 2004).

Similarly, in a sample of 236 NCAA athletes, 88% reported use of at least one nutritional supplement and 58% reported use of two or more (Burns et al., 2004). With regards to specific types of supplements, in a sample of 203 NCAA athletes, energy supplements were reported by 86% of the total sample, followed by, vitamins (67%), protein (48%), minerals (39%), and herbal supplements (26%; Froiland et al., 2004). Similarly, in 162 female collegiate athletes, 65% reported supplement use at least one time per month (Herbold, Visconti, Frates, & Bandini, 2004). Specifically, about 40% reported multivitamin or mineral use, 12% reported amino acid or protein use, and 17% reported herbal or botanical supplement use (Herbold et al.). Rates of supplementation were much lower in a group of 31 freshmen men playing collegiate football with only 42% using supplements (Jonnalagadda, Rosenbloom, & Skinner, 2001). The most commonly used supplement within this sample was creatine (36%), followed by vitamins (23%) and protein shakes (13%).

In some cases, athletes may require supplementation due to poor nutrition (Beals, 2002). In a sample of 24 women athletes with subclinical eating disorders and 24 women athletes without eating disorders, the energy intake was lower among women with subclinical eating disorders than those without an eating disorder despite having similar energy expenditures (Beals & Manore, 1998). Those with subclinical eating disorders also had lower intake of protein and fat than those without an eating disorder (Beals & Manore). There were no differences between those with or without an eating disorder with regards to mineral and vitamin intake (Beals & Manore). One problem with high rates of supplement use is that individuals who do not need additional nutritional support frequently use them at high rates. In a study of 139 high school athletes, 22% reported current use of dietary supplements and 27% reported past use of dietary supplements, with boys more likely than girls to report use (Scofield & Unruh, 2006). Interestingly, only 41% of the sample reported that they were planning to play sports at the collegiate level.

In a study examining the drive for muscularity among 99 men (56 of which were NCAA Division I athletes), engaging in more muscle building behaviors was associated with a higher likelihood of current dietary supplement use (Dodge, Litt, Seitchik, & Bennett, 2008). This relationship was mediated by negative and positive beliefs regarding performance enhancing drugs such that men who engaged in muscle building behaviors held higher positive beliefs and lower negative beliefs regarding legal performance enhancing drugs and were more likely to report use of such substances than men not engaging in muscle building behaviors (Dodge et al.).

Sex Differences in Supplement Use in Athletes

There are also sex differences with regards to supplement use. In a sample of 207 collegiate athletes, men were more likely than women to use energy and protein supplements and women were more likely than men to use vitamins and minerals (Froiland et al., 2004). Moreover, among male and female athletes with body image concerns, eating pathology and associated substance use may be present. Specifically, among 451 men and women playing collegiate and intramural athletics, 99% of women and 42% of men reported taking dietary supplements (Muller et al., 2009). Further, 33% of women compared to 16% of men reported food intake restrictions and 34% of women compared to 10% of men reported taking supplements in order to decrease body fat. In general, women were more likely than men to engage in body checking behaviors whereas men were more likely than women to avoid high fat foods, report concerns regarding body symmetry, check muscles in the mirror, and lift weights to become more powerful, faster, or to increase body size (Muller et al.).

Sport Differences in Supplement Use in Athletes

Supplement use appears to vary based on the type of sport in which one participates. For instance, one study of supplement use in 107 Division II collegiate athletes found that 27% of track/cross country athletes reported using supplements to gain muscle compared to 12% of soccer, 13% of basketball, 25% of swimming, and 37% of lacrosse athletes (Raudenbush & Meyer, 2003). In this sample, athletes using supplements were 15 lbs heavier, spent more hours per week working out, and viewed themselves as being larger than athletes not using supplements.

Few individuals who use supplements appear to know the nutritional content or efficacy of the supplements they use (Burns et al., 2004). Indeed, many athletes report using supplements for reasons that are contrary to the intended use (e.g., citing immediate energy for reason to take vitamins; Jonnalagadda et al., 2001). This represents a grave risk to athletes due to the negative consequences of overuse of supplements with regards to their bone, kidney, liver, and overall health (Beltz & Doering, 1993). Thus, determining the level of nutrition knowledge and source of nutrition knowledge is critical within collegiate athletes.

Nutrition Knowledge in Athletes

Some studies suggest that athletes have minimal knowledge regarding the effectiveness of the supplements they consume and when such knowledge is present, it is based on information from individuals involved in athletics (Burns et al., 2004; Dunn et al., 2001). One study examining nutrition knowledge and the source of nutritional information in a sample of 1,560 individuals in the general population found that most learned nutritional information from books, magazines, newspapers, and televisions (Medeiros, Russell, & Shipp, 1991). While the media was the most common source of information in this sample, the information gained from these sources were not always accurate, with individuals receiving nutritional information from dieticians or nutritionists generally reporting more knowledge (Medeiros et al.).

However, in a sample of 236 collegiate athletes, many reported that they derived nutritional information from strength coaches (24%) and athletic trainers (40%) (Burns et al., 2004). Only 14% of athletes received their information from a registered dietician, despite almost half of the athletes reporting that a registered dietician was a staff member

of their athletic program (Burns et al.). Most alarming, is that about 10% of collegiate athletes reported getting their information from magazines, websites, or team physicians (Burns et al.), all of which were associated with less knowledge in the study by Medeiros and colleagues (1991). Similarly, 1,626 adolescent athletes using supplements reported their athletic trainers as most influential in their choice to use dietary supplements followed by coaches and parents (Dunn et al., 2001).

Given the research regarding the source of nutrition knowledge, it is imperative to study the level of nutrition knowledge present within these groups. Rockwell, Nickols-Richardson, and Thye (2001) reported that within a group of 35 coaches and 18 athletic trainers from Division I collegiate athletics, scores on nutrition knowledge questionnaires were on average only 67%. This suggests that while athletes often turn to athletic trainers and coaches for nutrition knowledge (Burns et al., 2004; Dunn et al., 2001), they may be unknowledgeable regarding healthy practices (Rockwell et al.).

When examining the level of nutrition knowledge present in collegiate athletes, one study reported that 325 Division I athletes received an average score of 5.8 out of 11 (53%) on a measure of nutrition knowledge (Rosenbloom, Jonnalagadda, & Skinner, 2002). However, knowledge was somewhat lower among a group of 31 freshmen collegiate football players, with participants missing over half of the items on a nutrition questionnaire (Jonnalagadda et al., 2001).

Conversely, when comparing 59 female athletes to 32 female non-athletes, nutrition knowledge was higher among female athletes. Specifically, athletes scored an average of 81 out of 110 (74%) compared to a score of 75 out of 110 (68%) for non-athletes (Raymond-Barker, Petroczi, & Quested, 2007). However, many of the women in this

sample were nutrition majors, which may have lead to inflated knowledge within this sample. Surprisingly, while 10% of female athletes and 3% of female non-athletes were identified as at risk for disordered eating, this was not related to the level of nutrition knowledge within this sample (Raymond-Barker et al.).

Alarmingly, Dascombe and colleagues (2010) reported that many athletes who use supplements have minimal knowledge regarding what they consume. For example, in a sample of 72 athletes attending a sporting institute in Australia, 87% reported using at least one supplement. Among those who reported supplement use, 17 out of 63 had no knowledge regarding the supplement and 21 out of 63 only had knowledge regarding the active ingredient in the supplement (Dascombe et al.). Thus a large percentage of supplement using athletes have no knowledge of the side effects or physiological effects of the substance they consume. Similarly, Petroczi, Naughton, Mazanov, Holloway, and Bingham (2007) found that 60% of the 874 athletes participating in a national survey in the UK reported supplement use; however, the athletes' reported reasons for use of a given supplement did not match the purported benefits of the supplement. This was true for the supplements magnesium, Echinacea, iron, and ginseng. However, the majority of the athletes using multivitamins and vitamin C were knowledgeable regarding the benefits of use (Petroczi et al.)

With regards to the level of effort athletes put into researching supplements prior to consumption, in a sample of 221 varsity collegiate athletes, Kristiansen and colleagues (2005) found that approximately one-third reported that they researched any new supplement prior to consumption (Kristiansen, Levy-Milne, Barr, & Flint, 2005). Primarily they sought information regarding supplements from health professionals, the

internet, and magazines. Among those reporting supplement use, 37% of the total sample reported they knew enough about the supplement they were using; however, 46% did not feel they knew enough regarding the supplement and 16% were unsure whether they knew enough.

2.5 The Current Study

Understanding eating pathology, supplement use, and nutrition knowledge in collegiate athletes is critical for a number of reasons. Student athletes are at high risk for both eating pathology and supplement abuse because they are under extreme pressure to improve their athletic performance from themselves, coaches, and significant others (Beals, 2002; Galli & Reel, 2009; Muller et al., 2009; Muscat & Long, 2008) and may use dietary supplements as a means of achieving their desired performance (McDowall, 2007; Pramukova et al., 2011). However, when supplement use is present, knowledge of their effectiveness or other nutritional requirements may be absent (Burns et al. 2004; Dascombe et al., 2010; Petroczi et al., 2007) and high rates of illicit substance use may be present (Stephens & Olsen, 2001; Yussman et al., 2006). While individuals with eating disorders generally evidence greater nutrition knowledge compared to healthy controls (Laessle et al., 1988; Soh et al., 2009), this knowledge appears to do little to help them manage unhealthy behaviors around eating and exercise. Furthermore, existing literature identified that long-term illicit substance use may lead to medical complications such as, cardiovascular difficulties, suppressed testicular function, and cancer and psychiatric difficulties such as mood disorders and substance dependence (Kanayama et al., 2008) and the NCAA issued a strict warning that dietary supplements are poorly regulated and may contain banned substances (NCAA, 2012). Therefore, supplement use may result in

the same negative consequences as illicit substance use for athletes. Given these negative consequences, it is important that athletes are knowledgeable regarding the supplements they consume and they may turn to coaches and athletic trainers to gather information regarding healthy eating patterns, who may or may not be knowledgeable about proper nutrition (Rockwell et al., 2001).

Consequently, to build on existing literature, the overarching purpose of this study was to further explore rates of eating pathology (including body dissatisfaction and more severe eating pathology), supplement use, and nutrition knowledge in a large sample of male and female collegiate athletes. Specifically, I examined: 1) base rates and the strength of the relationships between eating pathology, supplement use, nutrition knowledge, and the source of nutrition knowledge; 2) differences in base-rates of these variables by sex and sport; and 3) differences in the strength of these relationships by sex.

When examining the sample as a whole (RQ1), I predicted that approximately one quarter of the overall sample would display subclinical to clinical levels of eating pathology and that the majority (over 50%) of the sample would be dissatisfied with their weight (H1). I also predicted that at least half of collegiate athletes would report using supplements (H2); that most collegiate athletes would have some knowledge of nutrition (but not a lot) (H3); and that coaches and athletic trainers would be the primary source of nutritional information (H4). With regard to the strength of these relationships, I predicted that nutrition knowledge would be positively correlated with supplement use and that supplement use would be positively correlated with ideal-actual weight discrepancy (H5).

With regard to sex differences among these variables (RQ2), I predicted that ideal-actual weight discrepancy would be more prevalent among women than men and that women would display higher rates of eating pathology than men (H6). Similar to past research, I predicted that men would report using supplements that aid in building muscle mass and aid in energy and protein building more frequently than other types whereas females would report using vitamins and minerals more frequently (H7); that women would display more nutrition knowledge than men (H8); and that women would be more likely than men to receive nutritional information from dieticians (H9). When examining the relationships between the aforementioned variables separately by sex, I predicted that weight loss/fat burning supplements would be positively correlated with ideal-actual weight discrepancy for women, and muscle-building supplements would be positively correlated with ideal-actual weight discrepancy for men (H10).

With regard to differences by sport (RQ3), I chose to examine sports by sex because past research suggested there would be significant sex differences in eating pathology, supplement use, and nutrition knowledge. Specifically, for sports that had an adequate sample size to produce appropriate power, I predicted that ideal-actual weight discrepancy would be more common among female athletes participating in sports emphasizing leanness (e.g., track and cheerleading) compared to female athletes participating in other sports and that there would be no differences in ideal-actual weight discrepancy for male athletes by sport type (H11). I also predicted that supplement use would be more prevalent among men participating in sports that emphasize muscularity (e.g., football) and women participating in sports emphasizing leanness (e.g.,

cheerleading) compared to other sports (H12). I also predicted that there would be no differences in nutrition knowledge by sport (H13).

CHAPTER 3

METHODOLOGY

Participants

The current study included 915 athletes (515 men, 400 women) participating in NCAA Division I athletics at the University of Nevada, Las Vegas (UNLV) from 2007-2011.

Procedures

The data utilized in the current study were collected as part of student athletes' required medical information at the beginning of each year of participation in student athletics at UNLV. All athletes provided consent for their medical records to be utilized for confidential research purposes and surveys were collected from the Director of Athletic Training. Identifying information was removed and each participant was assigned a participant number prior to the data entry process. Duplicate surveys were eliminated through the use of a checklist indicating which athletes had already been assigned a participant number. This list only indicated which athletes were included in the dataset. In other words, there is no record identifying athletes and their participant number. The UNLV Institutional Review Board approved the study as an exempt research protocol.

Measures

General Information

Demographic (i.e., sport and age) and descriptive information (i.e., current height, current weight, ideal weight, body fat percentage, cholesterol, and highest and lowest weight during the past year) was collected through 9-items utilizing an open-response

format on the Nutrition Knowledge and Screening instrument (NKS; see Appendix A). Ethnicity and sex was collected from the UNLV athletics department database in which they provided a report of all student athletes including sex and ethnicity during the years of interest. Prior to de-identifying the surveys, the ethnicity and sex of the athlete was placed on the NKS.

Eating Pathology

Ideal-actual weight discrepancy (I/A WD). I/A WD was calculated by computing the difference between self-reported current weight and desired weight. All correlational and inferential analyses examining I/A WD utilized the absolute value of the self-reported actual-ideal weight discrepancy scores. Absolute values were utilized in an effort to describe the magnitude of the difference between ideal and actual weight rather than determining exact direction of the desired change. Past research utilized this method as an indicator of I/A WD in samples of elderly adults, college students, and general adult populations (Caldwell, Brownell, & Wilfley, 1997; Hetherington, 1994; McKinley, 1998).

Eating Attitudes Test – 26 (EAT-26). The EAT-26 (Garner & Garfinkel, 1979; see Appendix B) is a 26-item inventory comprising a total score and three subscales (i.e., dieting, oral control, and food preoccupation). The EAT-26 was originally developed as a measure of the symptoms of anorexia nervosa (e.g., food restriction, preoccupation with thinness), but is often used as a general measure of eating concerns and severity. The EAT-26 utilizes a 6-point Likert scale to assess how frequently they engage in a given behavior (i.e., Always, Usually, Often, Sometimes, Rarely, and Never). An EAT-26 TOTAL score is derived by summing items (item 26 is reverse scored) using the

following formula: Always = 3, Usually = 2, Often = 1, and Sometime, Rarely, or Never = 0. Items 1, 6, 7, 10, 11, 12, 14, 16, 17, 22, 23, 24, and 26 are summed for a Dieting sub-scale score (DIET). Items 3, 4, 9, 18, 21, and 25 are summed for a Bulimia and Food Preoccupation sub-scale score (BUL). Items 2, 5, 8, 13, 15, 19, and 20 are summed for an Oral Control sub-scale score (ORAL). Higher scores indicate more eating pathology, with EAT-26 TOTAL scores greater than 20 identified as above the clinical cut-off. The EAT-26 has adequate reliability and moderate to high validity with concurrent measures such as body image, weight, and number of diets (Garner, Olsted, Bohr, & Garfinkel, 1982; Koslowsky et al., 1992).

In the current sample, Cronbach's coefficient alpha was .87 for women, which was well above the suggested cut-off (i.e., .70). For men, coefficient alpha was .56, which fell in the unacceptable range. Consequently, I conducted an item analysis (based on the alpha-if-item-deleted values), which suggested that items 9, 19, and 26 should be removed due to poor values. After deleting these items, internal consistency improved to .70 (i.e., an acceptable level). Additionally, for men and women, due to significant positive skew (i.e., EAT-26 TOTAL skew = 6.09; DIET = 3.84; BUL = 8.41; and ORAL = 3.06), all EAT-26 scales were transformed by taking the log10 value of the scores. This resulted in a more acceptable level of skew (i.e., EAT-26 TOTAL skew =0.07; DIET=0.34; BUL=3.39; and ORAL=0.54). All inferential and correlational statistics were computed utilizing these transformed values. Due to the differences in scoring the EAT-26 for men and women, sex differences were not computed for this variable.

Female Athletic Screening Tool (FAST; women only). The FAST (McNulty, Adams, Anderson, & Affenito, 2001; see Appendix C) is a 33-item self-report eating disorder

screening tool developed for female athletes. The FAST utilizes a 4-point Likert scale to assess the degree of exercising and eating pathology. The measure is scored by reverse scoring all items (except 15, 28, and 32) and summing the values; higher responses indicate greater risk for having an eating disorder. Higher scores indicate more eating pathology, with FAST TOTAL values greater than 94 in the clinical range and scores between 77 and 94 in the subclinical range. As it was designed for women, only female athletes completed this measure.

The FAST has high internal consistency in samples of female collegiate athletes (Cronbachs alpha = .87; McNulty et al.). In past research, it was more effective at differentiating athletes with eating disorders from athletes without eating disorders and non-athletes with eating disorders than measures designed for use in the general population (McNulty et al.). In the current study, Cronbach's alpha was .87 and well above the suggested cut-off for internal consistency.

Nutrition Knowledge

The NKS (see Appendix A) is a 40-item measure developed by the nutritional studies department at UNLV to measure general nutrition knowledge in student athletes. It contains 30-items that utilize a forced-choice format in which the respondent indicates whether they *agree*, *disagree*, or *I don't know* with each statement presented and 1-item that utilizes a multiple-choice format in which the respondent selects the best answer for a given question (e.g., carbohydrate, protein, or fat). These 31-items are scored as correct/incorrect to yield a NKS total score. The remaining 9-items (e.g., I have experienced a stress fracture) were utilized as descriptive information and not included in the NKS total score.

Supplement Use

The Supplement Use Survey (SUS; see Appendix D) was developed by the nutritional studies department at UNLV to evaluate the degree to which athletes use dietary supplements. It contains 42-items assessing use of specific nutritional supplements and an additional 5 items allowing for the respondent to indicate any other supplements they are currently taking. The measure utilizes a Likert-style frequency scale with anchors at 0; 1-10; 11-15; and >15 to assess how often each supplement was taken during the previous month. Additionally, respondents indicate their reason for taking each supplement (i.e., provide energy, enhance performance, enhance recovery, enhance muscle strength, build muscle, don't know, or other). One question assesses the source of supplement information (i.e., television, internet, friends, coach, athletic trainer, physician/nurse, registered dietician, personal trainer, magazines, parent, or other).

There are 5 main categories of supplements included on the SUS including: Consumable supplements (CON; energy/sport bars, cereal/fruit/nut bars, gels, and sports drinks); Weight Loss/Fat Burning supplements (WL/FB; carnitine, chitosan, citrus aurantium, conjugated linoleic acid, guarana, hyrdoxycitric acid, ma huang, pyruvate, caffeine, energy drinks); Vitamins/Minerals (V/M; multivitamin, B-complex, ginseng, calcium, coenxyme Q10, gingko biloba, St. John's Wort, Beta Carotene, Green Tea, Selenium, Vitamin C, Vitamin E, Echinacea, Chromium); Muscle-building supplements (MB; amino acids, glutamine, protein, androstenedione, branched-chain amino acids, creatine, DHEA, HMB, tribulus, NO/arginine); and Joint Supporting supplements (JS; chondroitin sulfate, glucosamine, MSM). The SUS was scored by totaling the number of supplements athletes endorsed within each category, which derived individual subscale

scores corresponding with each of the aforementioned supplements categories. A total score (SUS TOTAL) was also calculated, which reflected the sum of supplements taken across the 5 categories (i.e., CON; WL/FB; V/M; MB; and JS).

Statistical Analyses

After checking the data to ensure they met assumptions of statistical analyses (e.g., normality, data entry accuracy) and making adjustments as needed (e.g., data transformations, centering variables), each study hypothesis was then tested as follows:

RQ1. General Predictions About the Sample as a Whole

H1. A frequency distribution tested the hypothesis that approximately one quarter of the sample would display subclinical to clinical levels of eating pathology.

H2. A frequency distribution tested the hypothesis that at least half of collegiate athletes would report using supplements.

H3. Descriptive statistics (mean, standard deviation, and range) tested the hypothesis that athletes would have some knowledge of nutrition (but not a lot).

H4. A frequency distribution tested the hypothesis that coaches and athletic trainers would be the primary source of nutritional information for collegiate athletes.

H5. Bivariate correlations tested the hypothesis that nutrition knowledge would be positively correlated with supplement use and that supplement use would be positively correlated with ideal-actual weight discrepancy in this sample of student athletes.

RQ2. Sex Differences

H6. An ANOVA tested the hypothesis that ideal-actual weight discrepancy would be more prevalent among women than men and women would display higher rates of eating pathology than men.

H7. An ANOVA tested the hypothesis that men would report using supplements that aid in building muscle mass and aid in energy and protein building more frequently than other types whereas women would report using vitamins and minerals more frequently.

H8. An ANOVA tested the hypothesis that women would display more nutrition knowledge than men.

H9. A Chi-Square analysis tested the hypothesis that women would be more likely than men to receive nutritional information from dieticians.

H10. Bivariate correlations tested the hypothesis that nutrition knowledge would be positively correlated with supplement use and that supplement use would be positively correlated with ideal-actual weight discrepancy in both men and women. In women, ideal-actual weight discrepancy and eating pathology would be positively correlated with the number of weight loss/fat burning supplements used. In men, ideal-actual weight discrepancy would be negatively correlated with the number of muscle-building supplements used. After correlations were computed by sex, Fisher's z-transformation tested for differences in the strength of the relationships by sex.

RQ3. Sport Differences by Sex

H11. An ANOVA tested the hypothesis that ideal-actual weight discrepancy would be more common among women participating in sports emphasizing leanness than other sports. An ANOVA tested the hypothesis that there would be no differences in ideal-actual weight discrepancy among men participating in sports.

H12. An ANOVA tested the hypothesis that supplement use would be more common in men participating in sports emphasizing muscularity and women participating in sports emphasizing leanness than other sports.

H13. An ANOVA tested the hypothesis that there would be no differences in nutrition knowledge among men or women participating in sports.

CHAPTER 4

FINDINGS OF THE STUDY

Analyses are organized according to the aforementioned research question and hypothesis. When warranted and as sample size permitted, secondary analyses were performed.

Descriptive Information about the Sample

In total, 515 men and 400 women completed the surveys. As shown in Table 1, participants were approximately 19 years old (M = 19.24, SD = 1.47). Men were approximately 6 ft tall (M = 72.77 in, SD = 3.17) and weighed approximately 200 lbs (M = 199.62, SD = 39.93) whereas women were 5.5 ft tall (M = 66.25 in, SD = 3.32) and weighed approximately 140 lbs (M = 139.22, SD = 23.62). This resulted in an average BMI of about 26 for men (M = 26.40, SD = 4.42) and 22 for women (M = 22.22, SD = 2.84).

As shown in Table 2, ethnically, the majority of the sample (32%) self-identified as being White/Non-Hispanic; followed by Black/African American (18.4%), Hispanic/Latino (4.9%), Native Hawaiian/Pacific Islander (3.8%), bi- or multi-racial (1.9%), Asian (1.3%), and Native American (0.1%). Additionally, 7.2% were classified as non-residents or non-citizens of the United States. Of the sample, 25.2% participated in football; 13.4% in soccer; 10.3% in baseball; 9.4% in diving or swimming; 7.5% in track; 7.4% in basketball; 5.7% in cheerleading; 5.0% in softball; 4.2% in dance; 4.0% in volleyball; 3.9% in golf; and 3.7% in tennis. Approximately 11% of athletes in the study reported having sports injuries.

RQ1: General Information About the Sample as a Whole

Means and standard deviations are presented for the overall sample and by sex for all outcome variables in Table 3.

H1

With regard to ideal-actual weight discrepancy in the overall sample, 17.6% of athletes were satisfied with their current weight (as indicated by no discrepancy between their ideal and actual weight). Of those who reported a discrepancy (i.e., 82.4%), 5.9% of participants wished to gain 20 lbs or more; 9.4% wished to gain between 10 and 20 lbs; 25.4% wished to gain 10 lbs or less. Additionally, 11.5% of the overall sample wished to lose 10 lbs or less; 5.7% wished to lose between 10 and 20 lbs; and 3.1% wished to lose 20 lbs or more.

With regard to the frequency of severe eating, unfortunately, descriptive information using the EAT-26 could not be analyzed for the entire sample because I removed 3 items from the scale for men to improve internal consistency. Consequently, descriptive statistics were calculated utilizing the clinical cut-off suggested by McNulty et al. (2001) for women only. Additionally, the FAST were tabulated only for women.[1] These data are described in the section below (see H6).

H2

With regard to supplement use, 90.4% of the sample reported taking at least one supplement within the past month. Athletes reported taking an average of approximately 6 supplements within the past month. With regards to individual categories of supplements, athletes reported taking an average of approximately two consumable

[1] The FAST was developed for use with female athletes only (McNulty et al., 2001).

supplements (CON), one weight loss/fat burning supplement (WL/FB), two vitamins/minerals (V/M), and one muscle-building supplement (MB). Additionally, athletes reported using a negligible amount of joint supporting supplements (JS).

H3

To determine the level of nutrition knowledge present within the sample, the NKS was scored and descriptive statistics were calculated. As expected, athletes earned a score of approximately 19 out of 31, indicating that athletes answered 61% of questions correctly (range 0% to 97%).

H4

With regard to the source of nutrition information, 59% of athletes reported learning about supplements from the media (i.e., television, internet, or magazine). Additionally, 34.7% of athletes learned about nutrition from a friend; 27.9% from a coach; 23.6% from an athletic trainer; 18.4% from the medical or nutritional community (i.e., physician, nurse, or dietician); 13.6% from a personal trainer; 17.3% from a parent; and 5.2% from an alternate source (e.g., sibling, professor).

H5

Bivariate correlations between eating pathology, supplement use, and nutrition knowledge for the entire sample are presented in Table 4. BMI was positively correlated with ideal-actual weight discrepancy (I/A WD; $p = .001$) and using muscle-building supplements (MB; $p = .02$) and negatively correlated with using consumable supplements (CON; $p < .001$), using weight loss/fat burning supplements (WL/FB; $p = .03$), and nutrition knowledge (NK; $p < .001$). Ideal-actual weight discrepancy (I/A WD) was negatively correlated with using consumable supplements (CON; $p < .01$) and nutrition

knowledge (NK; $p = .002$) and positively correlated with using muscle-building supplements (MB; $p = .01$). Finally, using consumable supplements (CON) was positively correlated with nutrition knowledge (NK; $p < .001$). The use of supplements in any category was related to the use of supplements in all other categories.

RQ2. Sex Differences

H6

With regard to ideal-actual weight discrepancy in men and women, compared to their actual weight, on average, men wanted to weigh approximately 206 lbs (i.e., about 6 pounds more) whereas women wanted to weigh approximately 135 lbs (i.e., about 5 pounds less). More specifically, approximately 10.7% of men wished to gain 20 lbs or more; 16.3% wished to gain between 10 and 20 lbs; and 36.7% wished to gain 10 lbs or less. Additionally, 15.4% of men wished to lose 10 lbs or less; 3.3% wished to lose between 10 and 20 lbs; and 2% wished to lose 20 lbs or more. For women, none wished to gain more than 20 lbs or more; <1% wished to gain between 10 and 20 lbs; and 10.4% wished to gain 10 lbs or less. Additionally, 54.6% wished to lose 10 lbs or less; 9.1% wished to lose between 10 and 20 lbs; and 5.3% wished to lose 20 lbs or more.

Additionally, there was a statistically significant difference in percentage of athletes who reported ideal-actual weight discrepancy by sex, such that more men than women (84.7 vs. 79.5%, respectively) reported ideal-actual weight discrepancy ($X^2 = 41.49$, $p < .01$). Furthermore, there was a statistically significant difference in ideal-actual weight discrepancy by sex, $F(1, 800) = 28.47$, $p < .001$, such that the amount of dissatisfaction was larger (in terms of pounds) for men than for women.

With regard to severe eating pathology in men and women, contrary to predictions, approximately 3.5% of women who completed this measure scored at or above the clinical cut-off of 20. For men, the clinical cut-off was not used due to scoring the measuring differently. Sex differences for more severe eating pathology (EAT-26 TOTAL) and the specific subscales could not be computed because items were removed to improve internal consistency for men and therefore were scored differently for men and women. However, for women, FAST responses indicated that approximately 92% (n = 294) of women in the current sample scored within normal limits. Approximately 8% (n = 25) of the women scored in the subclinical range and no women scored in the clinical range for eating pathology: the average FAST TOTAL was within normal limits.

H7

With regard to sex differences in supplement use, about 88% of men and 94% of women reported taking at least 1 supplement in the past month. Furthermore, there was a statistically significant difference in total supplement use (SUS TOTAL) such that men reported more overall supplement use than women, $F(1, 860) = 4.75$, $p = .03$ (see Table 3). As expected, there was also a statistically significant difference in reported use of muscle-building supplements (MB) by sex, such that men reported more use than women, $F(1, 860) = 61.02$, $p < .001$ (see Table 3). There were no sex differences in reported consumption of supplements in any other category.

H8

With regard to sex differences in nutrition knowledge, there was a statistically significant difference in nutrition knowledge (NK) by sex. As expected, women scored higher than men, $F(1, 775) = 35.78$, $p < .001$ (see Table 3).

H9

With regard to sex differences in source of nutrition knowledge, there was a statistically significant difference for receiving supplement information from athletic trainers ($X^2 = 5.22$, $p < .05$) such that more men learned about supplements from athletic trainers than women (33% vs. 16%, respectively). There were no other statistically significant sex differences for source of nutrition knowledge.

H10

Bivariate correlations for men in the sample are presented in Table 5. BMI was negatively correlated with using consumable supplements (CON; $p < .001$), using weight loss/fat burning supplements (WL/FB; $p = .05$), and nutrition knowledge (NK; $p = .05$). Contrary to predictions, ideal-actual weight discrepancy (I/A WD) was not significantly correlated with using muscle-building supplements (MB) or total supplement use (SUS TOTAL), but was positively correlated with overall eating pathology (EAT-26 TOTAL; $p = .002$). Overall eating pathology (EAT-26 TOTAL) was positively correlated with total supplements used (SUS TOTAL, $p = .01$), using weight loss/fat burning supplements (WL/FB; $p = .001$), and using muscle-building supplements (MB; $p = .01$). Dieting behavior (EAT-26 DIET) was positively correlated with using muscle-building supplements (MB; $p = .002$) and using joint supporting supplements (JS; $p = .02$), and negatively correlated with nutrition knowledge (NK; $p = .04$). Bingeing and purging behavior (EAT-26 BUL) was positively correlated with total supplements used (SUS TOTAL, $p = .003$), using consumable supplements (CON; $p = .01$), using weight loss/fat burning supplements (WL/FB; $p = .002$), and using vitamins/minerals (V/M; $p = .001$). Furthermore, total supplements used (SUS TOTAL) was positively correlated with

nutrition knowledge (NK; $p < .05$); nutrition knowledge (NK) was positively correlated with using consumable supplements (CON; $p = .01$) and muscle-building supplements (MB; $p = .02$). Of note, the use of supplements in any category was associated with increased use of supplements in another category.

Bivariate correlations for women in the sample are presented in Table 6. BMI was positively correlated with ideal-actual weight discrepancy (I/A WD; $p < .001$), overall eating pathology (EAT-26 TOTAL, $p = .01$; FAST TOTAL, $p < .001$), and dieting behavior (EAT-26 DIET; $p = .01$). Ideal-actual weight discrepancy (I/A WD) was positively correlated with overall eating pathology (EAT-26 TOTAL; $p < .001$; FAST TOTAL; $p < .001$), dieting behavior (EAT-26 DIET; $p < .001$), bingeing and purging behavior (EAT-26 BUL; $p = .001$), and oral control (EAT-26 ORAL; $p = .03$), and negatively correlated with using consumable supplements (CON; $p = .001$). Overall eating pathology (EAT-26 TOTAL) was positively correlated with another measure of overall eating pathology (FAST TOTAL; $p < .001$) and using weight loss/fat burning supplements (WL/FB; $p = .04$). Dieting behavior (EAT-26 DIET) was positively correlated with overall eating pathology (FAST TOTAL; $p < .001$), total supplements used (SUS TOTAL; $p = .03$), using weight loss/fat burning supplements (WL/FB; $p = .02$), and using vitamins/minerals (V/M; $p < .04$). Bingeing and purging behavior (EAT-26 BUL) was positively correlated with overall eating pathology (FAST TOTAL; $p < .05$) and using weight loss/fat burning supplements (WL/FB; $p = .01$). Additionally, oral control (EAT-26 ORAL) was positively correlated with overall eating pathology (FAST TOTAL; $p = .002$); overall eating pathology (FAST TOTAL) was positively correlated with using weight loss/fat burning supplements (WL/FB; $p = .02$); and using consumable

supplements (CON) was positively correlated with nutrition knowledge (NK; $p = .04$). As was true for men, the use of supplements in any category was associated with increased use of supplements in another category.

The strength of some relationships differed significantly by sex, with many of the relationships being stronger for men than women (see Table 7). More specifically, the relationship between ideal-actual weight discrepancy (I/A WD) and using consumable supplements (CON) was stronger for men than women ($p < .01$); as was the relationship between dieting behavior (EAT-26 DIET) and using muscle-building supplements (MB; $p < .05$); bingeing and purging behavior (EAT-26 BUL) and total supplements used (SUS TOTAL; $p < .01$), using consumable supplements (CON; $p < .01$), and using vitamins/minerals (V/M; $p < .001$). With regard to supplement use, a similar pattern emerged. The following relationships were stronger for men than women: total supplements used (SUS TOTAL) and using joint supporting supplements (JS; $p < .001$) and nutrition knowledge (NK; $p < .05$); using weight loss/fat burning supplements (WL/FB) and using vitamins/minerals (V/M; $p < .05$), using joint supporting supplements (JS; $p < .01$), and nutrition knowledge (NK; $p < .05$); using vitamins/minerals (V/M) and using joint supporting supplements (JS; $p < .01$); and using muscle-building supplements (MB) and nutrition knowledge (NK; $p < .01$).

Conversely, some relationships were stronger for women than men. As shown in Table 7, the relationship between BMI and ideal-actual weight discrepancy was stronger for women than men ($p < .01$) as was the relationship between ideal-actual weight discrepancy (I/A WD) and overall eating pathology (EAT-26 TOTAL; $p < .05$), dieting

behavior (EAT-26 DIET; $p < .05$), and bingeing and purging behavior (EAT-26 BUL; $p < .05$).

RQ3: Sport Differences

Given the aforementioned statistically significant differences between men and women for eating pathology, supplement use, and nutrition knowledge, sports were divided by sex and analyzed separately. Male data are in Table 8 and female data in Table 9.

General Information for Men by Sport

BMI was highest for football followed by baseball, basketball, golf, soccer, diving/swimming, tennis, and cheer. For eating pathology, ideal-actual weight discrepancy (I/A WD) was highest for football and baseball athletes, followed by those who participated in basketball, diving/swimming, golf, cheer, soccer, and tennis. Similarly, severe eating pathology (EAT-26 TOTAL) was highest for football athletes followed by those who participated in diving/swimming, tennis, baseball, soccer, basketball, golf, and cheer. Dieting behavior (EAT-26 DIET) was highest for soccer athletes followed by those who participated in football, baseball, basketball, golf, diving/swimming, tennis, and cheer. Bingeing and purging behavior (EAT-26 BUL) was highest for cheerleaders and tennis athletes followed by those who participated in diving/swimming, football, soccer, baseball, golf, and basketball. Oral Control (EAT-26 ORAL) was highest for diving/swimming athletes followed by those who participated in football, basketball, tennis, baseball, golf, soccer, and cheer.

Total supplements used (SUS TOTAL) was highest for baseball and diving/swimming athletes followed by those who participated in soccer, football, cheer,

tennis, golf, and basketball. When examining specific categories of supplements, using consumable supplements (CON) was highest for golf athletes followed by those who participated in diving/swimming, tennis, soccer, baseball, cheerleading, football, and basketball. Using weight loss/fat burning supplements (WL/FB) was highest for cheerleaders followed by those who participated in diving/swimming, soccer, baseball, tennis, football, golf, and basketball. Using vitamins/minerals (V/M) was highest for cheerleaders followed by those who participated in diving/swimming, soccer, tennis, baseball, football, golf, and basketball. Using muscle-building supplements (MB) was highest for baseball athletes followed by those who participated in football, diving/swimming, soccer, tennis, golf, basketball, and cheerleaders. Men in all sports reported using negligible joint supporting supplements.

Nutrition knowledge (NK) was highest for male cheerleaders followed by those who participated in golf, diving/swimming, soccer, baseball, tennis, football, and basketball.

General Information for Women by Sport

BMI was highest for softball athletes followed by those who participated in basketball, volleyball, cheerleading, soccer, diving/swimming, golf, track, tennis, and dance. For eating pathology, ideal-actual weight discrepancy (I/A WD) was highest for softball athletes followed by those who participated in track, cheerleading, volleyball, dance, tennis, basketball, diving/swimming, golf, and soccer. For more severe eating pathology, overall eating pathology (EAT-26 TOTAL) was highest for golf athletes followed by those who participated in cheerleading, dance, basketball, diving/swimming, volleyball, softball, soccer, tennis, and track. Dieting behavior (EAT-26 DIET) was highest for golf athletes followed by those who participated in cheerleading, dance,

basketball, softball, diving/swimming, volleyball, tennis, soccer, and track. Bingeing and purging behavior (EAT-26 BUL) was highest for cheerleaders followed by those who participated in dance, basketball, soccer, diving/swimming, volleyball, track, golf, tennis, and softball. Oral control (EAT-26 ORAL) was highest for dancers followed by those who participated in basketball, cheerleading, volleyball, track, diving/swimming, track, softball, soccer, and tennis. On an additional measure of severe eating pathology (FAST), overall scores were highest for dancers followed by those who participated in cheerleading, softball, volleyball, basketball, golf, diving/swimming, tennis, soccer, and track.

Total supplements used (SUS TOTAL) was highest for basketball athletes followed by those who participated in cheerleading, softball, dance, soccer, track, golf, diving/swimming, volleyball, and tennis. When examining specific categories of supplements, using consumable supplements (CON) was highest for diving/swimming athletes followed by those who participated in soccer, golf, basketball, volleyball, dance, track, cheerleading, softball, and tennis. Using weight loss/fat burning supplements (WL/FB) was highest for cheerleaders followed by those who participated in dance, basketball, soccer, softball, tennis, track, diving/swimming, volleyball, and golf. Using vitamins/minerals (V/M) was highest for basketball athletes followed by those who participated in softball, track, dance, golf, cheerleading, soccer, diving/swimming, volleyball, and tennis. Using muscle-building supplements (MB) was highest for basketball athletes followed by those who participated in soccer, cheerleading, dance, softball, track, golf, diving/swimming, volleyball, and tennis. Women in all sports reported using negligible joint supporting supplements.

Nutrition knowledge (NK) was highest for soccer athletes followed by those who participated in diving/swimming, volleyball, track, softball, cheerleading, dance, tennis, golf, and basketball.

Sport Differences by Sex

Using G*Power, a power analysis was conducted a priori to determine the minimal number of participants for each sport that could be calculated in order to have acceptable effect size and power. The power analysis specifying a medium effect size (≥ .25) and adequate power (≥ .80) indicated a total sample size of 159 would yield an actual power of .80. For men, soccer, baseball, and football yielded the recommended sample size for comparison of all variables of interest (i.e., eating pathology, supplement use, and nutrition knowledge). Using the same parameters for women, a power analysis indicated a total sample size 240 would yield an actual power of .81. For women, due to missing data, sample sizes varied for each of the variables. Therefore, soccer, cheerleading, track, diving/swimming, softball, and dance were compared on ideal-actual weight discrepancy. For supplement use and nutrition knowledge, soccer, cheerleading, volleyball, track, basketball, diving/swimming, softball, and dance were compared. There was insufficient sample size to allow for comparison of FAST or EAT-26 data.

H11

With regard to sport differences in ideal-actual weight discrepancy for men, there was a statistically significant difference in ideal-actual weight discrepancy by sport, $F(2, 350) = 11.28$, $p < .001$. Post hoc analysis revealed that men who participated in soccer were more satisfied than those who participated in baseball ($p < .001$) and football ($p < .001$) (see Table 8).

With regard to sport differences in ideal-actual weight discrepancy for women, there was a statistically significant difference by sport, $F(5, 256) = 3.00$, $p = .01$. Post hoc analysis revealed that women who participated in soccer were more satisfied than women who participated in cheerleading ($p = .04$), track ($p = .02$), and softball ($p = .001$) (see Table 9). Additionally, softball athletes were more dissatisfied than those who participated in diving/swimming ($p = .01$) and dance ($p = .05$) (see Table 9).

Sport differences for more severe eating pathology (EAT-26 and FAST) were not calculated due to insufficient sample size.

H12

With regard to sport differences in supplement use for men, there was no statistically significant difference for total supplements used (SUS TOTAL). Further, there were no differences by sport for using consumable supplements (CON), weight loss/fat burning supplements (WL/FB), vitamins/minerals (V/M), muscle-building supplements (MB), and joint supporting supplements (JS).

With regard to sport differences in supplement use for women, there was no statistically significant difference for total supplements used (SUS TOTAL). Further, there were no differences by sport for use of consumable supplements (CON), weight loss/fat burning supplements (WL/FB), vitamins/minerals (V/M), and joint supporting supplements (JS). There was a significant difference in the use of muscle-building (MB) supplements, $F(7, 347) = 2.26$, $p = .03$. Post hoc analysis revealed that women who participated in basketball used more muscle-building supplements than those who participated in soccer ($p < .01$), cheerleading ($p < .01$), volleyball ($p = .001$), track ($p = .001$), diving/swimming ($p = .001$), softball ($p < .01$), and dance ($p < .01$) (see Table 9).

H13

With regard to sport differences in nutrition knowledge for men, there was a statistically significant difference in nutrition knowledge (NK), $F(2, 336) = 3.95$, $p = .02$. Post hoc analysis revealed that men who participated in football had less nutrition knowledge than those who participated in soccer ($p = .02$) and baseball ($p = .04$) (see Table 8).

With regard to sport differences in nutrition knowledge for women, there was a statistically significant difference in nutrition knowledge (NK), $F(7, 304) = 3.21$, $p < .01$. Post hoc analysis revealed that female cheerleaders had less nutrition knowledge than those who participated in soccer ($p = .03$); basketball athletes had less nutrition knowledge than those who participated in soccer ($p < .001$), volleyball ($p = .001$), track ($p < .01$), diving/swimming ($p = .001$), and softball ($p = .03$); and dancers had less nutrition knowledge than those who participated in soccer ($p = .02$) and diving/swimming ($p = .04$) (see Table 9).

CHAPTER 5

SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

Summary and Conclusions

The overarching purpose of this study was to explore rates of eating pathology, supplement use, and nutrition knowledge in a large sample of male and female Division I collegiate athletes. Overall, although study hypotheses were only partially supported, these results yielded important information about eating pathology, supplement use, and nutrition knowledge that is highly relevant to helping student athletes stay healthy.

Eating Pathology

Few athletes scored in the clinical or subclinical range on measures of severe eating pathology. These findings are considerably lower than what is reported in past research within college-aged samples (Byrne & McLean, 2001) and collegiate athletes (Johnson et al., 1999). However, great variability exists in the reported prevalence of disordered eating in athletic populations (Coelho, Soares, & Ribeiro, 2010). Literature reviews report rates of eating pathology in female athletes ranging from 0 to 27% (Coehlo, Soares, & Ribeiro, 2010); however, this review included eating pathology questionnaires that were designed for use in the general population and may have overestimated the extent of eating pathology in athletes. Regardless, a large percentage of the sample (82.4%) reported ideal-actual weight discrepancy, which was consistent with past research that within college-aged samples ideal-actual weight discrepancy occurs at an alarming rate (Paap & Gardner, 2011; Schwitzer et al., 1998).

Furthermore, when examined by sex, more men reported feeling dissatisfied with their body than women which is inconsistent with past research that suggests, compared

to men; more college-aged women are dissatisfied with their weight (Byrne & McLean, 2001; Frederick, Forbes, Grigorian, & Jarcho, 2007; Klemchuk et al., 1990; Pasman & Thompson, 1988; Pramukova et al., 2011). Research suggests that male athletes view having a muscular physique as a symbol of power and competitiveness and may lead to having a mental edge over opponents (Galli & Reel, 2009). The largest male sports presented in the current study were soccer, football, and baseball and according to the UNLV Athletics Department website (www.unlvrebels.com), these teams have had losing records for the past several years, as such they may have greater distortions regarding their ideal and greater pressures to be stronger and more powerful than other male athletes.

Additionally, when examining the differences between ideal and actual body weight, men reported greater weight differences than women. Suggesting that when men reported dissatisfaction, they were farther from their ideal than women. Past research supports greater distortions between perceived body and actual body shapes in male swimmers compared to female swimmers (Urdapilleta et al., 2010); however, sex differences in weight distortion research has been inconsistent with other researchers reporting that women desire a greater weight discrepancy than men (Dolan, Birtchnell, & Lacey, 1987).

In the current study, women reported the desire to lose weight and men reported the desire to gain weight. Past research supports that men generally are more satisfied with higher weight levels than women whereas women generally are more satisfied with lower weight levels than men (Frederick et al.; Ross & Ivis, 1999). In athletes results are generally consistent with female athletes engaging in dieting behaviors and male athletes engaging in exercising behaviors (Geisner, Grossbard, Tollison, & Larimer, 2012;

Greenleaf et al., 2009; Rosendahl et al., 2009). The current results add to the growing body of literature that suggests while men and women may evidence different body image concerns, ideal-actual weight discrepancy in male and female athletes is still high.

Supplement Use

An overwhelming majority of athletes reported using at least one supplement during the past month, which is consistent with past research (Burns et al., 2004; Diehl et al., 2012). Sex differences emerged such that men used more total and muscle-building supplements than women. Research examining sex differences in total supplement use has been inconsistent in past literature with some studies reporting more supplement use in men (Scofield & Unruh, 2006) and others reporting more supplement use in women (Muller et al., 2009). However, past research has found higher rates of protein supplementation in men (Bell et al., 2004; Froiland et al., 2004). Overall, research supports that men are more likely to take supplements for speed, agility, strength, power, and muscle gain whereas women are more likely to take supplements to improve their general health (Bell et al., 2004; Froiland et al.; Herbold et al., 2004). Interestingly, in the current study, there were no sex differences in the use of vitamins and minerals. Past research on sex differences in vitamin and mineral use is conflicting with some researchers reporting that women use vitamins and minerals more than men (Froiland et al.) and others reporting no sex differences (Bell et al.).

Nutrition Knowledge

Nutrition knowledge scores in the current study were somewhat higher than scores reported in past research (Jonnalagadda et al., 2001; Rosenbloom, Jonnalagadda, & Skinner, 2002), albeit still low. Additionally, women had more nutrition knowledge than

men. Somewhat higher scores (74% vs. 64%) on nutrition quizzes have been reported in a sample of female athletes compared to female athletes in the current sample (Raymond-Barker, Petroczi, & Quested, 2007). Overall, athletes relied on the media to gather nutrition information, followed by friends. Past research supports that athletes utilize the media for nutrition information (Medeiros et al., 1991); however, more recent literature found that coaches and athletic trainers comprise the most common sources of nutritional information (Burns et al., 2004; Torres-McGhee et al., 2012). In the current study, men were more likely than women to learn about supplements from athletic trainers, which is mostly consistent with past research that suggests men are more likely to learn about supplements from store clerks, athletic peers, friends, or coaches than women (Froiland et al., 2004).

Relationships between Eating Pathology, Supplement Use, and Nutrition Knowledge

Overall Sample. BMI, ideal-actual weight discrepancy, supplement use, and nutrition knowledge were positively correlated. Furthermore, ideal-actual weight discrepancy and BMI was associated with using more muscle-building supplements; and ideal-actual weight discrepancy was associated with less nutrition knowledge.

Men. Higher BMI was associated with using less total, consumable, and weight loss/fat burning supplements as well as less nutrition knowledge. This is inconsistent with past research, which reported that athletes who use supplements generally weigh more than athletes who do not use supplements (Kao, Deuster, Burnett, & Stephens, 2012; Raudenbush & Meyer, 2003). The finding that muscle-building supplements were not related to BMI was surprising given that past research supports the role protein consumption plays in weight gain (Duellman, Lukaszuk, Prawitz, & Brandenburg, 2008;

Lemon, 1997). Contrary to predictions, ideal-actual weight discrepancy was not related to total or muscle-building supplement use but was related to more severe eating pathology. Specifically, dieting behavior was associated with using more muscle-building and joint supporting supplements as well as less nutrition knowledge. Additionally, bingeing and purging behaviors were associated with using more total, consumable, and weight loss/fat burning supplements as well as more vitamins/minerals. This is consistent with past research, which reported that athletes who are engaging in efforts to increase muscle mass and who hold more positive beliefs (e.g., make me bigger; make me faster) and fewer negative beliefs (e.g., cause heart problems; cause long-term side effects) regarding performance enhancing supplements are more likely to use those supplements in the future (Dodge et al., 2008). Overall, in men, more total, consumable, and muscle-building supplement use was related to more nutrition knowledge.

Women. Ideal-actual weight discrepancy was associated with higher BMI and more eating pathology was associated with more ideal-actual weight discrepancy, higher BMI, and using more weight loss/fat burning supplements. The relationship between eating pathology and weight loss/fat burning supplements was not surprising given that past research suggests that women with eating disorders ingest high rates of weight suppressants, caffeine, cigarettes, and other legal supplements as a means of weight control (Bulik et al., 1992; Fahy & Treasure, 1991; French et al., 1994; Klesges & Klesges, 1988). Additionally, past research found that as female college freshmen gained weight, their risk for eating pathology increased and this result held true regardless of whether their actual BMI status changed (Delinsky & Wilson, 2008). More nutrition knowledge was associated with using more consumable supplements in the current study.

Sport Differences by Sex

For men, soccer athletes reported more satisfaction than those who participated in baseball and football. There were no significant sport differences in supplement use for men, which is somewhat surprising given that past research has found differences in the rates of supplement use depending on the types of sports under consideration (Raudenbush & Meyer, 2003). Further, football athletes had less nutrition knowledge compared to those who participated in baseball and soccer. While past research on sport differences in nutrition knowledge is limited, some research has examined nutrition knowledge in football players separately and has found somewhat lower total scores (Jonnalagadda et al., 2001) compared to past research examining nutrition knowledge in other athletes (Rosenbloom et al., 2002).

For women, soccer athletes displayed more satisfaction with their body weight than cheerleaders and softball athletes, which is consistent with past research that identified soccer athletes as having less body dissatisfaction than other female athletes (Blacker, Drake, Reed, Almeida, & Raudenbush, 2007). Conversely, softball athletes displayed more ideal-actual weight discrepancy than those who participated in diving/swimming and dance. With regard to supplement use, female basketball athletes used more muscle-building supplements than all other women's sports (i.e., soccer, cheerleading, volleyball, track, diving/swimming, softball, and dance). Research on differences in supplement use for women by sport is limited and the current results added to the growing body of research literature. For women, cheerleaders and basketball athletes displayed less nutrition knowledge than soccer athletes while basketball athletes also displayed less nutrition knowledge than women who participated in volleyball, track, diving/swimming,

and softball; dancers had less nutrition knowledge than soccer and diving/swimming athletes.

Implications of Current Research

These results have important implications for male and female athletes, coaches, and universities. First, nutritional supplementation is generally considered safe when taken at proper doses, and when coupled with proper diet and exercise (Greenwood, Farris, Kreider, Greenwood, & Byars, 2000; Lopez et al., 2009) and is primarily dangerous when taken at the wrong dosage, taken in the absence of a proper diet, or taken by individuals with pre-existing health conditions (e.g., renal disease; Greenway, Fujika, & Yu, 2011; Gualano et al., 2008). These data suggest that collegiate athletes are engaging in high levels of supplement use with little to no knowledge regarding nutritional and supplemental standards. This represents a grave health risk considering that the majority of the ill effects of supplementation use result from a lack of knowledge of appropriate dosing for such supplements.

Second, although the majority of athletes in the sample gleaned nutrition information from the media, it is not an ideal source of supplement information. Research suggests that websites marketing herbal weight loss supplements and steroids seldom provide information on drug interactions and adverse reactions (Cordaro, Lombardo, & Cosentino, 2011; Jordan & Haywood, 2007). This is significant risk to those who are seeking information through these sources. The media has also been implicated in increased ideal-actual weight discrepancy among men and women (Bartlett, Vowels, & Saucier, 2008; Benowitz-Fredericks et al., 2012; Grabe, Ward, & Hyde, 2008; Leit, Pope, & Gray, 2001; Mulgrew & Volcevski-Kostas, 2012). Taken together, the media may

represent a perfect storm for athletes who utilize the media for information, which is largely incomplete, if not inaccurate, and increased exposure is likely exacerbating ideal-actual weight discrepancy.

Third, male and female athletes displayed similar levels of eating pathology in the current study. While traditionally in general populations, women display higher levels of eating pathology than men (Eisenberg, Nicklett, Roeder, & Kirz, 2011; Striegel-Moore et al., 2009), there is some evidence to suggest that sex differences in eating pathology are minimized within athletic populations (Rosendahl et al., 2009; Sanford-Martens et al., 2005). That said, for men, the belief that they are underdeveloped and engaging in behaviors to increase muscle mass is common (McCreary & Sasse, 2000; Olivardia, Pope, Borowiecki, & Cohane, 2004) and this drive for muscularity is often exaggerated by comments from others and social desirability (Nowell & Ricciardelli, 2008). Research has suggested that exposure to the media worsens the drive for muscularity in men (Daniel & Bridges, 2010; Mulgrew & Volcevski-Kostas, 2012). Given that the primary source for supplement information was the media and that muscular physiques presented in the media have become more unrealistic and harder to achieve over time (Dallesasse & Kluck, 2013; Leit, Pope & Gray, 2001; Martins, Williams, Ratan, & Harrison, 2011; Pope, Olivardia, Gruber, & Borowiecki, 1999; Pope, Phillips, & Olivardia, 2000), athletes reliance on media for supplement information puts male athletes at a serious risk to develop ideal-actual weight discrepancy and engage in behaviors aimed at achieving the unrealistic muscular ideal. Behaviors that athletes may engage include the use of legal muscle-building supplements, as supported in the current and past research, or intense exercise (Hale, Roth, DeLong, & Briggs, 2010; Tylka, 2011).

Furthermore, for women, ideal-actual weight discrepancy was not related to supplement use; however, eating pathology was related to supplement use, specifically, weight loss/fat burning supplements. This suggests that while the majority of female athletes report ideal-actual weight discrepancy, ideal-actual weight discrepancy alone is not necessarily a risk factor for supplement use. Therefore, the belief that one is overweight or an undesirable body shape does not always lead to strategies aimed at achieving the ideal body shape, such as supplement use. The finding that eating pathology was related to weight loss/fat burning supplements is not surprising, given that research suggests women diagnosed with more severe eating pathology engage in numerous extreme dieting techniques, including supplementation in order to lose weight (Neumark-Sztainer, Wall, Larson, Eisenberg, & Loth, 2011). Further, in the current study ideal-actual weight discrepancy was related to eating pathology, past research suggests that current and past dieting, anxiety, and inflexible body image often moderates the relationship between ideal-actual weight discrepancy and eating pathology (Juarascio, Perone, & Timko, 2011; Wendell, Masuda, & Le, 2012). Specifically, Wendell and colleagues suggested that inflexible beliefs regarding body image mediate the relationship between body image cognitions and pathological eating behaviors in college women. This may serve as a partial explanation for the finding in the current study that ideal-actual weight discrepancy is not related to supplement use in women. Perhaps, female athletes that are able to accept weight fluctuations as part of their identity do not feel the need to engage in pathological eating behaviors.

Limitations of Current Research

Despite the apparent benefits of the current study, it is not without limitations. The use of information from the athlete's medical records allowed for examining collegiate athletes from several years prior to the current study. While this provided a large sample size, the use of archival data resulted in some limitations; 1) knowledge and supplement use surveys completed by athletes were not validated; and 2) athletes completed the questionnaires on their own time and returned them to the athletics department. This resulted in a lack of quality control and assurance that all surveys were completed as intended. Lastly, while the overall sample size was sufficient to test for gender differences and a few sports, a larger sample is necessary to test for differences in all sports as well as ethnic differences in eating pathology, supplement use, and nutrition knowledge.

The availability of eating pathology information from the athletics department resulted in some limitations; 1) athletes completed and submitted the questionnaires to the athletics department with their name included on the instruments; and 2) athletics programs have a large stake in the well being of their student athletes. As such, athletes have no confidentiality over matters that may put themselves or others at risk. The aforementioned issues likely resulted in athletes underreporting the level of eating pathology in the current study.

Information on illicit substance use would have been a valuable asset to the current study but issues with social desirability and the negative consequences of use precluded the accurate assessment of such information. Future research exploring illicit substance use, which utilizes the use of objective assessment (e.g., urinalysis) and examines the

relationships between eating pathology and nutrition knowledge would be a logical and valuable next step.

Recommendations for Future Research, Prevention and Intervention

Despite these limitations, these results have various implications for future research, prevention, and intervention. One recommendation is for university collegiate athletics programs to take a harm reduction approach to these topics. Harm reduction approaches have received much research in the field of addictive behaviors, with the majority of research on alcohol and drug use (Akbar et al., 2011; Logan & Marlatt, 2010; Marlatt & Witkiewitz, 2002; Wodak & Cooney, 2006) and more recently on performance-enhancing drugs in athletes (Kirkwood, 2009). Specifically, harm reduction approaches seek to 1) reduce harmful consequences associated with risky behavior; 2) provide alternatives to a zero tolerance policy; and 3) increase access to alternative treatment programs.

For example, one approach to problematic supplement use is for collegiate sports programs to develop a student-athlete nutrition course requirement. This required course would be tailored to the unique nutritional challenges faced by student-athletes and would provide information on proper diet, proper supplement intake, and efficacy of widely used nutrients. Karpinski (2012) made similar recommendations and provided a general outline of a student-athlete tailored course. Past research supports increased nutrition knowledge with brief nutritional interventions in the general population (Abood, Black, & Birnbaum, 2004).

Furthermore, given that the media plays such a prominent role in informing athletes regarding supplements and media's promotion of muscular-ideal and thin-ideal beliefs,

interventions should focus on how to lessen the impact of the media. One reason the media plays such a major role is likely due to the accessibility of information, sports programs may benefit from supplying sources of accurate information in accessible formats and from qualified sources. Ideas may include providing a web-based portal supplying the information gathered from reputable sources that is promoted by the athletics department. This may decrease the need for athletes to seek out their own information from sources of questionable validity.

Additionally, athletes in the current study were primarily just beginning their collegiate athletic careers and past research has found differences in the level of disordered eating in female athletes enrolled at Division I universities compared to Division II universities (Picard, 1999). This may mean that as level of competitiveness and thus, pressure to perform increases, eating pathology and supplement use may also increase. Future research utilizing a pre-post test design examining differences in supplement use as level of participation and competitiveness increases would be of value.

Moreover, past research has found differences in body dissatisfaction for women and men participating in sports with varying levels of aesthetic focus (Crissey & Honea, 2006; Krentz & Warschburger, 2011). Future research extending this finding and further exploring the differences in supplement use by sport in male and female athletes would present valuable information for sports professionals attempting to tailor effective interventions. Specifically, research exploring within sports variability would be of interest.

With regards to effective interventions, in women, for example, flexibility in body image beliefs appears to be an important mediator in the relationship between body

dissatisfaction and eating pathology (Wendell et al., 2012). Interventions tailored to athletes and coaching staff that focuses on acceptance and mindfulness, such as Dialectical Behavior Therapy or Mindfulness-Based Stress Reduction, would be of value. While the concept of utilizing clinical interventions with an acceptance component for individuals with eating disorders is not new (see Bankoff, Karpel, Forbes, & Pantalone, 2012 for review), utilizing the techniques of mindfulness and emotional regulation with athletes and coaching staff regardless of eating disorder diagnosis may prevent the development of eating pathology. Indeed recent literature has found increased body satisfaction among men who utilize mindfulness techniques (Lavender, Gratz, & Anderson, 2012). This will be particularly important for women and men who participate in sports that value physical appearance and leanness (e.g., track, cheerleading, dance).

Finally, there has been much controversy regarding creatine supplementation in athletes and whether there are adverse consequences of use (Gualano et al., 2008; Greenwood et al., 2000; Kim, Kim, Carpentier, & Poortmans, 2011; Lopez et al., 2009; Ostojic & Ahmetovic, 2008). However, recent research using animal models has found a possible link between creatine use and relief from symptoms of depression and posttraumatic stress disorder (Allen, 2012; Allen, D'Anci, Kanarek, & Renshaw, 2012; D'Anci, Allen, & Kanarek, 2011). Given the high rates of creatine use in men playing collegiate sports, research exploring mental health correlates other than eating pathology would be an interesting extension of the current research and would potentially illuminate more implications for the widespread use of creatine and other protein supplements.

APPENDIX A: NUTRITION KNOWLEDGE & SCREENING

Nutrition Knowledge and Screening / UNLV Athletic Training

Name _____ Sport _____ Age _____

What is your height? _____ What is your current weight? _____ lbs.

What is your desired weight? _____ What is your body fat? _____ % _____ Don't know

What is your serum cholesterol? _____ mg/dL ____ Don't know

In the last year, what was your highest weight? _____ lbs. and lowest weight? _____ lbs.

Date _____/_____/_____

	Please circle the answer that best answers the question.			
1	Carbohydrate and fat are the main energy sources for athletes.	Agree	Disagree	Don't know
2	Athletes should not eat sweets prior to an event.	Agree	Disagree	Don't know
3	Carbohydrates make you fat.	Agree	Disagree	Don't know
4	An athlete should consume a high-_____ meal 2-3 hours before an event.	Carbohydrate	Protein	Fat
5	Protein is the main energy source for the muscle.	Agree	Disagree	Don't know
6	Protein supplements are necessary for athletes.	Agree	Disagree	Don't know
7	An athlete should replace fluids before, during, and after an event.	Agree	Disagree	Don't know
8	Athletes should rely on thirst to ensure fluid replacement.	Agree	Disagree	Don't know
9	Urine color can indicate dehydration.	Agree	Disagree	Don't know
10	Vitamin and mineral supplements increase energy levels.	Agree	Disagree	Don't know
11	A multivitamin and mineral supplement is necessary for optimal sport performance.	Agree	Disagree	Don't know
12	Carbohydrates are not as easily and rapidly digested as protein and fat.	Agree	Disagree	Don't know
13	Eggs and legumes are examples of protein sources other than meat.	Agree	Disagree	Don't know
14	No more than 15% of calories in the diet should be provided by fat.	Agree	Disagree	Don't know
15	One 8-ounce glasses of milk is enough to fulfill the recommended amount of calcium per day.	Agree	Disagree	Don't know
16	Those with a meatless diet are at a higher risk for iron deficiency.	Agree	Disagree	Don't know

18	Bananas and avocadoes are good sources of potassium.	Agree	Disagree	Don't know
19	Excess vitamin supplementation may be harmful.	Agree	Disagree	Don't know
20	The body can synthesize vitamin D upon exposure to the sun.	Agree	Disagree	Don't know
21	Potatoes, strawberries, and cantaloupe are good sources of vitamin C.	Agree	Disagree	Don't know
22	Salt is an essential part of a healthy diet.	Agree	Disagree	Don't know
23	Bread and cereals are the only food groups that are a good source of fiber.	Agree	Disagree	Don't know
24	During exercise, it is better to drink a large amount of fluid all at once rather than small amounts over time.	Agree	Disagree	Don't know
25	Sports drinks are the best way to replace body fluids lost during exercise.	Agree	Disagree	Don't know
26	Drinking beer is a good way to rehydrate after exercise.	Agree	Disagree	Don't know
27	Drinking alcohol will add calories to your diet.	Agree	Disagree	Don't know
28	Caffeine has been shown to improve endurance performance.	Agree	Disagree	Don't know
29	A sound nutritional practice for athletes is to eat a wide variety of different food types from day to day.	Agree	Disagree	Don't know
30	What the athlete eats is only important if the athlete is trying to gain or lose weight.	Agree	Disagree	Don't know
31	Learning about nutrition is not important for athletes because they eat so much food they always get the nutrients their bodies need.	Agree	Disagree	Don't know
32	I lose weight regularly to meet weight requirements for my sport.	Agree	Disagree	Don't know
33	I have experienced bone stress fractures.	Agree	Disagree	Don't know
34	During my season, I find I am too busy to eat breakfast.	Agree	Disagree	Don't know
35	I limit my fat consumption.	In season	Off season	Never
36	I carefully control my calorie intake.	In season	Off season	Never
37	I have skipped meals to prepare for competition.	Agree	Disagree	Don't know
38	I have fasted for 24 or more hours for competition or training.	Agree	Disagree	Don't know
39	To lose weight, I have reduced my carbohydrate intake.	Agree	Disagree	Don't know

APPENDIX B: EATING ATTITUDES TEST - 26

Age: _____ Current Weight: _____ Highest weight (excluding pregnancy): _____
Sex: _____
Height: _____ Lowest Adult Weight: _____ Ideal Weight: _____

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

Behavioral Questions:			
In the past 6 months have you:		**Yes**	**No**
A.	Gone on eating binges where you feel that you may not be able to stop? (Eating much more than most people would eat under the same circumstances) If you answered yes, how often during the worst week: _____		
B.	Ever made yourself sick (vomited) to control your weight or shape? If you answered yes, how often during the worst week: _____		
C.	Ever used laxatives, diet pills or diuretics (water pills) to control your weight or shape? If you answered yes, how often during the worst week? _____		
D.	Ever been treated for an eating disorder? When: _____		

EAT-26 From: Garner et al. 1982, *Psychological Medicine, 12*, 871-878); adapted by D. Garner with permission.

APPENDIX C: FEMALE ATHLETIC SCREENING TOOL

Nutrition Screening for Female Athletes

Definitions:
Exercise = Physical activity ≥ 20 minutes.
Practice = Scheduled time allotted by coach to work as a team or individually in order to improve performance.
Training = Intense physical activity. The goal is to improve fitness level in order to perform optimally.

Name _____

Sport _____

Please answer as completely as possible:

1. I participate in additional physical activity ≥ 20 minutes in length on days that I have practice or competition.
   1) Frequently 2) Sometimes 3) Rarely 4) Never

2. If I cannot exercise, I find myself worrying that I will gain weight.
   1) Frequently 2) Sometimes 3) Rarely 4) Never

3. I believe that most female athletes have some form of disordered eating habits.
   1) Strongly Agree 2) Agree 3) Disagree 4) Strongly Disagree

4. During training, I control my fat and calorie intake carefully.
   1) Frequently 2) Sometimes 3) Rarely 4) Never

5. I do not eat foods that have more than 3 grams of fat.
   1) Strongly Agree 2) Agree 3) Disagree 4) Strongly Disagree

6. My performance would improve if I lost weight
   1) Strongly Agree 2) Agree 3) Disagree 4) Strongly Disagree

7. If I got on the scale tomorrow and gained 2 pounds, I would practice or exercise harder or longer than usual.
   1) Frequently 2) Sometimes 3) Rarely 4) Never

8. I weigh myself _____.
   1) Daily 2) 2 or more times per week 3) Weekly 4) Monthly or less

9. If I chose to exercise on the day of competition (game/meet), I exercise for
   1) 2 or more hours 2) 45 minutes to 1 hour 3) 30 to 45 minutes 4) Less than 30 minutes

10. If I know that I will be consuming alcoholic beverages, I will skip meals on that day or the following day.
    1) Frequently 2) Sometimes 3) Rarely 4) Never

11. I feel guilty if I choose fried foods for a meal.
    1) Frequently 2) Sometimes 3) Rarely 4) Never

12. If I were to be injured, I would still exercise even if I was instructed not to do so by my athletic trainer or physician.
    1) Strongly Agree 2) Agree 3) Disagree 4) Strongly Disagree

13. I take dietary or herbal supplements in order to increase my metabolism and/or assist in burning fat.
    1) Frequently 2) Sometimes 3) Rarely 4) Never

14. I am concerned about my percent body fat.
    1) Frequently 2) Sometimes 3) Rarely 4) Never

15. Being an athlete, I am very conscious about consuming adequate calories and nutrients on a daily basis.
    1) Frequently 2) Sometimes 3) Rarely 4) Never

16. I am worried that if I were to gain weight, my performance would decrease.
    1) Strongly Agree 2) Agree 3) Disagree 4) Strongly Disagree

17. I think that being thin is associated with winning.
    1) Strongly Agree 2) Agree 3) Disagree 4) Strongly Disagree

18. I train intensely for my sport so I will not gain weight.
    1) Frequently 2) Sometimes 3) Rarely 4) Never

19. During season, I choose to exercise on my one day off from practice or competition.
    1) Frequently 2) Sometimes 3) Rarely 4) Never

20. My friends tell me that I am thin but I feel fat.
    1) Frequently 2) Sometimes 3) Rarely 4) Never

21. I feel uncomfortable eating around others.
    1) Frequently 2) Sometimes 3) Rarely 4) Never

22. I limit the amount of carbohydrates that I eat.
    1) Frequently 2) Sometimes 3) Rarely 4) Never

23. I try to lose weight to please others.
    1) Frequently 2) Sometimes 3) Rarely 4) Never

24. If I were unable to compete in my sport, I would not feel good about myself.
    1) Strongly Agree 2) Agree 3) Disagree 4) Strongly Disagree

25. If I were injured and unable to exercise, I would restrict my calorie intake.
    1) Strongly Agree 2) Agree 3) Disagree 4) Strongly Disagree

26. In the past 2 years, I have been unable to compete due to an injury.
    1) 7 or more times 2) 4 to 6 times 3) 1 to 3 times 4) No significant injuries

27. During practice I have trouble concentrating due to feelings of guilt about what I have eaten that day.
    1) Frequently 2) Sometimes 3) Rarely 4) Never

28. I feel that I have a lot of good qualities.
    1) Strongly Agree 2) Agree 3) Disagree 4) Strongly Disagree

29. At times I feel that I am no good at all.
    1) Strongly Agree 2) Agree 3) Disagree 4) Strongly Disagree

30. I strive for perfection in all aspects of my life.
    1) Strongly Agree 2) Agree 3) Disagree 4) Strongly Disagree

31. I avoid eating meat in order to stay thin.
    1) Strongly Agree 2) Agree 3) Disagree 4) Strongly Disagree

32. I am happy with my present weight.
    1) Yes 2) No

33. I have done things to keep my weight down that I believe are unhealthy.
    1) Frequently 2) Sometimes 3) Rarely 4) Never

Thank you for completing this survey.

Supplement Use Survey

UNLV Athletic Training

Name _____

Sport _____

Date _____/_____/_____

Why do you choose to take the supplements that you indicated taking at least once per month?
(Check the box that applies or print your reason in "Other")

Which of the following nutritional supplements are you *currently* taking?	**How often do you take this supplement?** (Circle times per month)				Provide energy	Enhance performance	Enhance recovery	Enhance muscle strength	Build muscle	Don't know	Other
Category 1											
Energy / Sport bar (i.e. Powerbar, protein bars (i.e. Pure Pro), Snickers Marathon bar)	0	1-10	11-15	>15							
Cereal / Fruit / Nut bar (i.e. Special K bar, Quaker Oats bar)	0	1-10	11-15	>15							
Gels and other related products (i.e. GU, Clif Shots, Sport Beans)	0	1-10	11-15	>15							
Sports Drinks (i.e. Gatorade Thirst Quencher, Propel fitness water, G2,)	0	1-10	11-15	>15							
Category 2											
Carnitine	0	1-10	11-15	>15							
Chitosan	0	1-10	11-15	>15							
Citrus aurantium (Bitter Orange)	0	1-10	11-15	>15							
Conjugated Linoleic Acid (CLA)	0	1-10	11-15	>15							
Guarana	0	1-10	11-15	>15							
Hyrdoxycitric Acid (HCA)	0	1-10	11-15	>15							
Ma Huang (*Ephedra sinesis* , Ephedrine)	0	1-10	11-15	>15							
Pyruvate	0	1-10	11-15	>15							
Caffeine	0	1-10	11-15	>15							
Category 3											
Multivitamin/mineral supplement	0	1-10	11-15	>15							
B-complex	0	1-10	11-15	>15							
Ginseng	0	1-10	11-15	>15							
Calcium	0	1-10	11-15	>15							
Coenzyme Q10	0	1-10	11-15	>15							
Ginkgo biloba	0	1-10	11-15	>15							
St. John's Wort	0	1-10	11-15	>15							
β carotene	0	1-10	11-15	>15							
Green tea	0	1-10	11-15	>15							
Selenium	0	1-10	11-15	>15							
Vitamin C	0	1-10	11-15	>15							
Vitamin E	0	1-10	11-15	>15							
Echinacea	0	1-10	11-15	>15							
Chromium	0	1-10	11-15	>15							

Why do you choose to take the supplements that you indicated taking at least once per month?
(Check the box that applies or print your reason in "Other")

Category 4	**How often do you take this supplement?** (Circle times per month)				Provide energy	Enhance performance	Enhance recovery	Enhance muscle strength	Build muscle	Don't know	Other
Amino acids	0	1-10	11-15	>15							
Glutamine	0	1-10	11-15	>15							
Protein (Casein, whey, soy, colostrum)	0	1-10	11-15	>15							
Androstenedione	0	1-10	11-15	>15							
Branched-Chain Amino Acids (BCAAs)	0	1-10	11-15	>15							
Creatine	0	1-10	11-15	>15							
DHEA (Dehydroepiandrosterone)	0	1-10	11-15	>15							
HMB (β-Hydroxy-β-Methylbutyrate)	0	1-10	11-15	>15							
Tribulus	0	1-10	11-15	>15							
NO / arginine	0	1-10	11-15	>15							
Category 5											
Chondroitin Sulfate	0	1-10	11-15	>15							
Glucosamine	0	1-10	11-15	>15							
MSM (Methylsulfonymethane)	0	1-10	11-15	>15							
Category 6											
Energy drinks (i.e. Redbull, Rockstar)	0	1-10	11-15	>15							
Sugar-free drinks (i.e. Sugar-free Rockstar, 5-hour energy)	0	1-10	11-15	>15							
Other (Please list any other supplement that you take.)											
	0	1-10	11-15	>15							
	0	1-10	11-15	>15							
	0	1-10	11-15	>15							
	0	1-10	11-15	>15							
	0	1-10	11-15	>15							

How did/do you learn about using supplements?
Check all that apply.

Television			Personal Trainer	
Internet			Magazines	
Friends			Parent	
Coach			Other:	
Athletic Trainer			Other:	
Physician or Nurse			Other:	
Registered Dietitian			Other:	

TABLE 1

Descriptive Statistics for Overall Sample

	Overall			Men			Women		
	n	*M*	*SD*	*n*	*M*	*SD*	*n*	*M*	*SD*
Age	898	19.23	1.47	504	19.51	1.55	391	18.88	1.26
Height (ins.)	795	69.97	4.57	454	72.77	3.17	341	66.35	3.32
Actual Weight	795	173.71	45.20	454	199.62	39.93	341	139.22	23.62
Desired Weight	795	175.00	47.60	454	205.59	38.73	341	134.27	19.47
BMI	795	24.61	4.35	454	26.40	4.42	341	22.22	2.84

TABLE 2

Frequencies for Overall Sample

	f	%	Cum %
Sex			
Men	515	56.3	56.3
Women	400	43.7	100.0
Ethnicity			
White/Non-Hispanic	297	32.0	46.3
Hispanic/Latino	45	4.9	53.3
Black/African American	169	18.4	79.6
Native Hawaiian/Pacific Islander	35	3.8	85.0
Asian	12	1.3	86.9
Native American	1	0.1	87.1
Non-Resident/Non-Citizen	66	7.2	97.4
Bi/Multi-Racial	17	1.9	100.0
Sport Participation			
Soccer	123	13.4	13.4
Cheer	52	5.7	19.1
Volleyball	37	4.0	23.1
Track	69	7.5	30.7
Golf	36	3.9	34.6
Basketball	68	7.4	42.0
Diving/Swimming	86	9.4	51.4
Tennis	34	3.7	55.1
Softball	46	5.0	60.2
Baseball	95	10.3	70.5
Football	231	25.2	95.7
Dance	39	4.2	100.0

TABLE 3

Descriptive Statistics for Outcome Variables by Sex

	Overall		Men		Women	
	M	*SD*	*M*	*SD*	*M*	*SD*
I/A WD	8.34	8.84	9.51	8.57	6.80	8.96
EAT-26 TOTAL	4.24	5.41	2.07	3.48	4.68	7.05
EAT-26 DIET	2.61	3.48	2.28	2.54	3.07	4.44
EAT-26 BUL	0.31	1.27	0.28	0.93	0.34	1.61
EAT-26 ORAL	1.27	1.77	1.28	1.62	1.25	1.96
FAST TOTAL	60.73	10.99	-	-	60.73	10.99
SUS TOTAL	5.92	5.25	6.15	5.65	5.62	4.67
CON	2.26	1.09	2.18	1.14	2.35	1.00
WL/FB	1.03	1.56	0.95	1.55	1.13	1.55
V/M	1.80	2.42	1.87	2.53	1.71	2.27
MB	0.75	1.38	1.06	1.55	0.37	0.10
JS	0.07	0.41	0.09	0.47	0.05	0.33
NK	18.65	5.75	17.60	6.23	20.01	4.71

Note. EAT-26 was scored slightly differently for men and women because of low internal consistency. I/A WD = Ideal-Actual Weight Discrepancy; EAT-26 TOTAL = Eating Attitudes Test – 26 Total Score; EAT-26 DIET = Eating Attitudes Test – 26 Dieting Behaviors subscale; EAT-26 BUL = Eating Attitudes Test – 26 Bingeing/Purging Behaviors subscale; EAT-26 ORAL = Eating Attitudes Test – 26 Oral Control subscale; FAST = Female Athletic Screening Tool Total score; SUS TOTAL = Supplement Use Survey Total score; CON = Consumable supplements; WL/FB = Weight loss/fat burning supplements; V/M = Vitamins/minerals; MB = Muscle-building supplements; JS = Joint supporting supplements; NK = Nutrition Knowledge.

TABLE 4

Bivariate Correlations for Overall Sample

	1	2	3	4	5	6	7	8	9
1. BMI	-	**.12*****	-.05	**-.16*****	**-.08***	-.04	**.08***	.03	**-.17*****
2. I/A WD		-	.001	**-.09****	-.03	.001	**.09****	.01	**-.12****
3. SUS TOTAL			-	**.53****	**.80****	**.88****	**.78****	**.54****	.04
4. CON				-	**.33****	**.33****	**.27****	**.12****	**.13*****
5. WL/FB					-	**.59****	**.52****	**.38****	.02
6. V/M						-	**.57****	**.39****	.003
7. MB							-	**.54****	.01
8. JS								-	.03
9. NK									-

Note. FAST was not included in this table as it was only given to women. EAT-26 was not included in this table as it was scored differently for men and women to improve internal consistency. I/A WD = Ideal-Actual Weight Discrepancy; SUS TOTAL = Supplement Use Survey Total score; CON = Consumable supplements; WL/FB = Weight loss/fat burning supplements; V/M = Vitamins/minerals; MB = Muscle-building supplements; JS = Joint supporting supplements; NK = Nutrition Knowledge.
*$p \leq .05$, **$p \leq .01$, ***$p \leq .001$.

TABLE 5

Bivariate Correlations for Men

	1	2	3	4	5	6	7	8	9	10	11	12	13
1. BMI	-	-.02	.10	.18	-.16	-.13	**-.11***	**-.17*****	**-.09***	-.08	-.05	-.002	**-.10***
2. I/A WD		-	**.16****	.12	-.21	.05	.02	.00	-.002	-.01	.08	.02	-.09
3. EAT-26 TOTAL			-	**.80****	.30	**.48****	**.13***	.04	**.16*****	.06	**.12****	.09	.00
4. EAT-26 DIET				-	.16	-.09	.20	-.13	.08	.15	**.32****	**.25***	**-.22***
5. EAT-26 BUL					-	-.07	**.52****	**.47****	**.53****	**.56****	.19	.23	-.05
6. EAT-26 ORAL						-	-.15	-.20	.03	-.19	-.12	-.05	-.09
7. SUS TOTAL							-	**.55****	**.81****	**.89****	**.80****	**.59****	**.09***
8. CON								-	**.32****	**.36****	**.33****	**.15****	**.12****
9. WL/FB									-	**.63****	**.55****	**.46****	.06
10. V/M										-	**.58****	**.45****	.04
11. MB											-	**.56****	**.11***
12. JS												-	.05
13. NK													-

Note. I/A WD = Ideal-Actual Weight Discrepancy; EAT-26 TOTAL = Eating Attitudes Test – 26 Total Score; EAT-26 DIET = Eating Attitudes Test – 26 Dieting Behaviors subscale; EAT-26 BUL = Eating Attitudes Test – 26 Bingeing/Purging Behaviors subscale; EAT-26 ORAL = Eating Attitudes Test – 26 Oral Control subscale; SUS TOTAL = Supplement Use Survey Total score; CON = Consumable supplements; WL/FB = Weight loss/fat burning supplements; V/M = Vitamins/minerals; MB = Muscle-building supplements; JS = Joint supporting supplements; NK = Nutrition Knowledge.

*$p \leq .05$, **$p \leq .01$, ***$p \leq .001$.

TABLE 6

Bivariate Correlations for Women

	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1. BMI	-	**.21*****	**.22****	**.20****	-.13	.12	**.34*****	-.04	-.07	-.01	-.04	-.03	.02	-.05
2. I/A WD		-	**.37*****	**.40*****	**.26*****	**.17***	**.36*****	-.04	**-.19*****	-.04	.01	.02	-.03	-.08
3. EAT-26 TOTAL			-	**.86****	**.49****	**.61****	**.56*****	.12	.01	**.17***	.10	.03	.02	-.05
4. EAT-26 DIET				-	**.40****	**.21****	**.52*****	**.16***	.01	**.18***	**.15***	.08	.04	-.12
5. EAT-26 BUL					-	**.23****	**.30****	.07	.01	**.20****	-.40	.09	-.03	-.14
6. EAT-26 ORAL						-	**.26****	.12	.09	.11	.07	.03	.07	.10
7. FAST TOTAL							-	.06	.01	**.13***	.05	.01	-.10	-.06
8. SUS TOTAL								-	**.52****	**.81****	**.87****	**.79****	**.42****	-.05
9. CON									-	**.32****	**.29****	**.23****	.07	**.11***
10. WL/FB										-	**.53****	**.60****	**.28****	-.09
11. V/M											-	**.60****	**.27****	-.05
12. MB												-	**.52****	-.08
13. JS													-	-.002
14. NK														-

Note. I/A WD = Ideal-Actual Weight Discrepancy; EAT-26 TOTAL = Eating Attitudes Test – 26 Total Score; EAT-26 DIET = Eating Attitudes Test – 26 Dieting Behaviors subscale; EAT-26 BUL = Eating Attitudes Test – 26 Bingeing/Purging Behaviors subscale; EAT-26 ORAL = Eating Attitudes Test – 26 Oral Control subscale; FAST = Female Athletic Screening Tool Total score; SUS TOTAL = Supplement Use Survey Total score; CON = Consumable supplements; WL/FB = Weight loss/fat burning supplements; V/M = Vitamins/minerals; MB = Muscle-building supplements; JS = Joint supporting supplements; NK = Nutrition Knowledge. $^{*}p \leq .05$, $^{**}p \leq .01$, $^{***}p \leq .001$.

TABLE 7

Fisher's z-Transformation for Differences in Relationships by Sex

	1	2	3	4	5	6	7	8	9	10	11	12	13
1. BMI	-	**-3.24****	-1.19	-0.16	-0.15	-1.60	-1.01	-1.46	-1.15	-0.58	-0.29	0.26	-0.67
2. I/A WD		-	**-2.34***	**-2.26***	**-2.35***	-0.77	0.84	**2.69****	0.53	-0.28	0.84	0.70	-0.13
3. EAT-26 TOTAL			-	-1.45	-1.06	-1.17	0.10	0.30	-0.10	-0.40	0.90	0.70	0.48
4. EAT-26 DIET				-	-1.09	-1.46	0.31	-1.07	-0.78	0.00	**1.92***	1.64	-0.76
5. EAT-26 BUL					-	-1.02	**2.50****	**2.47****	1.91	**5.21*****	0.50	1.30	0.43
6. EAT-26 ORAL						-	-1.74	-1.88	-0.52	-1.68	-0.97	-0.77	-1.15
7. SUS TOTAL							-	0.63	0.00	1.33	0.41	**3.44*****	**1.93***
8. CON								-	0.00	1.17	1.62	1.21	0.14
9. WL/FB									-	**2.26***	-1.12	**3.13****	**2.07***
10. V/M										-	-0.46	**3.11****	1.24
11. MB											-	0.84	**2.62****
12. JS												-	0.71
13. NK													-

Note. I/A WD = Ideal-Actual Weight Discrepancy; EAT-26 TOTAL = Eating Attitudes Test – 26 Total Score; EAT-26 DIET = Eating Attitudes Test – 26 Dieting Behaviors subscale; EAT-26 BUL = Eating Attitudes Test – 26 Bingeing/Purging Behaviors subscale; EAT-26 ORAL = Eating Attitudes Test – 26 Oral Control subscale; SUS TOTAL = Supplement Use Survey Total score; CON = Consumable supplements; WL/FB = Weight loss/fat burning supplements; V/M = Vitamins/minerals; MB = Muscle-building supplements; JS = Joint supporting supplements; NK = Nutrition Knowledge. *$p \leq .05$, **$p \leq .01$, ***$p \leq .001$.

TABLE 8

Descriptive Statistics for Outcome Variables by Sport for Men

	Soccer			Cheer			Golf			Basketball		
	n	*M*	*SD*	*n*	*M*	*SD*	*n*	*M*	*SD*	*n*	*M*	*SD*
BMI	67	23.56	1.89	3	21.26	2.86	18	23.79	1.87	31	24.64	2.25
I/A WD	61	5.08	5.29	3	6.00	6.56	16	7.69	5.56	31	10.16	7.54
EAT-26 TOTAL	31	1.68	3.87	3	1.00	1.00	9	1.22	1.39	14	1.50	1.70
EAT-26 DIET	32	1.47	2.95	3	0.33	0.58	9	0.89	1.45	15	1.00	1.65
EAT-26 BUL	33	0.30	1.10	3	0.67	1.15	9	0.00	0.00	15	0.00	0.00
EAT-26 ORAL	32	0.25	0.72	3	0.00	0.00	9	0.33	0.71	14	0.64	1.81
SUS TOTAL	60	7.13	7.04	3	6.67	4.73	17	5.59	3.00	35	4.63	2.73
CON	60	2.47	0.91	3	2.33	0.58	17	2.88	0.49	35	2.11	0.93
WL/FB	60	1.18	2.25	3	1.67	1.15	17	0.71	0.92	35	0.60	0.85
V/M	60	2.30	3.21	3	2.67	3.06	17	1.47	2.21	35	1.40	1.58
MB	60	1.05	1.79	3	0.00	0.00	17	0.53	0.62	35	0.51	0.98
JS	60	0.13	0.60	3	0.00	0.00	17	0.00	0.00	35	0.00	0.00
NK	62	18.77	4.86	3	23.67	4.93	17	20.65	4.12	29	13.72	6.74

Note. I/A WD = Ideal-Actual Weight Discrepancy; EAT-26 TOTAL = Eating Attitudes Test – 26 Total Score; EAT-26 DIET = Eating Attitudes Test – 26 Dieting Behaviors subscale; EAT-26 BUL = Eating Attitudes Test – 26 Bingeing/Purging Behaviors subscale; EAT-26 ORAL = Eating Attitudes Test – 26 Oral Control subscale; SUS TOTAL = Supplement Use Survey Total score; CON = Consumable supplements; WL/FB = Weight loss/fat burning supplements; V/M = Vitamins/minerals; MB = Muscle-building supplements; JS = Joint supporting supplements; NK = Nutrition Knowledge.

TABLE 8 cont.

Descriptive Statistics for Outcome Variables by Sport for Men

	Diving/Swimming			Tennis			Baseball			Football		
	n	*M*	*SD*	*n*	*M*	*SD*	*n*	*M*	*SD*	*n*	*M*	*SD*
BMI	40	23.46	2.76	16	22.99	1.38	88	24.97	2.72	217	29.24	4.77
I/A WD	37	8.70	6.62	15	3.27	3.45	84	10.90	11.38	208	10.97	8.38
EAT-26 TOTAL	19	2.26	3.09	12	2.00	6.62	45	1.71	2.22	106	2.47	3.74
EAT-26 DIET	19	0.84	1.89	12	0.83	2.59	47	1.19	1.74	111	1.39	2.67
EAT-26 BUL	19	0.47	1.07	12	0.67	2.31	47	0.04	0.20	112	0.33	0.87
EAT-26 ORAL	19	0.95	1.65	12	0.50	1.73	49	0.39	1.11	112	0.75	1.50
SUS TOTAL	39	7.28	6.98	21	6.38	4.88	90	7.28	4.13	209	6.59	5.97
CON	39	2.56	1.25	21	2.48	1.21	90	2.41	0.91	209	2.25	1.03
WL/FB	39	1.21	2.04	21	1.14	1.68	90	1.17	1.15	209	0.96	1.57
V/M	39	2.33	2.86	21	2.14	2.35	90	2.13	2.47	209	1.98	2.54
MB	39	1.10	1.90	21	0.62	0.67	90	1.47	1.31	209	1.27	1.71
JS	39	0.08	0.48	21	0.00	0.00	90	0.10	0.43	209	0.13	0.56
NK	37	20.16	5.26	18	17.44	7.72	79	18.33	6.47	198	16.67	6.21

Note. I/A WD = Ideal-Actual Weight Discrepancy; EAT-26 TOTAL = Eating Attitudes Test – 26 Total Score; EAT-26 DIET = Eating Attitudes Test – 26 Dieting Behaviors subscale; EAT-26 BUL = Eating Attitudes Test – 26 Bingeing/Purging Behaviors subscale; EAT-26 ORAL = Eating Attitudes Test – 26 Oral Control subscale; SUS TOTAL = Supplement Use Survey Total score; CON = Consumable supplements; WL/FB = Weight loss/fat burning supplements; V/M = Vitamins/minerals; MB = Muscle-building supplements; JS = Joint supporting supplements; NK = Nutrition Knowledge.

TABLE 9

Descriptive Statistics for Outcome Variables by Sport for Women

	Soccer			Cheer			Volleyball			Track			Golf		
	n	*M*	*SD*	*n*	*M*	*SD*	*n*	*M*	*SD*	*n*	*M*	*SD*	*n*	*M*	*SD*
BMI	52	22.06	1.84	44	22.07	2.37	34	22.34	2.24	64	21.50	3.73	17	21.69	2.01
I/A WD	50	4.14	4.89	43	7.30	5.99	32	6.50	5.90	53	7.50	9.38	17	5.12	4.14
EAT-26 TOTAL	22	3.41	3.97	20	8.45	15.64	17	3.94	3.44	32	2.41	2.23	6	8.67	7.63
EAT-26 DIET	23	2.13	3.17	20	5.65	7.94	17	2.41	2.43	33	1.42	1.79	6	6.83	5.98
EAT-26 BUL	23	0.26	0.92	23	1.13	3.77	18	0.11	0.47	35	0.06	0.34	7	0.00	0.00
EAT-26 ORAL	22	0.91	1.02	23	1.52	3.73	18	1.39	1.72	24	1.15	1.94	7	1.14	2.27
FAST TOTAL	47	58.66	11.81	28	66.21	9.81	29	60.69	11.41	54	55.59	9.96	15	60.60	11.84
SUS TOTAL	54	5.91	4.86	42	6.07	3.89	36	5.00	2.80	68	5.68	4.77	17	5.24	2.99
CON	54	2.65	0.89	42	2.31	0.90	36	2.48	0.65	68	2.43	1.06	17	2.53	0.80
WL/FB	54	1.35	1.82	42	1.76	1.66	36	0.86	0.96	68	0.90	1.53	17	0.65	0.86
V/M	54	1.44	2.02	42	1.55	1.70	36	1.36	1.74	68	2.03	2.69	17	1.71	1.79
MB	54	0.41	1.19	42	0.38	0.79	36	0.19	0.71	68	0.32	0.68	17	0.29	0.47
JS	54	0.06	0.30	42	0.07	0.34	36	0.11	0.52	68	0.00	0.00	17	0.06	0.24
NK	50	21.46	4.28	42	19.26	4.92	30	21.23	3.90	55	20.47	4.45	9	18.22	6.46

Note. I/A WD = Ideal-Actual Weight Discrepancy; EAT-26 TOTAL = Eating Attitudes Test – 26 Total Score; EAT-26 DIET = Eating Attitudes Test – 26 Dieting Behaviors subscale; EAT-26 BUL = Eating Attitudes Test – 26 Bingeing/Purging Behaviors subscale; EAT-26 ORAL = Eating Attitudes Test – 26 Oral Control subscale; FAST = Female Athletic Screening Tool Total score; SUS TOTAL = Supplement Use Survey Total score; CON = Consumable supplements; WL/FB = Weight loss/fat burning supplements; V/M = Vitamins/minerals; MB = Muscle-building supplements; JS = Joint supporting supplements; NK = Nutrition Knowledge.

TABLE 9 cont.

Descriptive Statistics for Outcome Variables by Sport for Women

	Basketball			Diving/Swimming			Tennis			Softball			Dance		
	n	*M*	*SD*	*n*	*M*	*SD*	*n*	*M*	*SD*	*n*	*M*	*SD*	*n*	*M*	*SD*
BMI	27	23.06	2.22	42	22.02	1.71	7	21.01	1.35	43	24.30	3.17	37	20.63	3.48
I/A WD	25	6.10	4.49	40	5.18	4.48	8	6.13	5.72	40	9.60	11.37	36	6.25	4.77
EAT-26 TOTAL	10	5.20	5.96	25	3.96	4.29	7	2.71	1.70	14	3.71	3.63	19	7.53	7.95
EAT-26 DIET	12	3.25	4.92	25	2.56	3.43	7	2.14	1.57	15	2.67	3.56	19	5.00	5.36
EAT-26 BUL	12	0.33	0.65	27	0.22	0.70	7	0.00	0.00	17	0.00	0.00	21	0.90	2.32
EAT-26 ORAL	12	1.67	1.50	27	1.15	1.20	7	0.57	0.79	16	1.06	1.18	20	1.70	1.95
FAST TOTAL	27	60.67	11.69	38	60.18	10.21	10	58.80	10.34	39	62.95	10.19	32	66.34	10.65
SUS TOTAL	30	8.30	9.36	43	5.23	2.77	11	3.82	1.40	43	6.05	4.57	39	6.05	2.95
CON	30	2.50	0.78	43	2.70	0.86	11	1.82	0.87	43	2.30	0.94	39	2.33	0.84
WL/FB	30	1.43	2.57	43	0.86	0.91	11	0.91	0.83	43	1.33	1.80	39	1.44	1.05
V/M	30	3.00	4.02	43	1.42	1.71	11	0.91	0.83	43	2.09	2.39	39	1.90	1.74
MB	30	1.07	2.52	43	0.23	0.43	11	0.18	0.40	43	0.33	0.52	39	0.38	0.59
JS	30	0.30	0.84	43	0.02	0.15	11	0.00	0.00	43	0.00	0.00	39	0.00	0.00
NK	30	17.43	6.11	39	21.26	3.68	12	18.42	5.12	33	19.97	4.79	32	19.06	3.93

Note. I/A WD = Ideal-Actual Weight Discrepancy; EAT-26 TOTAL = Eating Attitudes Test – 26 Total Score; EAT-26 DIET = Eating Attitudes Test – 26 Dieting Behaviors subscale; EAT-26 BUL = Eating Attitudes Test – 26 Bingeing/Purging Behaviors subscale; EAT-26 ORAL = Eating Attitudes Test – 26 Oral Control subscale; FAST = Female Athletic Screening Tool Total score; SUS TOTAL = Supplement Use Survey Total score; CON = Consumable supplements; WL/FB = Weight loss/fat burning supplements; V/M = Vitamins/minerals; MB = Muscle-building supplements; JS = Joint supporting supplements; NK = Nutrition Knowledge

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