

EFFECTS OF TRAINING PERIOD ON DISORDERED EATING IN TRIATHLETES

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ABSTRACT

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For athletes, there has been little research done on the prevalence of eating disorders or disordered eating. However, from what has been researched, it suggests that athletes may be at a higher risk for the development of an eating disorder than non-athletes, especially those competing in leanness-focused sports (Thiemann, et al., 2015; Byrne & McLean, 2001; Sundgot-Borgen & Torstveit, 2004; Smolak, Murnen, & Ruble, 2000; Byrne & McLean, 2002; Pasman & Thompson, 1988). Additionally, female athletes have been seen to be at the greatest risk for disordered eating, though the rates in male athletes are on the rise (Glazer, 2008; Pasman & Thompson, 1988; Greenleaf, Petrie, Carter, & Reel, 2009). What has not been studied, however, is the relationship between where an athlete is in their training cycle and their disordered eating. The present research study will examine whether there is a relationship between training period (off-season, before a big race, after a big race) and disordered eating patterns among triathletes. The current study takes approximately thirteen triathletes, both male and female, elite and non-elite, and looks at their eating behaviors and attitudes at those three time points.

KEY WORDS: Disordered eating, Anorexia nervosa, Bulimia nervosa, Anorexia athletica, Leanness-focused sport, Aesthetic sports

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CHAPTER I

Literature Review

Disordered eating can be defined as “abnormal behaviors associated with eating disorders, such as restraint eating...binge eating; weight, shape, and eating concerns; strict dieting; and controlling one’s body weight and shape through inappropriate compensatory behaviors...that do not warrant a psychiatric diagnosis of an eating disorder” (Quick, Byrd-Bredbenner, & Neumark-Sztainer, 2013, p. 278). In 2007, at least 30 million people of all ages and genders were suffering from an eating disorder in the United States alone (Hudson, Hiripi, Pope, & Kessler, 2007). To make matters worse, eating disorders, specifically anorexia nervosa, had the highest mortality rate of any mental illness in 2012 (Smink, Van Hoeken, & Hoek, 2012). Disordered eating patterns are a cause for concern as they are unhealthy (causing bone loss, electrolyte imbalances, and low blood pressure) and may lead to the development of a diagnosed eating disorder (Marci Anderson MS, 2015). Additionally, disordered eating increases the risk of other health-compromising behaviors, such as smoking, alcohol and drug use, depression and suicide (M., Bennett, Olmsted, M.L., & Rodin, 2001, EDCAS of the William Alanson White Institute, 2014).

For athletes, there has been little research done on the prevalence of eating disorders or disordered eating. However, from what has been researched, it suggests that athletes may be at a higher risk for the development of an eating disorder than non-athletes, especially those competing in leanness-focused sports (Thiemann, et al., 2015; Byrne & McLean, 2001; Sundgot-Borgen & Torstveit, 2004; Smolak, Murnen, & Ruble, 2000; Byrne & McLean, 2002; Pasmán & Thompson, 1988). Additionally, female

athletes have been seen to be at the greatest risk for disordered eating, though the rates in male athletes are on the rise (Glazer, 2008; Pasman & Thompson, 1988; Greenleaf, Petrie, Carter, & Reel, 2009). What has not been studied, however, is the relationship between where an athlete is in their training cycle and their disordered eating. The present research study will examine whether there is a relationship between training period (off-season, before a big race, after a big race) and disordered eating patterns among triathletes. Triathletes have not been categorized as leanness-focused however, because long-distance runners fall into this category, triathletes are put into an odd position where they need to be very fit, but not too lean, which may influence the prevalence of disordered eating in this population.

Athletes Versus Non-Athletes

Due to the energy requirements that athletes have, maintaining a balanced and healthy diet may seem natural. However, this is not the case for some athletes where disordered eating becomes a part of their daily training routine because of the great pressures that are put on them by themselves or others to become leaner or meet other body requirements. In a literature review done by Byrne (2001) comparing athletes and non-athletes, she concludes that athletes have a higher rate of disordered eating, though not all studies concur. According to Byrne, few of these supporting studies have been empirically based and methodologically sound and therefore, do not allow for definite conclusions to be drawn from the information provided. The results also showed that overall, the prevalence of eating disorders in athletes was higher than among controls (Byrne & McLean, 2001). Similar results were found in a large study conducted by the same authors with an Australian sample (Byrne & McLean, 2002). These results were

corroborated by a study of professional athletes in Germany (Thiemann et al., 2015). While their study found no group differences between sports with other mental disorders, the groups differed significantly in prevalence of eating disorders. Aesthetic sports, or sports with a heavy focus on body-type such as figure-skaters, gymnasts, and synchronized swimmers, had the highest rates at 17%, followed by ball-game sports (3%) and non-athletes (2%) (Thiemann, et al., 2015). In addition, the aesthetic sports athletes also reported more societal pressure and a greater degree of its internalization (Thiemann, et al., 2015).

In a study conducted by Sundgot-Borgen and Torstveit (2014) in Norway, the researchers examined the prevalence of eating disorders among elite athletes as compared to the general population. The goal of this study was to examine the prevalence of anorexia nervosa (AN), bulimia nervosa (BN), and anorexia athletica (AA). Anorexia athletica is a concept that allows the “identification of athletes with symptoms of [eating disorders] who do not meet all diagnostic criteria for AN or BN,” (Sundgot-Borgen & Torstveit, 2004, p. 25). This study sampled 1620 athletes and 1696 age-matched controls from the Norwegian Confederation of Sports and Norwegian Population Register respectively. Of the elite athletes, 34% reported placing in the top ten in the Olympics, World Cup, or World Championships, 39% were competing at international levels, and 27% were on national teams and/or recruits to the national team (Sundgot-Borgen & Torstveit, 2004). The researchers found that the prevalence of eating disorders was higher among elite athletes than controls (Sundgot-Borgen & Torstveit, 2004).

Greenleaf, Petrie, Carter, and Reel (2009) examined the prevalence of eating disorders in female collegiate athletes and found that 2% met the requirements for an

eating disorder classification, 25.5% were symptomatic, meaning that they had some symptoms but did not meet full diagnostic criteria, and 72.5% were asymptomatic. Of the women surveyed, about half (54.4%) reported being dissatisfied with their current weight, and, of those, 88.2% believed they were overweight and wanted to lose an average of almost 15 lbs. Another study conducted with female athletes examined 603 elite female athletes in Norway between the ages of 12 and 35 years. Of the 522 who responded, 22.4% were classified as “at risk.” Of those, 89% could be classified with AN, BN, or AA (Sundgot-Borgen, 1994).

A meta-analysis done by Smolak and colleagues (2000) combined data from 34 studies used to examine the relationship between athletic participation and disordered eating. From these studies, the authors found that athletes had somewhat more risk for disordered eating than nonathletes. They also found that nonelite, non-lean sport athletes, or those athletes whose sport does not require a lean physique to compete at competitive levels such as basketball, rowing, soccer, as compared to lean sports such as gymnastics, cross country and cheerleading, appear to score better on measures for eating disorders than nonathletes (Smolak, Murnen, & Ruble, 2000). Taken together, this shows that athletic competition may be a protective factor when comparing the rate of eating disorders in nonelite, non-lean sport athletes to nonathletes.

In 1986 Rosen et al. surveyed 182 college level female athletes from ten different sports. They found that 32% of these athletes used at least one unhealthy weight control method (Rosen, McKeag, Hough, & Curley, 1986). An unhealthy weight control method is a term that is used to describe a behavior that causes harm to an individual in an attempt to lose weight such as self-induced vomiting or using laxatives. Overall, of the

uncontrolled studies that Byrne (2001) reviewed for his article, 15-78% of female athletes engages in at least one unhealthy method of weight control. While the previous study was confined to female athletes, Pasman and Thompson (1988) investigated both female and male runners, weight lifters, and non-athletes using the Eating Disorder Inventory to assess eating disturbances. They found that both male and female athletes had significantly higher scores than the non-athletes on a Drive for Thinness scale (Pasman & Thompson, 1988). Additionally, a study done by Byrne and colleagues (2002) showed that athletes had significantly higher rates of eating disorders than non-athletes.

In contrast, a study done by Kirk and colleagues (2001) found that college athletes actually had a lower incidence of disordered eating compared to non-athletes. In addition, it was found that the typical college female athlete falls into the normal range with regard to eating patterns and demonstrates healthier attitudes than non-athletes. (Virnig & McLeod, 1996). The differences in the findings could be due to several reasons which were discussed in the article. They include the fact that colleges have resources that they can provide to athletes for counseling and academic support which could create a different social environment for the student athletes. The researchers also suggested that the growing awareness among varsity athletic departments regarding the risk of eating disorders could account for greater efforts being made to create networks of support. However, the majority of research seems to suggest that overall, athletes may be at a greater risk for eating disorders than non-athletes.

Elite Athletes

There have been numerous studies that included elite athletes in their samples (Sundgot-Borgen, 1994; Thiemann et al., 2015; Smolak, Murnen, Ruble, 2000; Weight &

Noakes, 1987; Byrne & McLean, 2002; Hulley, Currie, Njenga, Hill, 2006); however, many have not compared differences between recreational and elite athletes. This is an important factor to consider in the development and maintenance of eating disorders because of the considerable stress that training puts on an athlete. Weight and Noakes (1987) compared elite and recreational marathon runners, along with non-runners, and found that the elite runners in their sample were much more likely than the recreational runners to have an eating disorder. In fact, 80% of the runners that were identified as having an eating disorder fell into the elite runner group (Byrne & McLean, 2001). In a meta-analysis done by Smolak and colleagues (2000) it was found that elite athletes involved in thinness-focused sports were especially at risk for developing eating disorders. Additionally, in a study done by Kong and Harris (2015), elite level athletes were more likely to have disordered eating than those competing at recreational and noncompetitive levels (Kong & Harris, 2015). However, in another study done by Blaydon and Lidner (2002) they found that professionals (31.5%) had a slightly less incidence of eating disorder than amateurs (35.7%). Taken together, this information suggests that elite athletes are at a greater risk than recreational athletes or non-athletes; however, this may not always be the case and may be an area for further research.

Sports with a Focus on Thinness

With respect to the relation between sport categories and body types, it has generally been found that athletes in sports in which there is an emphasis on being thin have higher rates of eating problems than athletes in other sports. According to Byrne & McLean (2001), there were only three studies (Borgen & Corbin, 1987; Davis & Cowles, 1989; Sungot-Borgen, 1993) that directly investigated this research question. The largest

of the three studies found that a “significantly higher number of athletes (18%) than controls (5%) were found to actually suffer from ED, particularly athletes competing in sports in which leanness or a specific weight were considered important” (Sundgot, 1993, p. 29). Similarly, Byrne and McLean (2002) found that among the females in their study, 15% of the thin-build athletes versus 1% of the non-athletes and 2% of normal-build athletes evidenced anorexia nervosa or bulimia nervosa. An additional study done by Sundgot-Borgen (1994) examined the prevalence of eating disorders within different sports and found that those sports where athletes are encouraged to be thin have a higher rate of athletes reporting eating problems than those not focused on thinness.

Though there are many studies involving athletes and eating disorders, many do not have large enough samples, are too varied with respect to sport types, or are only focused on a specific population, such as female college athletes. Therefore, when Byrne (2001) reviewed controlled studies he found mixed results based on these design limitations. While some have found a greater range of disordered eating in athletes than non-athletes, the majority of the controlled studies reported no differences. When the sample sizes were large enough, they often collected data from athletes in a wide range of sports. For example, Borgen and Corbin (1987) compared 67 female athletes to 101 female non-athletes. These collegiate athletes were drawn from seven different sports. Though the results indicated no overall difference between athletes and non-athletes, athletes in sports which emphasized leanness (long-distance running, gymnastics) showed a higher percentage of elevated scores on the Eating Disorder Inventory (EDI) (20%) than the athletes in the other sports (10%) and non-athletes (6%) (Sundgot-Borgen & Corbin, 1987). The research therefore suggests that athletes competing in leanness-

focused sports are more prone to developing eating disorders than non-athletes or other athletes in general.

Triathletes

Triathletes are an interesting population to study because of the lack of research regarding them when it comes to this topic. Additionally, because triathletes compete in three different sports during their competitions, it is difficult to categorize them into a leanness-focused or nonleanness-focused sport. Long distance runners and elite cyclists are usually very lean, while swimmers require a different body type. Therefore, examining rates of disordered eating among triathletes will be beneficial, and the research on this population is extremely limited. In a study done by DiGiacchino DeBate, Wethington, and Sargent (2002), sub-clinical characteristics of eating disorders were assessed in 583 male and female triathletes. They found that on the Eating Attitude Test - 26 (EAT-26) 89% of the males and 72% of the females scored above the mid-point of the range for the construct Preoccupation with Food and Weight, with higher scores being indicative of subclinical disordered eating attitudes. Additionally, 77% and 61% respectively scored above the mid-point for Calorie Control subtest of the EAT-26. All the subjects in the study reporting being dissatisfied with their current body mass index (BMI) (DiGiacchino DeBate, Wethington, & Sergant, 2002). This study suggests that triathletes are vulnerable to higher rates of disordered eating, as are those in more traditional leanness sports.

In 2002, Blaydon and colleagues conducted a study examining the relationship between eating disorders and exercise dependence in triathletes. Exercise dependence "...is thought of as an obsessive compulsion to exercise" (Blaydon & Lindner, 2002, p.

49). This concept was first introduced by Glasser in 1976; however, he viewed this as a positive addiction since it has so many health benefits, including psychological outcomes as well as increases in life satisfaction (Blaydon & Lindner, 2002). However, since his initial study many studies have been published looking at the outcomes of exercise dependence and have found that this behavior may have negative consequences such as withdrawal symptoms, detrimental social consequences, disturbed psychological functioning, and exercising despite medical contraindications (Berczik, et al., 2012). These studies (Baekeland, 1970; Morris, 1990; Thaxton, 1982) found that athletes may have begun to learn to rely on exercise to counteract anxiety and depression or to lose weight. They also found that later, after becoming accustomed to exercising heavily for a period of time, exercise deprivation had negative psychological effects on the subjects (Blaydon & Lindner, 2002). Specifically, they found that 34% of the triathletes reported having eating disorders, with 50% of females compared to 27% of males (Blaydon & Lindner, 2002). This may be an important aspect of eating disorders especially with athletes, as there is "...a strong link between exercise addiction and various forms of eating disorders" (Berczik, et al., 2012, p. 408). Having such a high rate of disordered eating among a population is concerning and partly motivates the current study.

As stated by Virnig and colleagues (1996), runners and other endurance athletes have many times been viewed in a negative light by mental health professionals, especially those that specialize in eating disorders. Runners have even been described as "compulsive" (Sacks, 1987). Additionally, obligatory runners, or those who feel a compulsion to run, have shown similar personality characteristics to anorexic patients, such as inhibition of anger and a tendency towards depression (Yates, Shisslak, Allender,

Crago, & Leehy, 1992). Virnig, being both a runner and a triathlete herself, hypothesized that runners would regard food as an enemy as excess fat is seen as a curse while triathletes would view food as an ally due to the varied and sustained energy and strength requirements needed to compete in triathlons and the extra buoyancy that having some fat brings (Virnig & McLeod, 1996). The trend of this study showed that triathletes scored lower than runners on the EAT-26 meaning that they had less disordered eating, and the group with the highest mean score (more disordered eating) was that of the female runners. However, neither athletes reported extreme eating behaviors, and it was found that the athletes have relatively healthy eating attitudes (Virnig & McLeod, 1996). This study contradicts what Blaydon and Lindner (2002) discovered, however this study had a significantly smaller sample and directly compared triathletes to another group (runners).

Gender

Eating disorders can be experienced by any person; however, there are specific populations that are more susceptible to the development of this disorder. When looking at gender and its influence on athletes' disordered eating, only one study was created to adequately look at its effects. Pasman and Thompson (1988) investigated both female and male runners, weight lifters, and non-athletes using the EDI to check for eating disturbances. They found that both male and female athletes had significantly higher scores than the non-athletes on the Drive for Thinness scale and also found a gender difference in which females had more disturbed eating attitudes than males (Pasman & Thompson, 1988). A point of interest was that the male athletes scored higher than the female non-athlete controls on the Drive for Thinness and Bulimia subscales of the EDI

(Byrne & McLean, 2001). Similarly, Virnig & McLeod's 1996 study found that females tended to have more disordered eating patterns than males.

Looking at male athletes, Glazer (2008) found that eating disorders are on the rise. Due to the wide-held belief that eating disorders are "a female's disorder," little research has been done on disordered eating and its incidence in males. In fact, in 1994 one survey of physicians found that only 40% of internists and 25% of psychiatrists believed that males could have an eating disorder (Glazer, 2008). Glazer found that males actually had higher rates of subclinical eating disorders and sport-specific eating behaviors than females. In addition, Glazer (2008) discovered that "cyclists scored significantly higher (reflecting more abnormal attitudes) than their nonathletic peers" (p. 333). There was a similar study finding that among male and female triathletes respectively, 11% and 28% demonstrated food and weight preoccupation, 23% and 39% were engaging in restrictive calorie-controlling behaviors, and 100% endorsed being unhappy with their BMI (DiGioacchino, Wethington, & Sargent, 2002). However, in a separate study done by Greenleaf and colleagues, no male collegiate athletes in a sample of 203 were classified with a clinical eating disorder, although almost 20% reported a sufficient number and level of symptoms to be considered symptomatic (Petrie, Greenleaf, Reel, & Carter, 2008). This suggests that even if an eating disorder is not diagnosed in male athletes, they still may be suffering from disordered eating or symptoms of such.

Body Dissatisfaction

Now that the topics of who and what are going to be addressed by the proposed study have been reviewed, risk factors and competing aspects of the disorder need to be

discussed. Body dissatisfaction occurs when there is a mismatch between the individual's body image and their perceived ideal body (Kong & Harris, 2015). Body image refers to the "internal representation of your outer appearance" (Hausenblas & Downs, 2001, p. 323). For athletes, this is a particularly confusing relationship. Athletes may be satisfied with their 'social' body, as distinguished by De Bruin and colleagues (2011), but may be dissatisfied with their 'sporting' body. In regards to studies looking at body type requirements, it has generally been found that sports in which there is an emphasis to be thin have higher rates of eating problems than do other sports. In 2015, a study done by Thiemann et al. looking at female German professional athletes, investigated societal pressure to be thin, its internalization, specific pressure from sports, body dissatisfaction and early specialization within the sports as putative risk factors for eating disorders in female athletes. All of these factors were found to account "...for 57.3% of variation in disordered eating, with sports pressure and body dissatisfaction [being] significant predictors," (Thiemann, et al., 2015, p. 269).

Kong and Harris (2015) conducted a study looking at the relationship between body image and eating disorder symptomatology among female athletes. They took 174 athletes from leanness focused sports and 146 in nonleanness-focused sports and found that those competing in the former reported engaging in disordered eating patterns significantly more than the latter (Kong & Harris, 2015). The researchers posited that the difference between elite athletes' and recreational athletes' disordered eating may come from their higher levels of body dissatisfaction. This dissatisfaction may be due to the level at which they are competing and the condition at which they need their body to be at to compete. The higher levels of disordered eating may also be exacerbated by the

pressure the athletes feel from their coaches to maintain a low body weight, which in turn can contribute to the high body dissatisfaction as well (Kong & Harris, 2015).

One study done by Byrne and colleagues (2002) showed that the pressure to conform to a lean body type does not work in isolation to affect a person's eating behaviors. In that study, though athletes showed significantly higher rates of eating disorders than non-athletes, their levels of body dissatisfaction were not significantly different from non-athletes. The data that was collected from athletes and non-athletes through the Body Dissatisfaction subscale of the EDI-II (Eating Disorder Inventory) did not discriminate between the two groups, nor did it discriminate between thin-build and normal-build athletes (Byrne & McLean, 2002). Similarly, another study conducted by McLester and colleagues (2014), examined susceptibility to eating disorders among female collegiate (NCAA Division I, II, III) student athletes. They found that most of the student athletes at all competition levels fell within the normal to high range for self-esteem and rated themselves as satisfied with their body image (McLester, Hardin, & Hoppe, 2014). Few of the athletes were rated as susceptible to eating disorders, which the authors suggested may be explained by the relationship between body image satisfaction and self-esteem. Though the authors concluded that few of the athletes were susceptible to eating disorders, 8.6% were classified as either susceptible to anorexia or bulimia (McLester, Hardin, & Hoppe, 2014).

A good summary of what many studies have concluded regarding body dissatisfaction and athletic competition comes from a meta-analysis done by Smolak and colleagues (2000). Data from 34 studies were used to examine the relationship between athletic participation and disordered eating. From these studies, the authors found that

athletes had somewhat more risk for disordered eating than nonathletes, but body dissatisfaction was overall lower in athletes (Smolak, Murnen, & Ruble, 2000).

Athletes face many challenges in their athletic endeavors. They face the extra pressure to achieve and maintain an ideal body shape and composition for their respective sport. In addition, they may feel a burden to conform to the socially ideal body shape which has been becoming increasingly thin and physically fit (Byrne & McLean, 2002). This is especially true for athletes who compete in sports that require a lean body type or low body weight to compete at high levels such as ballet, gymnastics, or long-distance running. The “most frequent commonalities found in individuals with eating disorders include a high drive to achieve, perfectionism... and self-worth linked to external validation” (Ginger Kirk, 2001, p. 122). These commonalities are not only experienced by those with eating disorders but by those competing in sports, affecting those in leanness-focused sports most. Many athletes feel a great deal of pressure to achieve a certain ideal weight for their respective sport, either from their coach or from themselves, in order to perform at their highest levels. Additionally, perfectionism, self-motivation, and high achievement expectations in regards to athletic performance are risk factors in the development of an eating disorder in athletes (Ginger Kirk, 2001).

According to Byrne, athletes may be expected to have increased rates of eating disorders compared to the general population. Later, she goes on to explain why this may be the case. First, it is thought that athletes are subject to “increased sociocultural pressure to conform to an ideal body shape,” (Byrne & McLean, 2001, p. 146). Not only do athletes have to face the pressures of society to be thin in everyday life, but they also have specific pressure from within their sport to improve their performance, which

translates to improving their physique. For elite athletes, this pressure may be even greater as pressure from sponsors to be at a specific weight or look a certain way may influence how much an athlete tries to maintain or lose weight. Second, the mindset that most athletes have may amplify the pressures that they face resulting in eating disorders. The “psychological make-up of the elite athlete...has often been described as perfectionistic, goal-oriented, competitive, and intensely concerned with performance,” (Byrne & McLean, 2001, p. 146). Though these personality characteristics are frequently linked to athletic success, these same factors have also been linked to individuals with eating disorders (Hulley, Currie, Njenga, & Hill, 2007, Byrne & McLean, 2001, Byrne & McLean, 2002). Third, the onset of eating disorders usually occurs during adolescence or early adulthood. For athletes, this time period, or the time at which an athlete reaches maturity, is crucial to get into the elite athletic competitions and puts an added pressure on this population (Byrne & McLean, 2001). If a female athlete considered the age at which they had reached menarche too early, and viewed its coming as detrimental to their athletic performance, then they were more likely to feel burdened and more likely to diet (Sundgot-Borgen, 1994).

In regards to identifying risk factors for athletes in developing eating disorders or disordered eating, Sundgot-Borgen (1994) found several including extreme exercise. As many athletes go through extreme exercise regimes as part of their daily routines, this is a difficult risk factor to avoid. However, athletes who experience an even greater increase than usual in their training volume could experience caloric deprivation, possibly due to diminished appetites from changes in endorphins, which could prompt an eating disorder (Sundgot-Borgen, 1994). Those that are predisposed to eating disorders may be triggered

by the pressures to diet and maintain a low body weight from within their sport of choice (Hulley, Currie, Njenga, & Hill, 2007). Another study suggests that people who are susceptible to eating disorders are attracted to certain sports, some personality factors (such as perfectionism) are common in athletes and may lead to the development of eating disorders, and the levels at which the athletes compete and train physically allows for the development and maintenance of such disorders (Hulley, Currie, Njenga, & Hill, 2007)

Eating disorders have many dimensions involving individual, family and cultural predisposing factors (Chadda, Molhotra, Asad, & Bambery, 1987). Individual characteristics that predispose an individual to anorexia nervosa include personality characteristics such as perfectionism and inflexible thinking (Chadda, Molhotra, Asad, & Bambery, 1987). As stated previously, in a study done by Thiemann and colleagues, the societal pressure to be thin, its internalization, specific pressure from sports, body dissatisfaction and early specialization within the sports were risk factors that accounted for 57.3% of variation in disordered eating (Thiemann, et al., 2015). Culturally, living in a society where the ideal body shape is lean and being involved in a weight-focused sport atmosphere are significant as well (Chadda, Molhotra, Asad, & Bambery, 1987).

Summary of Literature

From the research I have summarized, I conclude the following. Athletes in general may be at a higher risk for developing eating disorders because of the confounding variables of sociocultural pressures to maintain a thin body shape, the burden of finding the ideal performance weight for their sport and the perfectionistic, goal-oriented, and competitive nature that many elite athletes possess (McLean, 2001;

Byrne & McLean, 2002; Ginger Kirk, 2001; Hulley, Currie, Njenga, & Hill, 2007; Sundgot-Borgen, 1994; Chadda, Molhotra, Asad, & Bambery, 1987; Thiemann, et al., 2015). Much research has found that elite athletes in thin-build sports, such as long-distance running, have higher rates of eating disorders than athletes in non-thin-build sports and non-athletes (McLean S. B., 2002, McLean S. B., 2001). There is also considerable research supporting the increased prevalence of disordered eating among athletes compared to non-athlete controls (Sundgot-Borgen & Torstveit, 2004; Byrne & McLean, 2001; Greenleaf, Petrie, Carter, & Reel, 2009; Sundgot-Borgen, 1994; Smolak, Murnen, & Ruble, 2000; Kong & Harris, 2015). Additionally, females are at a higher risk of developing an eating disorder or disordered eating patterns (Greenleaf, Petrie, Carter, & Reel, 2009; Pasmán & Thompson, 1988; Byrne & McLean, 2001; Virnig & McLeod, 1996). Though this is not to say that males do not ever develop eating disorders, as Glazer commented they are on the rise in the male athlete population (Glazer, 2008).

Interestingly enough, although athletes anecdotally report responding differently in season and out of season in regards to eating behaviors, there seems to be no research systematically looking at this relationship. An extensive search of the literature produced no research exploring this. Therefore, the current study will be aimed at determining whether disordered eating symptoms changes with an athlete's training schedule. In other words, does an athlete's attitude towards eating differ during training season versus off-season training? The reason for collecting this data will be in order to supplement the lacking research regarding athletic training period and disordered eating. Specifically, the study will examine (1) changes in disordered eating at three different time points in an athlete's training (2) the differences between male and female disordered eating and (3)

differences in disordered eating between elite/professional triathletes and non-elite triathletes. I hypothesize that women will experience greater rates of disordered eating, as will elite athletes. Additionally, I hypothesize that the period where an athlete is getting ready for a big race will show higher rates of disordered eating than off-season and directly after the big race.

CHAPTER II

Methods

Participants

The sample was comprised of participants engaging in endurance sports, predominantly triathletes, some of whom were competing at elite and professional levels. Participants ranged between 24 and 75 years of age. As part of an ongoing study (Henderson, Formon, Gabel, & Ocker, 2017), participants were initially contacted through coaches who were collaborating with the researchers and Facebook announcements recruiting participants for the study on pages whose followers were members of triathlon clubs. Potential participants who requested more information on the study were then contacted directly by email. They provided their consent either in face-to-face meetings, or in an online survey. The participants were then given a packet of surveys that examined demographics, everyday physical activity, couples' satisfaction, eating behaviors, levels of mindfulness, mental strengths and weaknesses, drinking behaviors, their experience of pain, personality characteristics, and Hopkins symptoms (Couple's Satisfaction Index, Eating Disorder Examination Questionnaire, Exercise Dependence and Elite Athletes Scale, Five Facet Mindfulness Questionnaire, Psychopathic Personality Inventory, Fear of Pain Questionnaire, Daily Drinking Questionnaire, Hopkins Symptom Checklist, Big Five Inventory, International Physical Activity Questionnaires) to complete before beginning the training camp.

Procedure

Participants were also asked if they would be open to receiving follow-up assessments, delivered through the training season with respect to their eating patterns.

Interested participants were sent a link to a Qualtrics survey via email at three separate time points in their training season (off-season, approximately one month before their big race, and approximately 1.5 weeks after the race) on day one of those two-week periods they completed the eating disorder questionnaires. The survey included the EDE-Q to measure retrospective reports of engaging in specific disordered eating behaviors over the past month. These time points were chosen to negate possible changes in diet before a big race (i.e. carb-loading). Having the participants complete the surveys a few weeks before their big race allows us to look at their overall eating behaviors and attitudes rather than an outlier day near their big race.

Instruments

The Eating Disorder Examination Questionnaire (EDE-Q) is a 28-item survey consisting of both Likert-style questions and retrospective reports of engaging in specific disordered eating behaviors over the past month (ex. deliberately trying to limit the amount of food consumed, excluding certain foods from diet, fear of weight gain, etc.). Internal consistencies for the scales are as follows for the general population: global score, $\alpha=.95$; restraint $\alpha=.85$; eating concern $\alpha=.81$; weight concern $\alpha=.83$; shape concern $\alpha=.91$ (Aardoom, Dingemans, Slof Op't Landt, & Van Furth, 2012). Another study found that the validity coefficient was 0.78-0.85 by reviewing the validity in male and female athlete populations 18-26 years of age between various studies (Pope, Gao, Bolter, & Pritchard, 2015). The ROC analysis demonstrated an AUC of .96 (95% CI=.95-.97), “meaning that the EDE-Q global score could highly accurately discriminate between individuals with an ED and those without,” (Aardoom, Dingemans, Slof Op't Landt, & Van Furth, 2012, p. 308). The EDE-Q was chosen over other instruments that measure

disordered eating because it has been used with athletes more often than other instruments. Though it has not been normed on all the ages included in this study, because it is used so consistently with athletes, it is still the best option. Additionally, there are very few tests that have been normed on males, let alone male athletes. The EDE-Q has been normed for both male and female young adults, who are included in this study.

Analysis

The proposed repeated measure ANOVA was unable to be conducted due to the small sample size at time three. Therefore, the main hypothesis (time effect) was tested using a paired-samples t-test for time points one and two. Time point three was not examined with a paired-samples t-test. Independent samples t-tests were conducted for sex and elite status at time point one to assess for differences within the groups' Global EDE-Q scores.

CHAPTER III

Results

It should be noted that the present study is a subset of a larger, ongoing study that includes a larger number of participants that are being assessed for different hypotheses. Of the larger survey respondents, nineteen participants took part in this study. Of those respondents, three (15.8%) were missing data for gender and elite status, and one respondent (5.3%) had to be discarded due to being an outlier on the Global Score of the EDE-Q. The average age of the respondents was 46.1 ($SD = 13.1$) years, with an age range of 24-75 years. Half of the respondents that provided their sex were female and half were male, with 16% not reporting their age. 31.6% of the respondents were elite tri-athletes, and 52.6% non-elite, with 16% again not reporting their status. Of the sixteen people who reported their race, 87.5% were white, 6.3% were Asian and 6.3% were Hispanic.

Prior to testing study hypotheses, the assumptions of t-tests and repeated measures ANOVA, namely normality, homogeneity of variance, and, in the case of the ANOVA, sphericity, were examined. When the outlier (mentioned above) was removed, the data were approximately normal and satisfied the test for homogeneity of variance (Levene's tests for elite status and sex were not statistically significant). Because of this statistical outlier, paired-sample t-tests were conducted with and without the outlier included in the data to insure that the outlier did not impact the outcome.

Preliminary Analysis

Independent samples t-tests were conducted to examine gender differences in eating disorder symptoms as well as differences by elite status (see Table 1). Figure 1

shows mean global EDE-Q scores at time point one by race. Because there were only two participants that were not Caucasian, descriptive statistics were the only test that was able to be run (see Figure 1).

Table 1

Descriptive Statistics

<i>Variable</i>	<i>Time 1</i>			<i>Time 2</i>			<i>Time 3</i>		
	M	SD	N	M	SD	N	M	SD	N
<i>Elite</i>	1.46	1.09	6	1.26	0.91	3	0.76	-	1
<i>Non-elite</i>	1.55	0.72	11	1.01	0.71	8	2.53	1.23	4
<i>Male</i>	1.47	0.85	8	1.30	1.11	4	1.58	1.16	2
<i>Female</i>	1.56	0.89	9	0.95	0.41	7	2.57	1.56	3
<i>Total</i>	1.51	0.84	17	1.09	0.73	11	2.18	1.36	5

Note. There was only one respondent for time point three in the elite category. Therefore, no SD could be calculated.

At time 1, average baseline EDE-Q scores did not significantly differ between elite and non-elite athletes $t(14) = -.205$, $p = 0.841$, $d = 0.10$. Likewise, male and female EDE-Q scores did not significantly differ $t(14) = -0.195$, $p = 0.848$, $d = 0.10$.

Due to the small number of participants who completed assessments during the off-season training period (5) and the listwise deletion algorithms built into the statistical software I used to analyze the data, the preferred and proposed repeated measures ANOVA, was unable to be conducted. Therefore, I used a paired-samples t-test to compare average disordered eating scores at the other two time points. Results were significant, $t(10) = 2.93$, $p = 0.015$, $d = 0.70$, indicating that disordered eating was greater leading up to participants' "A race" than following the race (see Figure 2 for means and norms). In addition, I ran a second paired-sample t-test that included the outlier that was discarded previously. Results of this test were also significant, $t(11) =$

2.778, $p = .018$, $d = 0.41$. Though the effect size was smaller, the data show that even with the outlier included there is a significant difference in disordered eating at time points one and two.

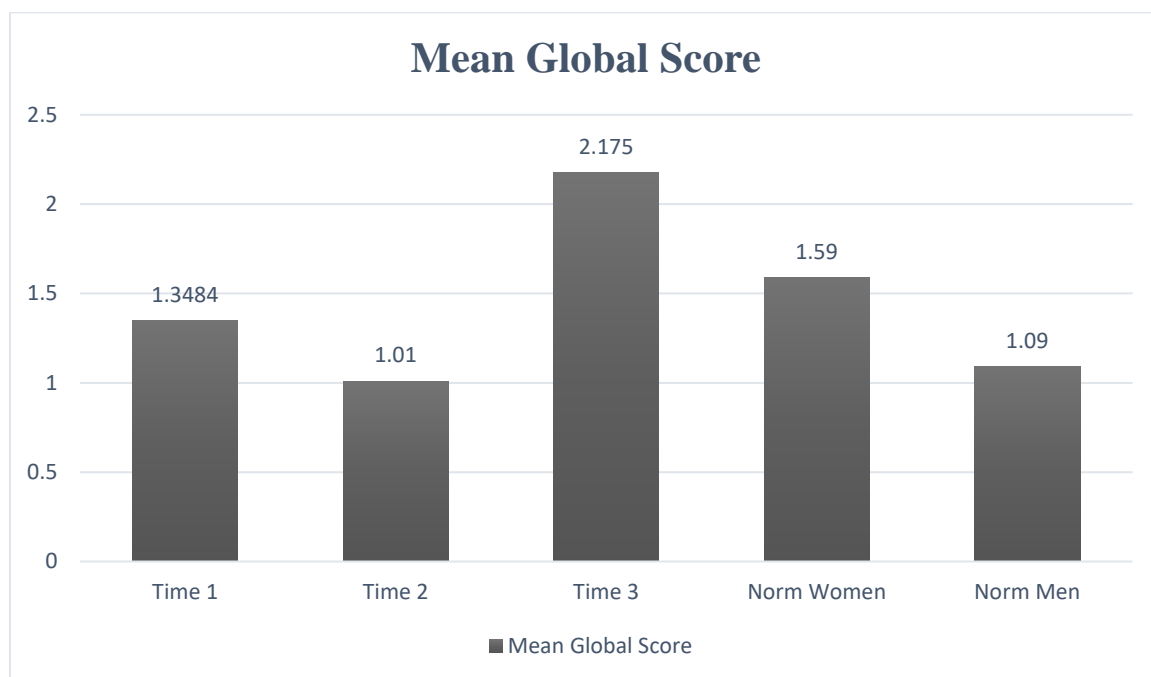


Figure 1. Mean Global Scores at Three Time Points. Time 1: N=19, Time 2: N=11, Time 3 N=5, Normed mean score is normed for females ages 18-22 years of age (Luce, Crowther, & Pole, 2008), Normed mean score for males ages 18-26 years of age (Lavender & Anderson, 2010)

Finally, independent samples t-test was conducted at time points one and two, separating the data between those who only responded at one or two time points, versus those who responded at all three time points. Levene's Test showed that the two groups could be treated as equal. After running the t-test it was found that at time point one $t(16) = 0.437$, $p = 0.668$ and at time point two $t(10) = -2.18$, $p = 0.054$. This means that at time point one, groups that responded to the surveys at all three time points did not differ from those who only responded to one or two time points. While at time point two (directly

after a big race) the two groups did differ significantly. Those who responded to all three time points had significantly more disordered eating at time point two than those who only responded to one or two time points.

Discussion

The primary purpose of the current study was to evaluate the relationship between training period and disordered eating behaviors and attitudes. Additionally, this study sought to examine the relationship of sex and elite status in disordered eating. Results indicate that before a big race, participants were more likely to display disordered eating behaviors or attitudes than directly after the big race. The hypotheses presented were as follows: (1) Females will show more disordered eating behavior/attitudes than males, (2) elite athletes will experience more disordered eating behaviors/attitudes than non-elite athletes, (3) there will be more disordered eating behaviors/attitudes in the time leading up to the big competition versus after the competition or during off-season.

The data analysis found that there were no significant differences between males and females in rates of disordered eating at time point one. This was unexpected, as a majority of the studies that were examined for this research showed a marked difference between male and female rates of disordered eating. The small number of participants is most likely the explanation for this discrepancy. In regards to elite status, no differences were found, but the small sample likewise may have influenced this result. Notably, the effect sizes associated with both these statistical tests were small. This could be due to the fairly large proportion of participants who were elite (31.6%), possibly suggesting that gender differences level out when athletes train and participate at elite levels. However,

there was not a significant difference between elite and non-elite athletes either, so this explanation may not work.

The broad aim of the current study was to examine whether training periods (before a big race, after, and off-season) had an effect on disordered eating. In regards to the main hypothesis (a difference in rates of disordered eating between periods of the racing system, namely, prior to and following a big race, there was a significant difference with a large effect size. The hypothesis was most likely supported due to a number of factors including competitiveness, pressure from self/coaches/society to be thin and muscular, and body dissatisfaction. The hypothesis was also likely supported due to athletes believing that restricting calories and reducing their weight would lead to better performance. However, this is speculative as these factors were not measured.

This data only supports one of the three proposed hypotheses. However, it may have large implications should it be replicable. This study could possibly change how coaches approach training athletes in regards to dieting for athletic achievement. Of course, having a physically fit body is extremely important in an athlete, but being aware as both a coach and an athlete of the increase in disordered eating behaviors before a big race may influence how they think about training and nutrition. Coaches may be able to address eating concerns in a more health conscious manner, providing nutrition or mental health counseling for those athletes who struggle with unhealthy restricting or disordered eating. Providing psychoeducation to both athletes and coaches in sports where thinness is a large factor in an athlete's performance, especially before an important competition, may be necessary to reduce the rates of disordered eating that this study has shown to be higher before a big competition.

Limitations

Although the current study is one of the first looking at the relationship between training period and disordered eating, it does have several limitations. First, the data were collected through self-report using only one measure, which makes it vulnerable to mono-method reporting bias. Second, there was only a small percentage of the participants that were racial/ethnic minorities. This limits the extent to which that variable could be explored statistically. Including more racially diverse participants in the study would better represent the overall demographic of triathletes. Third, the small sample size could have affected the outcome of the analysis. The lack of significant findings in regards to sex and elite status may be due to the small sample size used for the study. Additionally, because of the number of participants who did not complete both time points, this data could be influenced by those who have a certain personality type, such as perfectionism (making them more likely to complete the surveys), which has been known to be a personality trait in people with eating disorders (Ginger Kirk, 2001). Finally, due to the high drop-out rate, analyses were restricted to two time points, and eating behaviors during the off season could not be assessed.

Despite these limitations, the current study does have strengths worth noting. First, this is one of the first studies examining the relationship between training period and disordered eating. Additionally, because of the online format, a high level of anonymity required to honestly respond to potentially embarrassing behaviors or attitudes was provided. Finally, though the participants were not ethnically or racially diverse, this is one of the few studies on disordered eating that includes an equal number of men and women, which additionally includes a wide range of age and elite statuses.

Future Research

Finding a large number of participants for this study was difficult and keeping them in the study was even more so. In the future, it is suggested that the researcher focus on recruiting larger numbers in the beginning to reduce the effect of drop-outs. Including more participants in the study would have allowed for a further investigation of elite-status, as there are many different levels of this variable. Additionally, if a researcher would like to know more about the underlying factors in disordered eating within this population, including a personality inventory would be necessary. Studying athletes of other sports would be important in this area of investigation as well. Higher levels of disordered eating have been found in aesthetic sports and leanness-focused sports (Byrne & McLean, 2001; Byrne & McLean, 2002). Additionally, due to the results for time three as seen in Figure 1, researching off-season versus in-season eating behaviors may be especially needed as the data shows increased disordered eating during off-season.

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VITA

Sky Gabel

EDUCATION

Masters of Arts (Clinical Psychology) at Sam Houston State University, 2016-present, Thesis: "Eating Disorders and Training Period in Athletes"

Bachelor's of Science (Biology and Psychology) at Rocky Mountain College, (May 2015), Honors: *Magna Cum Laude*, Dean's Honor List

RESEARCH EXPERIENCE

Sam Houston State University

Graduate Student Researcher

2016-Present

- Study the effects of training period on disordered eating patterns in athletes
- Prepare relevant literature reviews, recruit subjects, collect data, and send correspondence to participants, coaches and organizations
- Maintained integrity of confidential information and reviewed informed consent

Graduate Student Researcher

2016-Present

- "Daily Stress, Training and Recovery Among Triathletes"
- Organize relevant literature reviews, help administer daily survey instruments involving triathletes and their attitudes towards stress
- Assisted during the IRB amendment process, contacting possible training agencies to recruit subjects, and overseeing email reminders to subjects
- Maintained integrity of confidential information and reviewed informed consent

Rocky Mountain College

Undergraduate Researcher (paid position)

2014-2015

- "The Effect of Substance Abuse Education on Crow Middle School Youth"
- Conducted relevant literature reviews
- Helped develop an original drug and alcohol prevention program for Native American, middle school youth
- Implemented program and collected, compiled, and interpreted data

Undergraduate Researcher

2011-2012

- "Acknowledging Differences before Similarities: Consequences in the Teaching of Evolution"
- Compiled relevant literature and independently composed a preliminary research document for college professors at Rocky Mountain College

- The consequences of teaching evolution in college were examined in the context of why the brain acknowledges differences before similarities

Animal Behavior Undergraduate Researcher

2013

- Used operant conditioning techniques to influence behavior of laboratory parrot

PRESENTATIONS

Gabel, S; Robertson, P; Wylie, A. (2015, April). The Effect of Substance Abuse Education on Crow Middle School Youth. Paper session at RMC's 2nd Annual Research Symposium, Billings, MT.

Gabel, S; Robertson, P; Wylie, A. (2015, April). Education of Crow Middle School Youth about the Physical and Emotional Impacts of Substance Abuse. Poster session at Montana INBRE, Bozeman, MT.

Gabel, S. (2012, April). Acknowledging Differences and Ignoring Similarities: Consequences in the Teaching of Evolution. Paper session at RMC's 1st Annual Research Symposium, Billings, MT.

CLINICAL EXPERIENCE

Sam Houston State University Counseling Center

August 2017-Present

Practicum Therapist

- Provide short and long-term individual and group therapy services to students within a stepped care system
- Conduct intake assessments and create treatment plans for clients as part of ongoing therapy
- Assist in the facilitation of outreach programming

Eating Recovery Center

January 2017-April 2017

Volunteer

- Compiled eating disorder curriculum for group therapy sessions
- Filed confidential patient information and took vital signs
- Observed psychiatric therapy groups (e.g. Acceptance and Commitment Therapy (ACT), Cognitive Behavioral Therapy (CBT))

Billings Clinic

January 2014-January 2015

Mental Health Worker

- Worked with patients with severe psychopathology
- Independently led psychiatric groups (Common topics included: anger management, coping skills, depression, anxiety)
- Observed patient intakes, activities, and behaviors, take vital signs, administer group therapy, and report changes in behavior.

ACADEMIC AWARDS

CHSS Scholarship (2016-2018) Sam Houston State University

RMC Psychology Student of the Year (2014) Rocky Mountain College

PROFESSIONAL MEMBERSHIP

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