Effectiveness of Nutrition Interventions In the Prevention of Eating Disorders in Female Athletes

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ABSTRACT OF THESIS

Purpose: This evidence analysis project evaluated the effectiveness of different nutrition interventions in the prevention of eating disorders among female athletes. Background on female athletes and eating disorders was explored in the literature review including topics such as eating disorder risk factors, the female athlete triad, and the diagnostic criteria for eating disorders.

Methods: Following the methodology of the Academy of Nutrition and Dietetics evidence analysis process, this evidence analysis examined seven different studies that met the inclusion and exclusion criteria. A conclusion statement was developed and graded in response to the research question.

Results: Nine studies were initially considered for the evidence analysis review. Two studies were eliminated due to the fact that they were not primary research articles. The remaining seven articles each were analyzed for the effectiveness of their nutrition interventions for the prevention of eating disorders. The article by Becker et al. (2012) showed that dietary restraint, bulimic pathology, concerns with shape and weight, negative affect, and thin-ideal internalization were reduced one year after receiving the intervention. This was shown in both intervention groups: an athlete-modified dissonance prevention program and the healthy weight program. The article Smith et al. (2008) showed a cognitive-dissonance based intervention may be helpful in preventing eating disorders, but the study recognized that more research was needed in order to address the many factors that contribute to eating disorder development. The article by Abood et al. (2000) showed that the intervention group experienced a decrease in drive for thinness and body dissatisfaction, which demonstrated potential value of the program in eating disorder prevention. The article Stewart el al. (2014) showed that whether the participants were in lean or non lean sports did not seem to affect the responses to the interventions, while pre-existing bulimic pathology, negative affect, and shape concern did. The article Laramie et al. (2017) showed that after a theory of planned behavior based intervention, there was a lower intention to restrict the diet in the intervention group than the control group. The article Becker et al showed that there was a reduction in the pressure to be thin after the intervention was completed despite a lack of changes in body esteem (2008). The study Martinsen et al. (2014) took it a step further and concluded that their intervention program focusing on the use of mental techniques was effective in preventing new cases of eating disorders from developing when compared with the control group.

Conclusion: Nutrition interventions such as the cognitive dissonance intervention, the healthy weight intervention, the theory based intervention, or other nutrition interventions focused on promoting a healthy attitude towards eating, may be effective in preventing eating disorders among female athletes. Each study found some success in improving risk factors for eating disorders, although specific interventions are still being studied. The effectiveness of these nutrition interventions in reducing risk factors of eating disorders indicates that coaches and families should be aware of eating disorder risk factors and understand that interventions can be useful to prevent long-term complications or future eating disorders. This is a Grade I conclusion as the studies are generally free from design flaws and findings are generally consistent.

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CHAPTER 1: INTRODUCTION

Every year, new female athletes develop eating disorders, many of which go undiagnosed or unnoticed. Thirty million people in the United States alone are estimated to have an eating disorder, and every sixty-two minutes someone dies from an eating disorder (ANAD, n.d.). Almost one percent of American women suffer from anorexia, 1.5% suffer from bulimia, and 2.8% suffer from binge eating disorder (ANAD, n.d.). Athletes specifically are at a high risk of eating disorders, as it has been shown in research that approximately 70% of female division I athletes are not consuming enough calories to meet their estimated nutrition needs (Stewart et al., 2017). Athletes are also prone to other eating disorder risk factors such as perfectionism and a competitive environment. Further details about risk factors for eating disorder development in female athletes and the prevalence of eating disorders in female athletes will be explored in the literature review.

The main eating disorders include anorexia nervosa (AN), binge eating disorder, and eating disorder not otherwise specified (ED-NOS). New criteria released under the fifth edition of Diagnostic and Statistical Manual of Mental Disorders (DSM-5) outlines diagnostic criteria for eating disorders established in 2013. Anorexia nervosa occurs when energy intake is restricted and a significant low body weight results. Individuals with AN experience an intense fear of weight gain despite underweight status, and have distorted body image/association of self-worth with body weight or shape. Bulimia nervosa occurs with recurrent episodes of binge eating, recurrent behaviors to prevent weight gain that are inappropriate and compensatory, and when weight/shape influence

self-evaluation (Harrington, Jimerson, Haxton, & Jimerson, 2015). Binge eating disorder is different from bulimia because there are no compensatory behaviors.

Risk factors for eating disorders include use of compensatory behaviors to control food intake, an unhealthy relationship with food and/or exercise, and competitive athlete status. Athletes competing in sports that are dependent on body weight such as long distance running or figure skating are considered high risk for eating disorders, as well as athletes in non-weight dependent sports (Giel et al, 2016). Eating disorder treatment is often conducted on a case-by-case basis, although there are general guidelines related to calorie requirements and expected weight gain. Treatment often involves meeting with a variety of professionals including psychologists, behavioral therapists, physicians, and registered dietitians. There are also different levels of treatment depending on the severity of the eating disorder.

Early identification of eating disorders is helpful so that treatment may begin as soon as possible to prevent negative health outcomes. Signs that may indicate the presence of an eating disorder include a decline in performance, anxiety when not exercising, and excessive activity. Restricted calorie intake and a negative relationship with eating can also point towards an eating disorder. Eating patterns may also be very regimented, or the athlete may not be flexible with incorporating any new foods into their usual diet. Negative body image is common, and the athlete may have weight goals that are not realistic. Overall, a negative relationship with food and exercise may indicate that disordered eating is occurring. Disordered eating is a term that can be used to refer to behaviors that are not considered to be a normalized form of eating, whereas eating disorders are a clinically defined diagnostic term.

This evidence analysis project examined the effectiveness of preventing eating disorders in female athletes, and explored the relationship between disordered eating and exercise. The consequences of eating disorders among adolescent/young adult females can lead to many complications in female athletes, including the female athlete triad. The female athlete triad represents the relationship between a deficiency in energy, amenorrhea, and low bone mass.

There are currently few established prevention programs for eating disorders, particularly pertaining to nutrition interventions. Some studies that will be analyzed in this evidence analysis project consider possible interventions that incorporate behavior change theories. Some of these interventions focus more on changing beliefs and thought processes, whereas others provide nutrition education to encourage athletes to make health a priority for their performance rather than being thin. Such theories and methods will be compared in the evidence analysis portion of this project.

This evidence analysis project evaluated the effectiveness of different nutrition interventions in preventing eating disorders among female athletes. This evidence analysis project will compare different interventions that have been studied and analyze their effectiveness. This will provide information that can be utilized in order to further develop nutrition interventions for preventing eating disorders in female athletes.

Research Question

Are current nutrition interventions effective in the prevention of eating disorders among female athletes?

Limitations: A limitation of this project is that there is minimal research on athletes specifically in relation to eating disorders in female athletes, and that many studies will need to utilize self-reporting in order to analyze the psychological aspects that contribute to eating disorders.

Delimitations: The studies that will be used must satisfy the inclusion criteria, which are outlined in the search plan in chapter three. The main outcome that this project will be looking for is the effectiveness of eating disorder prevention. If studies do not include these criteria, then they will not be included in my evidence analysis.

Assumptions: It will be assumed that some study results will be dependent on self-reporting of individuals with eating disorders and that they were honest about their thoughts and feelings regarding recovery. It will be assumed that these individuals were honest when they reported their thoughts and feeling and that they are valid since much of eating disorders in psychological in nature.

List of definitions (Mahan, Escott-Stump, & Raymond, 2012):

- Anorexia Nervosa-This is an eating disorder characterized by restricting energy intake, a significantly low body weight, a distorted body image, and being fearful of weight gain despite a low body weight.
- Bulimia Nervosa- This is an eating disorder that consists of a combination of binge eating and repeated compensatory inappropriate behaviors to prevent weight gain; behaviors must occur for three months and at least once a week and should not occur only during periods of anorexia nervosa

- Binge eating disorder-This eating disorder involves eating more food than is considered normal during an allotted time period, and a lack of control over eating is experienced. A person with binge eating disorder may eat a large amount of food even though they experience no hunger, and they feel uncomfortably full after or feel depressed and guilty. They also may eat alone or quickly related to embarrassment.
- Female athlete triad- The female athlete triad is composed of three components: low energy availability, amenorrhea, and osteoporosis.
- Disordered eating- This is seen with irregular behaviors related to food intake; it may involve restriction, a need to be in control of eating, or a negative relationship with food.
- Amenorrhea- This is the absence of menstrual periods.
- Energy availability- This is defined as the quantity of energy that the body can use after exercise. This is calculated subtracting the amount of energy expended during exercise from the amount of energy taken in through food.

CHAPTER TWO: LITERATURE REVIEW

This literature review aims to provide a background on eating disorders in female athletes specifically and provide a critical analysis of the current literature. It will set the stage for an evidence analysis review that will analyze the successes and failures of nutrition interventions for the prevention of eating disorders in female athletes of any age. It aims to define the different types of eating disorders, explain the medical nutrition therapy associated with these eating disorders, mention the importance and relevance of the female athlete triad, and explain risk factors and prevalence for female athletes with eating disorders in order to provide background information for an evidence analysis project.

Background

Eating disorders are classified into the following categories: anorexia nervosa, bulimia nervosa, binge eating disorder, and eating disorder not otherwise specified. New criteria released under the fifth edition of Diagnostic and Statistical Manual of Mental Disorders, called DSM-5, outlines diagnostic criteria for eating disorders.

Diagnostic Criteria

Anorexia nervosa (AN) is diagnosed when energy intake is restricted, which results in significant low body weight. Additionally, individuals with AN experience an intense fear of weight gain despite underweight status, and distorted body image/association of self-worth with body weight or shape (DSM 5, 2013).

Bulimia nervosa is diagnosed based on recurrent episodes of binge eating, recurrent behaviors to prevent weight gain that are inappropriate and compensatory, when weight/shape influence self-evaluation. These behaviors must occur at least once a week

for three months, and should not occur only during periods of anorexia nervosa ("Classifying Eating Disorders", 2016).

An episode of binge eating is described as eating an amount of food that is larger than normal within a certain time period while experiencing a lack of control over eating (Harrington, Jimerson, Haxton, & Jimerson, 2015). Binge eating disorder is classified by episodes that are associated with at least three of the following characteristics: eating a large amount of food despite lack of hunger, eating alone as a result of embarrassment, feeling uncomfortably full after a binge, eating very quickly, having feelings of depression or guilt or disgust after an episode, and distress during episodes. These episodes occur at least once a week for three months, per the DSM-5 definition. Binge eating disorder is different from bulimia in that there are no compensatory behaviors.

Other eating disorders outlined under DSM-5 include pica, rumination disorder, avoidant/restrictive food intake disorder, other specified feeding or eating disorder, and unspecified feeding or eating disorder ("Classifying eating disorders", 2016).

The DSM 5 criteria are summarized below in the following table.

Anorexia Nervosa	Bulimia Nervosa	Binge Eating Disorder
Restricted energy intake	Recurrent episodes of binge eating	Eating a large amount of food despite lack of hunger
Low body weight	Recurrent inappropriate compensatory behaviors to prevent weight gain	Eating alone due to embarrassment
Intense fear of weight gain	Weight/shape influence self-evaluation	Feeling uncomfortably full after a binge
Distorted body image	Behaviors occur at least once a week for 3 months and not occur only during periods of anorexia nervosa	Eating very quickly

Association of self-worth with body weight/shape		Feelings of depression/guilt/disgust following a binge
		Behaviors occur at least once a week for 3 months
		Distress during episodes

Medical Nutrition Therapy for Eating Disorders

While the primary treatment for eating disorders is psychotherapy and behavioral therapy, medical nutrition therapy (MNT) must be included as well for full recovery. MNT for anorexia nervosa usually consists of an initial weight gain period, achieved by a 30-40 kcal/kg/day prescription (Mahan, Escott-Stump, & Raymond, 2012). It is then followed by a controlled weight gain phase, increasing calories in small amounts such as 100 calories per day to promote two to three pounds of weight gain during inpatient treatment and one half to one pound of weight gain during outpatient treatment. This is achieved through a team of professionals including a registered dietitian and a therapist. Dietitians utilize motivational interviewing and work with clients to gradually increase their caloric intake; therapists meet with these clients and further work through the psychology behind the eating disorder. A weight maintenance phase then follows, which is achieved by a 40-60 kcal/kg/day prescription for adults. For bulimia nervosa, calorie recommendations are set for weight maintenance. Weight reduction diets should not be encouraged until normal eating patterns resume with bulimia nervosa. There are different treatment options that take various approaches such as inpatient, residential, partial, and outpatient care. Treatment for binge eating disorder centers around nutrition counseling;

some programs are more focused on weight loss, while others focus on reduction of binge episodes rather than weight loss (Mahan, Escott-Stump, & Raymond, 2012).

Behavioral Therapy For Eating Disorders

There are a few different methods of behavioral therapy that are used in the nutrition interventions that will be looked at in the study. One type of behavioral therapy is referred to as cognitive dissonance. Cognitive dissonance occurs when there are conflicts between a person's beliefs and their behavior (Cooper, 2001). An example would be a person who smokes but has just watched a documentary about how harmful smoking is to his or her health. At this moment, this individual would be in a state of cognitive dissonance. They may convince themselves that smoking will not hurt them as much as the research says, and continue to smoke. Alternatively, they may attempt to give up their smoking habit after learning new information because their attitude has changed. The thought behind interventions utilizing cognitive dissonance is that by changing a person's attitude, you may be able to consequently influence their behavior as well. The interventions in this evidence analysis project utilize an intervention based on cognitive dissonance to attempt to change participants' thoughts regarding risk factors for eating disorders such as the desire to be thin, body image, and self-esteem.

Another intervention utilized in this study is the healthy weight intervention, which focuses on promoting the "healthy ideal" rather than the "thin ideal." Essentially, this intervention is promoting the idea that overall health and good nutrition are more beneficial for performance than striving for a thin physique. This intervention focuses on educating the participants about nutrition to increase their interest in fueling their bodies

and seeing food in a positive light rather than simply something to restrict to achieve a certain weight.

A third intervention that is utilized in nutrition interventions for eating disorders is the theory of planned behavior. This theory states that the ability to change behaviors is dependent upon several factors: attitude, behavioral intention or motivation, subjective norms or general approval of this behavior as believed by the individual, social norms, perceived power, and perceived behavioral control. For example, an individual's likelihood to restrict calories could be influenced by their attitude towards obtaining a certain body type and whether or not restrictive eating is considered to be the norm in their environment (LaMorte, 2018).

Athletes and Proximity to Eating Disorders

Research has demonstrated that athletes are prone to eating disorders, and one reason for this is the perfectionism and performance-driven nature that many athletes possess. The study Shanmugam et al. (2014) showed that self-critical perfectionism was a key risk factor for the development of eating disorders in female athletes. This was based on the statistical tests conducted in the study that analyzed the link between eating psychopathology and self-critical perfectionism. There are many other risk factors faced by athletes, such as the emphasis put on body ideals in certain sports such as gymnastics, long distance running, and figure skating as well as the association of weight and performance. Adolescent athletes in particular experience much growth and numerous physical and developmental changes, further increasing their risk of developing an eating disorder (Giel et al, 2016).

The study conducted by Holm-Denoma et al. 2009) looked at variations in eating disorder symptoms between women in four different categories of exercisers by taking sports anxiety into account. The four categories were varsity athletes, independent exercisers, club athletes, independent exercisers, and nonexercisers. Two hundred seventy-four participants were recruited from a large university in the southeast United States. Varsity athletes had to practice on a division I sports team and practice for at least two hours every day. Swimming, softball, basketball, and soccer were the teams that were represented. Participants who were considered club athletes practiced at the university level at least four times a week on average. Swimming, water polo, volleyball, lacrosse, basketball, field hockey, and rugby were the sports that were represented. Participants who were considered to be independent exercisers were required to exercise on their own at least three times per week. The participants who were considered non-exercisers only exercised zero to two times per week. One of the measures used in the study was the Eating Disorders Inventory, which contains 64 items and is used to evaluate eating behaviors and thoughts about eating. Another measure was the Rosenberg Self Esteem scale, which contains 10 items and focuses on attitudes related to self-esteem. Another measure is the Physical Activity and Sport Anxiety Scale, which contains 16 items and looks at social issues as it related to physical activity avoidance. These scales have demonstrated validity according to the study.

Results of this study showed that women who were active in sports usually had higher rates of eating disorder symptoms when compared to women who were not active in sports. Additionally, if a woman had higher levels of sports anxiety, then consequently there was a greater desire to achieve thinness and a higher incidence of bulimic

symptoms. Based on the results, female athletes at high levels of competition with sports anxiety had the greatest incidence of eating disorder symptoms. Authors concluded that it is important for coaches to be aware of these results, and to be looking for out for sports anxiety as well as eating disorder symptoms and how to best approach this situation. One limitation of this study was that it did not distinguish well between lean and non-lean sports, as certain sports have shown to have different prevalence of disordered eating and this could affect the results. Additionally, potential variables such as influence of the coach or environment were not accounted for in the study. Strengths of the study include the large sample size and the variety of sports that were included in the study (Holm-Denoma et al., 2009).

The study conducted by Martinsen et al. (2013) aimed to determine the prevalence of eating disorders in elite athletes in comparison with a nonathletic control group. Elite athletes from high schools in Norway were invited to participate. The sample size was six hundred eleven athletes and three hundred fifty-five controls from fifty different sports. Participants first completed a questionnaire which outlined training history, physical activity and nutritional patterns, use of oral contraceptives, history of weight fluctuations, dieting history, pathogenic weight control methods, injuries, history of menstrual dysfunction, and eating disorder history. The standard Eating Disorders Inventory-2 and the Hopkins Symptom Checklist were also included. Participants also completed a clinical interview based on the Eating Disorder Examination that looked at the psychopathology of eating disorders, emphasis on weight and shape for determination of self-worth, and specific eating disorder behaviors.

The results of this study showed that adolescent elite athletes (50.7%) had a greater prevalence of eating disorders than among the control group (25%). Interestingly however, more control group participants self-reported eating disorder symptoms than the athletes. This was because numerous athletes underreported unhealthy behaviors, which was revealed during the clinical interview portion of the study. Many athletes actually viewed their disordered eating behaviors as a normal part of the sport. The clinical interview helped distinguish behaviors that were unhealthy in nature from those behaviors that were related to trying to achieve success in the sport but were not necessarily unhealthy. Strengths of the article include the large sample size. A limitation of this study was that there were a high number of false positives for eating disorders due to the wide criteria. Overall, the authors concluded that eating disorders were more prevalent in the athlete group rather than the controls (Martinsen et al, 2013).

The study conducted by Greenleaf et al. (2009) provides further insight on eating disorders among female athletes. Two hundred and four college athletes served as participants in this study; these participants came from seventeen different sports at three different universities at the NCAA Division I level. The average age of the participants was 20.16 years, and the average body mass index was 23.10. The athletes had been participating in their sport for an average of 10.88 years and had been competing on their sports team at their university for 2.1 years on average. The fifty item QEDD was utilized to measure eating disorder symptoms. Participants were organized into the following groups based on their responses to the questions: asymptomatic, symptomatic, and eating disordered.

Approximately 54% of the participants said that they were not happy with their current weight and wished to lose weight. About 26% were classified as symptomatic, 73% were classified as asymptomatic, and 2% were classified as eating disordered. About nineteen percent of participants reported that they engaged in binge eating at least once per week. Approximately fifteen percent of athletes reported that they had been binge eating for at least three months. Twenty-five percent of athletes reporting exercising for at least two hours a day with the intention of burning calories. Thirty-two percent of athletes followed strict diets or utilized fasting at least twice over the past year. Three percent utilized vomiting as a weight control method at least two to three times a month. One percent utilized laxatives 2 to 3 times per month as a method of weight control. This study suggests that the high percentage, seventy-five percent, of athletes who are symptomatic but do not have a diagnosed eating disorder is cause for concern and something to take note of. The most common behavior utilized for weight control in this study was exercise, which is consistent with past research (Greenleaf, Petrie, Carter, & Reel, 2009). A major weakness of this study was that the data was self-reported, but several steps were put into place to ensure that the data collected was as accurate as possible.

These studies overall demonstrated that athletes are at risk of developing disordered eating habits which can potentially lead to a diagnosed eating disorder. The study by Giet el al. (2016) pointed out the characteristics, such as self-critical perfectionism, that is common among both athletes and individuals with eating disorders. The study by Holm-Denoma et al. (2009) showed that women who were active in sports usually had higher rates of eating disorders than women who were not active in sports.

The study by Martinsen et al (2013) showed that young female elite athletes had a higher prevalence of disordered eating when compared with the control group. The study by Greenleaf et al (2009) showed that numerous athletes demonstrated symptoms of disordered eating behaviors but did not necessarily have a clinically diagnosed eating disorder, which would still serve as a risk factor for eating disorder development. The next section will explore additional details about risk factors for eating disorder development in female athletes.

Risk Factors of Eating Disorders for Female Athletes

There are multiple risk factors that can contribute to the development of an eating disorder. Beals et al. (2000) outlined risk factors and characteristics of female athletes with eating disorders. To gather participants for this observational study, flyers were passed out at Arizona State University, local community colleges, road races, fitness centers, running clubs, cycling clubs, and swimming clubs. Participants had to be training for their sport for at least 6 hours per week. A comprehensive health history was conducted to gather information on the participants. The Eating Disorder Inventory, Body Shape Questionnaire, and the DSM IV criteria for anorexia nervosa and bulimia nervosa were utilized to determine the prevalence of subclinical eating disorders among the participants. If a participant had a clinical eating disorder, they were excluded from the study. Twenty-four subclinical athletes and twenty-four control athletes were included in the study. These subjects completed an interview with the primary investigator of the study that lasted between thirty and one hundred twenty minutes. This interview utilized the Eating Disorder Examination, which is a standard interview that is structured to

analyze common eating disorder behaviors. Seven day weighted food records and seven day activity logs were used to assess energy intake. Anthropometric measurements such as weight, waist and hip circumference, height, and body composition were taken.

Results of this study showed that energy intake of the subclinical group was significantly lower than those athletes in the control group who did not have eating disorders, showing a higher negative energy balance. The subclinical group's dietary intake was an estimated average of 79% of their energy expenditure, whereas the control group's was 96% of energy expenditure. The subclinical athletes reported more restriction of foods, avoidance of bad foods, and following strict dietary rules with the intention of weight control than the control athletes. The subclinical athletes also experienced more guilt than the control athletes who followed dietary rules. The subclinical athletes also had less variety in their diets and their eating habits were more regimented than the control athletes. Subclinical athletes were also focused more on body weight and shape than control athletes, and experienced higher levels of body image distortion. The overall incidence of menstrual dysfunction was higher in the subclinical athletes, which related to the female athlete triad since disordered menstrual function is one component of the female athlete triad. Authors concluded that awareness of these characteristics would be beneficial in identifying disordered eating behaviors before a clinically diagnosed eating disorder begins (Beals & Manore, 2000).

Another important risk factor to consider is the actual calorie intake that female athletes are typically consuming. The study conducted by Shriver et al. (2013) aimed to explore the dietary caloric intakes and eating habits of college athletes and compare it with the current standards. This study suggests that based on previous research, a

minimum of 5g/kg of carbohydrates from the diet are necessary for athletes. Protein recommendations range from 1.2-2.0 g/kg depending on the type and amount of exercise; 1.2 g/kg is considered as the minimum amount needed. The dietary fat recommendation is the same as the general recommendation, 20-35% of total daily intake (Shriver et al., 2013) Participants were recruited from a Division 1 university by athletic trainers. Inclusion criteria was that the participants had to be on an athletic team at the university, be at least 18 years of age, and have no injuries during the study. Anthropometric measurements and body composition measurements were completed. Each participant also completed a 24 hour food recall and a 3-day food record. Any physical activity during the 3 day period was also recorded. Dietary software, Diet Analysis Plus, was used to complete a diet analysis. Eating habits were also investigated through the Nutrition Questionnaire.

The majority of the athletes in the study did not meet their estimated energy needs, and also did not meet their minimum carbohydrate needs. Thirty-five out of forty-five participants did not meet the requirement for 5 g/kg of carbohydrates. However, 24% of the participants reported dietary fat consumption that was higher than the required amount, which could have played a role in the low carbohydrate intake. Protein requirements appeared as thought they were met by athletes based on the food recall results, but additional analysis was done and this showed that protein intake was below recommendations. Seventy-five percent of participants failed to meet the required carbohydrate amount, thirty-six participants consumed less than the recommended five meals per day, and most participants reported skipping breakfast regularly. Carbohydrate intake showed was significantly lower than the recommended amount ($p<0.001$),

although protein did not show a significant difference in intake compared to the estimated energy needs. Seventy-six percent of participants consumed less than the recommended amount fat per day. Overall, the reported energy intake of the participants was significantly lower than their estimated energy needs ($p<0.001$) as 91% of the participants did not meet their estimated energy needs. The authors concluded that female athletes could benefit from nutrition education and intervention, since their intake differs so much from their estimated energy needs. There were some limitations of the study in that a food recall provided some of the data, which could present bias (Shriver, Wollenberg, & Gates, 2013).

These studies have shown the proximity of athletes to eating disorders, and have demonstrated that athletes are at high risk for eating disorder development. Table 1 shows examples of abnormal eating and exercise patterns that could assist with early detection of an eating disorder. This table was based upon the table found in page 470 of the text (Dunford & Doyle, 2015).

Table 2 Risk Factors For Eating Disorders In Athletes

	Features of athletes with "normal" eating and exercise patterns	Features of athletes who may have disordered eating and exercise patterns
Performance	Improvements in performance	Performance declines
Training	No evidence of overtraining	Anxiety caused by not being able to train, training even though injured, overtraining, evidence of excessive exercise or activity
Energy Intake	Athlete monitors caloric intake in a disciplined way and consumes enough	Athlete records/calculates caloric intake and obsesses about the numbers, calorie

	energy to meet increased needs with training. Athlete does not obsess about food/dietary restrictions.	intake is controlled in an unhealthy way. If additional calories are consumed, anxiety results.
Perspective on food intake	Eating is an enjoyable activity and food is viewed as an essential part of training.	Eating is considered a negative experience, athlete feels that food should always be restricted
Dietary intake	Athlete consumes a healthy diet overall and does not worry about eating foods that are considered "unhealthy" or of low nutritional value on occasion	Consumes healthy foods but a low caloric amount each day, refuses or rarely eats foods unless they have nutritional value
Dietary flexibility	Follows a diet that is planned out well, but is able to be flexible.	Is not flexible with eating pattern, diet plan is very regimented.
Body image	Positive body image	Body image is negative and inaccurate
Body composition	Has attainable goals for improving weight and body composition that will improve performance without compromising health.	Has goals for weight and body composition that are unrealistic and would compromise health.
Muscle mass	Has the ability to increase muscle mass with resistance training	Decreased or inability to increase muscle mass with resistance training

The Female Athlete Triad

Additional risk factors for eating disorder development are related to the female athlete triad. The female athlete triad is a condition that can result due to disordered eating. The female athlete triad has three components: low energy availability,

amenorrhea, and osteoporosis. Energy availability is defined as the quantity of energy that the body can use after exercise. This energy is used by the body to maintain its normal functions, and can be calculated by subtracting the amount of energy expended during exercise from the amount of energy taken in from the diet (Pantano, 2006).

Without the adequate energy, hormone synthesis and secretion is compromised. In turn, estrogen production is inadequate and processes such as menstruation are often suppressed (Dunford & Doyle, 2015). This can lead to irregular menstrual cycles, referred to as oligomenorrhea, or complete amenorrhea, which is the absence of menstrual cycles. Also, without enough nutrients, the body will be unable to rebuild the muscles and bones that are worn down each day. If a menstrual cycle is absent for more than three months, the ability to re-build and form bone can be limited. If this is experienced for a long duration of time, females have a greater chance of developing bone disorders such as osteoporosis and low bone density. This leads to a higher occurrence of fractures, as well as other physical issues such as infertility. In addition, once bone density is lost, it can never be fully restored (Pantano, 2006). In fact, the two years surrounding menarche consist of 25% of bone mass growth, and by age 18 girls will have acquired more than 92% of their bone mass. Adolescence is a critical bone-building period, and if bone is prevented from forming during that period, then osteoporosis is much more likely to occur (Pantano, 2006).

Female athletes are particularly at risk of developing the female athlete triad, due to the societal standards in both competition and daily life. Non-athletes can also develop the female athlete triad, however. If the body does not have the appropriate amount of energy that it needs, a person is at greater risk for developing the triad. The general

number found in research is that increased risk for adverse effects such as the triad are seen if someone has an energy availability under 30 kcal/kg of fat-free mass (Dunford & Doyle, 2015). It is important to consider though that some women will still menstruate at this caloric intake and that women are affected by low energy availability differently. Ultimately, once energy availability is low enough for a long enough period of time, the body's ability to release luteinizing hormone is limited. Luteinizing hormone, or LH, is a hormone that triggers a woman's body to ovulate (Pantano, 2006) and if this is too limited, menstruation will not occur. Additionally, estrogen is important in bone building as estrogen helps protect calcium from being lost from bone. Essentially, the female athlete triad has many factors, but ultimately low energy availability is what drives the triad (Dunford & Doyle, 2015).

The study conducted by Thralls et al. (2016) looked at how BMI affects the female athlete triad, in order to determine what effect underweight status had on the female athlete triad. This was a cross-sectional study, and data was collected from four cohorts between 2003 and 2009. There were three hundred and twenty participants. These participants were high school female athletes and represented eight different sports and ten different San Diego schools. They were between the ages of thirteen and eighteen years old and had reached menarche; if they had not begun menstruating then they needed to be between the ages of fifteen and eighteen. Participants completed the Eating Disorder Examination Questionnaire and menstrual history questionnaire. Height and weight were also measured, and a DXA scan was done to measure bone density. A subscale of the Eating Disorder Examination Questionnaire was used to evaluate dietary restraint. A medical history questionnaire determined menstrual information, and

menstrual dysfunction was classified as either primary amenorrhea, secondary amenorrhea, or oligomenorrhea. Bone mineral density was measured through DXA at the spine and proximal femur; total body and body composition were measured (Thralls, Nichls, Barrack, Kern, & Rauh, 2016).

Results of this study showed that athletes whose weight was less than 85% of their ideal body weight and had a youth BMI lower than the 5th percentile were nearly four times more likely to experience menstrual dysfunction within the last year. Underweight categories were also related to low bone mineral density. Underweight categories were not significantly related to dietary restraint, but individuals who had the highest body fat percentage were nearly three times more likely to report elevated dietary restraint. Strengths of this study included that the data was collected over a long period of time, and that standardized exams and methods of measuring bone density were utilized. Weaknesses of this study include the fact that the standardized exam used does not directly measure energy availability, although it measures disordered eating and has been linked to energy deficiency. This study also utilized self-reporting for some of the data which could present bias. Authors concluded that low body mass index and percentage of ideal body weight could be potential indicators for the female athlete triad, but more research would need to be conducted in order to confirm this (Thralls, Nichls, Barrack, Kern, & Rauh, 2016).

The study presented by Barrack et al. (2014) looked at the relationship between bone stress injuries and the female athlete triad. Participants (n=259) were combined from three prospective cohort studies. The study with data collection from Pennsylvania State University and the University of Toronto looked at how an intervention of increased

energy intake for twelve months affected bone health and menstrual function in athletes with menstrual dysfunction compared to regular menstrual cycles. The data collected from San Diego State University utilized female athletes between ages 13 and 18 years if menarche had been established (if not menstruating, the age was between 15 and 18). Risk factors were evaluated, and injuries were reported. Data from the University of California, Los Angeles was collected over a five-year period for NCAA Division I cross country and track and field athletes.

Results showed that 28% of participants developed a bone stress injury. Approximately 46% of those who exercised greater than 12 hours a week had a bone mineral density score of less than -1.0, and showed 3-4 of the following criteria: either body mass index less than 21, oligo- or amenorrhea, increased dietary restraint, and participating in a sport or activity that emphasized leanness acquired a bone stress injury. Strengths of this study include the large sample size and the long time period allotted for data collection. Weaknesses include the fact that there were four different machines used to measure bone density, and that bone injuries that were self-reported did not necessarily specify what imaging was used to diagnose the bone injury. Authors concluded that competitive female athletes have a higher risk of bone stress injuries when the risk factors associated with the female athlete triad are considered compared to nonathletes, further emphasizing the importance of the female athlete triad in women's health and its long term implications. (Barrack, Gibbs, De Souza, Williams, Rauh, 2014).

Results of the study conducted by Thralls et al. (2016) showed that athletes whose weight was lower than 85% of their ideal body weight and whose BMI was under the 5th percentile were four times as likely to experience menstrual dysfunction than the control

group. In the study Barrack et al. (2014), the conclusion was that competitive athletes are more at risk of bones stress injuries than non-athletes when the components of the female athlete triad are taken into account. Overall, the female athlete triad can have long-term implications in women's health and it is important to address the components of the triad such as disordered eating and how to prevent the triad and eating disorders from developing.

Impact of Environment on Prevention/Recovery From Eating Disorders

A study conducted by Heffner et al., (2003) examined the response of coaches to disordered eating on their teams. Coaches (n=303) from six different sports completed a survey with 40 different items. These sports included gymnastics, swimming, basketball, softball, track, and volleyball. NCAA Division I, NCAA Division II, and NCAA Division III were all represented. The survey that was distributed to the coaches had six general content areas: demographic information, coaching behaviors, awareness of nutrition and related general health issues, eating and any problems related to eating with athletes, any preventative services or interventions for athletes struggling with disordered eating, and attitudes toward food/eating and emphasis of weight in the sport. This study showed that a large amount of coaches practice weight monitoring or emphasize weight management with athletes but are aware that the athletes may be struggling with their weight or experiencing disordered eating. About sixty-nine percent of gymnastics coaches and forty-two percent of other coaches assessed body fat composition. Fifty percent of gymnastic coaches and twenty-five percent of other coaches promoted weight loss through extra workouts in the past 5 years. Seventy-five percent of gymnastics coaches

and forty-two percent of other coaches had an athlete with eating disorders in the past 5 years. The coaches also reported that despite the disordered eating issues that were occurring, there were many different resources available for athletes who were struggling. For example, 94% of gymnastics coaches and 62% of other coaches said that a nutritionist or dietitian was available for the athletes to see if needed. Overall, authors concluded that a significant amount of coaches and athletes have demonstrated unhealthy attitudes related to eating (Heffner, Ogels, Gold, Marsden, & Johnson, 2003).

This study indicates that additional training for coaches would be beneficial so that they are informed of the potential risks involved when it comes to disordered eating. The study also suggested that additional professionals such as athletic trainers or dietitians would be valuable in helping to monitor for disordered eating or help athletes who are struggling, since coaches are often motivated by the championship season and have certain standards to uphold (Heffner, Ogels, Gold, Marsden, & Johnson, 2003). This study was limited in that it was based on the coach's self-reporting and memory recollection, which must be considered when taking this study into account.

Another important aspect in the treatment of eating disorders is recovery. The qualitative analysis by Arther-Cameselle et al. (2014) was designed to look at how different individuals with eating disorders responded during their recovery period. There were sixteen participants in the study; they participated in either track and field/cross country, swimming, tennis, crew, golf, or diving. Athletes had to meet the criteria for diagnosis of an eating disorder for at least six months and had to have experienced recovery from their eating disorder for at least three months. Participants first answered survey questions online, and then completed an interview conducted by the primary

author of this study, who is a clinical psychologist as well as a former professional and collegiate tennis player. The first part of the interview focused on the onset of the eating disorder, and the second part of the interview focused on factors that helped the participants recover from their eating disorder, inspired a change in their disordered eating behavior, and prevented their full eating disorder recovery.

The results of showed that when 69% percent of the participants experienced negative effects from their eating disorder, such as losing hair and being unable to compete in their sport, they were motivated to recover. Fifty percent of participants were motivated by the desire to improve their quality of life, and 38% percent of participants were motivated by the desire to improve their self-esteem and mood. Major factors that participants perceived to have assisted recovery were cognitive changes (100%), important relationships (100%), professional care (94%), and the environment that their sports training and competition took place in (81%). Major things that prevented recovery included lack of support (81%), professional care complaints (63%), others with eating disorders (56%), negative cognition (50%), and relational conflict (50%). The researchers concluded that there were many factors that encourage, assist with, and interfere with recovery, and many of these factors are internal. The researchers also suggested that coaches, parents, and teammates should be more educated about eating disorders in order to better assist them with their recovery and assist with therapeutic interventions.

This study has some limitations. The participants were not randomly selected, which may present bias as they were recruited through convenience sampling which would limit the generalizability of the results. Additionally, what classifies as "recovered" could have been better defined, as the definition is general. Results were also

not associated with a specific diagnosis, but were grouped together to present overall results about eating disorders. Strengths were that this study was able to focus on a select group of athletes and understand their thoughts and ideas through an interview rather than a regimented survey which may not portray the whole picture. This study provided major insight into the thoughts of eating disorder patients during recovery, and identified some of the major areas that a dietitian could focus on during a nutrition counseling session such as relationships, goals, or aspirations related to the desire to improve quality of life (Arthur-Camselle & Quatromoni, 2014).

A different study by Arthur-Cameselle et al. (2012) was a qualitative study that aimed to provide advice for those who would be supporting athletes with eating disorders during recovery. Sixteen athletes between the ages of eighteen and twenty-eight participated in this study. All participants needed to be a former or current NCAA athlete, have a diagnosis of an eating disorder for at least six months, and have a period of recovery for the past three months. Eleven athletes from this study agreed to do a follow-up study where they were asked about additional advice for coaches of someone with an eating disorder, whether or not coaches should intervene if they suspect an athlete to have an eating disorder, and advice for parents of someone with an eating disorder.

Recommendations were as follows for coaches: become more educated on eating disorders, encourage athletes to have good nutrition, do not emphasize the value of body size in order to achieve a goal, do not single out athletes about body weight, confront the person with the eating disorder if the athlete respects the coach, listen and provide emotional support, prevent the athlete from competing in the sport if the eating disorder worsens, and refer the athlete to seek professional care if needed. The article also

provided recommendations for parents: listen and provide support emotionally, encourage the athlete to seek professional treatment, and gain more knowledge about eating disorders.

This study was limited in that it had very little quantitative data. Other limitations of the study include that the sample size was small and responses to eating disorder treatment vary from patient to patient, so these findings may not hold true for all patients. Additionally, some of the follow-up questions were completed electronically, which may have prevented further explanation. A strength of this study was that it was able to uncover very specific thoughts and ideas of eating disorder patients, in the hopes that further research will be able to develop interventions and methods of treatment related to these findings (Arthur-Camselle & Baltzell, 2012).

The study by Cameselle et al. (2014) concluded that there were many internal factors that contribute to recovery and thus coaches, parents, and teammates must become more educated about eating disorders in order to help with the recovery process. The study. The other study by Cameselle et al. (2012) provided specific recommendations for parents and coaches to help in the recovery process. These studies essentially demonstrated the importance of environmental factors and their influence on the internal aspects of eating disorder recovery.

Discussion

This literature review set the stage for the evidence analysis portion of the project. It described the diagnostic criteria according to DSM 5 for various eating disorders and discussed current evidence for medical nutrition therapy for those eating disorders. This literature review also described different behavioral interventions in detail: cognitive

dissonance, healthy weight, and theory of planned behavior. Many articles in this literature review focused on the risk factors and the prevalence of eating disorders, showing that athletes in particular have certain risk factors that make them prone to eating disorders. An example is that the majority of athletes are not meeting their estimated nutrition needs according to Shriver et al. (2013), indicating that athletes are at risk for disordered eating due to their overall low energy consumption. Another study, Patano et al. (2006) described the long term-implications of the female athlete triad and suggested the importance of eating disorder prevention as a consequence.

Other articles in this literature review focused on recovery from eating disorders. The study written by Arthur-Cameselle et al. (2014) concluded that there were many internal factors that encourage, assist, and interfere with recovery. For example, quality of life, desire to improve self-esteem, and mood encouraged recovery. Researchers suggested that more education for parents, teammates, and coaches would be beneficial for the athlete's recovery. The study written by Arthur-Cameselle et al. (2012) concentrated on people who support athletes in their recovery and how they could best support recovery. This included having a knowledge base of eating disorders and nutrition, as well as providing encouragement to athletes to value nutrition and not emphasize the value of body weight or body size.

Conclusions

Overall, the area of research pertaining to nutritional interventions for eating disorders with athletes could benefit from a lot more quantitative research. The evidence clearly indicates a high prevalence of eating disorders in female athletes. However, there are few studies demonstrating evidence on effective ways to screen for, prevent, and

provide nutrition counseling for an athlete with eating disorders. Future studies could build upon the information gathered from these studies and replicate the process on a larger scale. These studies provide some initial direction that further research can build upon and uncover more specific methods of preventing eating disorders and nutritionally assisting with eating disorder recovery in female athletes. The evidence analysis review will look specifically at female athletes and current research on the prevention of eating disorders, and will analyze the intervention programs that have currently been tested.

CHAPTER 3: METHODS

Introduction to the Evidence Analysis Process

This evidence analysis project is focused on the prevention of eating disorders among female athletes. This evidence analysis project is significant as it will provide evidenced based recommendations for how to prevent eating disorders among female athletes.

The evidence analysis process is outlined by the Academy of Nutrition and Dietetics in the Evidence Analysis Manual (Evidence Analysis Library, 2018). This process provides a source of synthesized research that helps to provide evidence-based recommendations. The results of the evidence analyses are housed in the Evidence Analysis Library in order to promote evidence-based practice. The systematic process is an objective analysis of research on a topic related to the practice of nutrition and dietetics, often within the framework of the nutrition care process.

There are five steps to the evidence analysis process. Step one is to formulate the evidence analysis questions, step two is to gather and classify the evidence, step three is to critically appraise each article, step four is to summarize the evidence, and step five is to write and grade the conclusion statement. When evidence analysis reviews are conducted by the academy, a team of experts works together and follows these steps in order to gather research and summarize the evidence available. The Academy's Evidence Analysis Library consists of several different topics and provides evidence for each of them in order to support evidence-based practice.

Formulating the Research Question and Gathering the Evidence

The first step of the evidence analysis process was to formulate the research question. The research question is as follows: are current nutrition interventions effective in the prevention of eating disorders among female collegiate athletes?

The second step involves searching through the research and determining which articles are most appropriate and relevant for the evidence analysis process.

Search Plan:

Question:

Are current nutrition interventions effective in the prevention of eating disorders among female collegiate athletes?

Date of Literature Review for the Evidence Analysis: October and November 2018

Inclusion Criteria:

 Age: female, any age

 Setting: athlete

 Health Status: not specified

 Nutrition Related Problem/Condition: Healthy, at risk of an eating disorder, or diagnosed with a clinical eating disorder. Study provides information on nutrition interventions for the prevention of eating disorders.

 Study Design Preference: primary research articles

 Size of Study Groups: any

 Study Drop Out Rate: any

 Year Range: any

 Authorship: any

 Language: Limited to articles published in English.

Exclusion Criteria

 Age: any

 Setting: not a female athlete

 Health Status: none

 Nutrition Related Problem/Condition: study does not focus on the nutrition interventions for prevention

 Study Design Preference: review articles

 Size of study groups: none

 Study Drop Out Rate: none

 Year Range: none

 Authorship: none

 Language: Articles not published in English.

Search Terms:

Health Condition: healthy or at risk of disordered eating

Intervention: eating disorder prevention

Type of Study Design: primary research

Electronic Databases

Database: Academic Search Complete

Search Terms: nutrition AND eating disorders female athletes, prevention AND eating disorders female athletes, diet AND eating disorders female athletes

Hits: 147

Articles to review:

Total articles identified to review from electronic databases: 9

Inclusion List:
List of Articles Included from Electronic Databases:

Becker, C.B., McDaniel, L., Bull, S., Powell, M., McIntyre, K. (2012). Can we reduce eating disorder risk factors in female collegiate athletes? A randomized exploratory investigation of two peer-led interventions. *Body image,* 9(1), 31-42.

Abood,D.A, Black, D.B. (2000). Health Education Prevention for Eating Disorders Among College Female Athletes. *American Journal of Health Behavior*, 24(3), 209-220.

Smith, A., Petrie, T. (2008). Reducing the Risk of Disordered Eating Among Female Athletes: A Test of Alternative Interventions. *Journal of Applied Sport Psychology*, 20, 392-407.

Stewart, T., Plascenica, M ., Han, H., Jackson, H., Becker, C.B. (2014). Moderators and predictors of response to eating disorder risk factor reduction programs in female collegiate athletes. *Psychology of Sport and Exercise*, 15, 713-720.

Buchholz, A., Mack, H., McVey, G., Feder, S., Barrowman, N. (2008). BodySense: An Evaluation of a Positive Body Image Intervention on Sport Climate Female Athletes. *Eating Disorders.* 16, 308-321.

Laramee, C., MS RD, et al. (2017). Evaluation of a Theory-Based Intervention Aimed at Reducing Intention to Use Restrictive Dietary Behaviors Among Adolescent Female Athlete. *Journal of Nutrition and Behavior*. 49(6), 497-504.

Martinsen, M., Bahr, R., Borresen, R., Holme, I., Pensgaard, A.M., Sundgot-Borgen, J. (2014). Preventing Eating Disorders among Young Elite Athletes: A Randomized Controlled Trial. *Medicine and Science in Sports and Exercise.* 46 (3), 435-447.

List of Excluded Articles with Reason:

Morgado de Oliveira Coelho, Abreau Soares, E., Goncalves Ribeiro, B. (2010). Are female athletes at increased risk for disordered eating and its complications? *Appetite*. 55(3), 379-387.
➔ This article was excluded due to not qualifying as primary research.

Bratland-Sanda, S., Sundgot-Borgen, J. (2013). Eating disorders in athletes: Overview of prevalence, risk factors and recommendations for prevention and treatment. *European Journal of Sport Science*. 13(5), 499-508.
➔ This article excluded due to not qualifying as primary research.

Summary of Articles Identified to Review:
Number of Primary Articles Identified: 7
Number of Review Articles Identified: 2
Total Number of Articles Identified: 9

Number of Articles Reviewed but Excluded: 2

Appraise Articles

The data extraction worksheet and quality criteria checklist were used to appraise each article. Appraisals of the articles included assessing the study design, class, rating, research purpose, inclusion criteria, exclusion criteria, description of study protocol, data collection summary, the description of the data sample, summary of the results, and the author's conclusion. Questions of relevance and validity determine the quality and rating of each article. The data extraction worksheets and Quality Criteria Checklist can be found in the appendix. In general, all articles scored very well on the quality criteria checklists and earned a positive rating.

Summarize The Evidence

The next step was to summarize the evidence in an overview table and evidence summary. This step allowed for comparing and contrasting the articles and to determine the overall big picture of the studies. This also was important to link each study with the overall theme of preventing eating disorders among female athletes. The summaries of these articles can be found in chapter 4. There is also a table that summarizes each article in chapter 4. Each of these studies focused on a nutrition intervention; as part of the evidence analysis project, its effectiveness was evaluated and discussed in chapter four.

Grade evidence

Step five was to develop the conclusion statement and grade the strength of the supporting evidence. Each of the studies scored well on the quality criteria checklist, earning a positive rating. Each of these studies were randomized control trials, which helped to strengthen the studies. Additionally, study groups were comparable and the outcomes and intervention were clearly stated in the studies. Statistical analysis was used to strengthen the study with quantitative data, which helped to provide more definite conclusions as to which risk factors were improved with the interventions.

CHAPTER FOUR: RESULTS

Seven articles met the criteria for inclusion and were included in the evidence analysis. The article by Becker et al (2012) compared a cognitive dissonance prevention program, a healthy weight program, and a control group in a randomized control trial with a positive rating according to the evidence analysis process. The purpose of the study was to determine whether these results suggested that interventions similar to these could be used for preventing eating disorders. The cognitive dissonance intervention focuses on changing beliefs and attitudes related to eating, whereas the healthy weight intervention focuses on making small a change towards diet and exercise to achieve a healthier weight. The sample consisted of 157 female collegiate athletes participating in a variety of sports at a competitive Division III university. Teams were divided up so that half of the time was put into the cognitive dissonance program, and half into the healthy weight program. Surveys were completed prior to treatment, immediately after treatment, 6 weeks after treatment, and 1 year after treatment. These surveys were used to evaluate the effects of the interventions on risk factors for eating disorders.

Both interventions were effective in reducing the following behaviors that could have led to disordered eating: restricting intake, bulimic pathology, body dissatisfaction, negative affect, and the internalization of the thin-ideal. All six dependent variables showed a reduction at 6 weeks, and there were reductions in negative affect, shape concern, and bulimic pathology after one year. Thin ideal internalization showed a significant difference between pretreatment and the 6 week measure ($p<0.05$). There was decreased dietary restraint between pretreatment (T1) and posttreatment (T2, $p <0.05$) and 6 week follow-up (T3, $p <0.001$). There was decreased bulimic pathology between

T1 and T2 ($p < 0.01$) and T3 ($p<0.001$) and T4 ($p<0.05$). There was a decrease in shape concern between T1 and T2 $p < 0.05$) and T3 ($p<0.001$) and T4 ($p<0.05$). There was a decrease in weight concern between T1 and T3 $p<0.01$). There was a decrease in negative affect between T1 and T2 ($p<0.01$ and T3 ($p<0.01$) and T4 ($p<0.05$).

There were multiple limitations of this study that need to be considered. The study is dependent on self-reporting to measure progress. The study also had uneven participation groups, which influenced how much the leaders of the intervention were able to engage all participants in the educational sessions according to the study. Additionally, just 76% of the sample was retained for the follow up analysis. Despite is limitations, this study did receive a positive rating. Overall, the authors concluded that both interventions, the cognitive dissonance based intervention and the healthy weight intervention, are effective at reducing some of the risk factors for eating disorder development and raising awareness in regards to the female athlete triad.

The article by Smith et al. (2008) was similar to the trial conducted by Becker in that a cognitive-dissonance based intervention program, a healthy weight based intervention, and a wait list control were all compared to determine their effectiveness in reducing behaviors that could lead to eating disorders. This study received a positive rating. There were twenty-nine participants from a Division I university and a variety of sports. Three months before the study, data was collected from all the athletes at the university and this data was used to select a random group that were dissatisfied with their bodies based on their score. Three one hour sessions where the interventions took place occurred three weeks in a row. There was an educational aspect, discussion, activity, homework review, and homework assignment involved with each session. In the

first dissonance session, there was an overview of the purpose of the study and background information about the thin ideal was given. In the second session, more emphasis was given to the thin-ideal and role-playing occurred. In the third dissonance session, more role playing was completed and difficulties in resisting the thin ideal were discussed. In the healthy weight intervention, the focus was on nutrition basics and participants were asked to keep a food record as their assignment. In the second session, participants learned about diet myths and had their food logs reviewed. They also focused on motivation for striving for an overall healthy lifestyle, referred to as the healthy ideal. This healthy ideal contrasts the thin ideal that many athletes strive for. The third session focused on the benefits of this healthy ideal and discussed updated changes they had tried to make in the food intake since the previous session. Overall, the dissonance based intervention focused more on changing athletes' thought process related to the thin ideal by addressing ways to counter the thin ideal and addressing negative thoughts and emotions. The healthy weight intervention used more specific nutrition education in order to persuade athletes to strive for the healthy ideal vs the thin ideal.

The initial results showed that female athletes who participated in the cognitive-dissonance based intervention did not show any greater reduction in eating disorder risk factor reduction than the other eating disorder groups. However, post-hoc analyses did show that the cognitive-dissonance based group did lead to minor improvements in the psychosocial status of participants, demonstrating possible effectiveness in easing psychological distress which can contribute to eating disorders. For sadness/depression, there were no differences across time for the control or healthy weight group. In the cognitive dissonance group there was decreased sadness ($p<0.05$). No differences were

reported for stress or anxiety in any group. Levels of guilt and shame were similar. The cognitive dissonance group did report less internalization ($p<0.001$) than the other groups. No differences were reported for the importance of being thin/attractive. No significant changes were seen in bulimic pathology

Authors concluded that an intervention that is cognitive-dissonance based can be helpful in the prevention of eating disorders. However, more research is needed as there are many factors that contribute the success and failure of addressing behaviors that might lead to an eating disorder, and factors such as the sport environment would need to be considered in the intervention. Limitations of this study include the numerous variables that contribute to an athlete's mindset during the season, such as coaches and the team environment. Additionally, the coaches told the athletes when to attend the sessions, even though they did not know what the sessions were for, which may have influenced their willingness to complete the intervention sessions (Smith & Petrie, 2008).

The article Abood et al. (2000) was designed to evaluate ways to decrease the risk of female college athletes developing an eating disorder. Athletes were divided into two different groups: a comparison group, and an experimental group that participated in a health education intervention that lasted eight weeks. There were seventy participants in the study, and they were all female athletes who competed in a variety of sports at a division 1 university. There was a pretest administered to all participants, and this was given again two weeks after the intervention.

In the intervention group, the main intervention was focused on promoting good attitudes toward health rather than focusing on specific weight loss methods or weight management practices. The main four content areas addressed were self-esteem,

performance pressure, nutrition knowledge, and stress management. The comparison group attended study halls for the same amount of time that the intervention group received their intervention.

At the end of the intervention period, the participants in the comparison group scored lower in the categories of nutrition knowledge and self-esteem. Participants in the intervention group showed lower scores on drive for thinness ($p<0.01$ and body dissatisfaction ($p<0.05$). The score for body dissatisfaction was decreased by 1.47 points in the experimental group, but only 0.62 points in the control group. The score for drive for thinness was decreased by 1.75 points in the experimental group but only was decreased by 0.65 in the control group. The comparison group scored lower on self-esteem ($p<0.01$) and nutrition knowledge ($p <0.05$). The comparison group scored 8.18 points lower in the self esteem category in the control group, compared to only a 2.69 point decrease in the intervention group. The nutrition knowledge scores were increased by 1.37 in the experimental group, and were decreased by 0.79 in the control group.

The authors concluded that there were significant decreases in the scores for thinness and body dissatisfaction within the control group based on regression analysis. This demonstrates the success of an intervention focused on promoting healthy attitudes about nutrition (Abood & Black, 2000). There are some limitations in this study that should be considered. One limitation is that the results of the study were dependent on the self-reporting of the participants, which could have influenced results. Additionally, since the participants were from a variety of different sports, this could have contributed to the results, especially since there was not an even amount of participants from each sport.

The article by Stewart el al. (2014) looked at factors that may affect the effectiveness of nutrition intervention programs in reducing eating disorders in female athletes. There were 157 participants, all of which were college female athletes. Participants were placed into two programs: the athlete modified cognitive dissonance-based program (AM-DBP) or an athlete modified healthy weight intervention program (AM-HWI). Statistical analysis was then used to analyze the impact that different factors had on the results of the Becker et al study. Results of the study showed that athletes who participated in non-lean sports that participated in the AM-DBP intervention showed greater improvement in negative affect than the non-lean athletes who received the AM-HWI intervention. If athletes had a higher preoccupation with body shape, they showed a lower response to the AM-HWI intervention. Athletes who had a higher score of bulimic pathology at baseline demonstrated a greater response in bulimic pathology at the six week mark, and athletes who had higher scores in negative affect and dietary restraint at baseline showed a lower response to both of the interventions when scores were measured at 6 weeks. Participants who had more bulimic pathology at baseline showed higher levels of reduction at post-intervention and the 6 week follow up ($p<0.01$) and higher values of dietary restraint also showed greater amounts ($p<0.05$), baseline shape concern ($p<0.05$), and baseline negative affect ($p<0.05$).The authors concluded that pre-existing bulimic pathology, negative affect, concern with body shape, and dietary restraint may affect responses to interventions. They also indicated that participation in lean sports versus non-lean sports did not seem to indicate a specific response to intervention programs. This study received a positive rating.

The study Laramie et al looked at the effectiveness of a theory-based intervention and its ability to reduce the desire to restrict dietary intake. There were 70 participants, who were female athletes over the age of 12-17. Participants were divided into either the comparison group or the intervention group. The comparison group received three 60 minute sessions which focused on nutrition education, including educational topics such as energy needs in athletes and the importance of macronutrients. The intervention group also received three 60 minute sessions that provided nutrition education and also promoted behavior change through a theory based intervention. This study promoted behavior change through persuasive communication, active learning, and observational modelling. Data was collected at baseline, after the intervention, and 8-12 weeks after the study was completed. A questionnaire focusing on general nutrition knowledge was given. Height and weight were also measured. Another questionnaire was used to evaluate intention, attitude, subjective norm, and perceived behavioral control. The questionnaire also assessed dietary restraint, and the if the following criteria were met then this would qualify as dietary restraint: avoiding dairy products, skipping meals by choice, avoiding meat/grain/fat/sugary foods, avoiding restaurants, and decreasing the serving size.

The results of Laramie et al. demonstrated that the intention to restrict dietary behaviors showed a significant change ($p<0.03$). Attitude ($p<0.62$), subjective norm ($p<0.46$) and perceived behavioral control ($p< 0.57$) did not show a significant effect. The score for intention was 1.9 at baseline, on a scale of 1-6. A score of six would have shown a higher tendency to use dietary restriction. The score of 1.9 decreased by 0.2 at post-intervention, and 0.3 at follow-up in the intervention group. In the control group, the

score was 2.0 at baseline, was decreased by 0.2 at the post-intervention, and was increased by 0.4 at follow-up. The authors consequently concluded that intervention group showed a lower intention to restrict the diet when compared with the control group. This determined that an intervention with a theory-based component might be useful in preventing eating disorders among athletes. There was some limitations to this study that were important to note, such as the use of self-reporting measures, as well as a short duration of time to measure the effects of the study. This study received a positive rating.

Buccholz et al. (2008) looked at the effectiveness of a prevention program that focuses on reducing body image and minimizing pressure to be thin in female athletes. The sample population consisted of 62 female gymnasts who were between the ages of 11 and 18 years. These female athletes were from seven different gymnastics clubs. Four of these clubs received the intervention program that focused on promoting positive body image and reducing pressure to be thin. The three other clubs served as the control group. The gymnasts completed questionnaires before and after the intervention. These questionnaires measured eating attitudes and behaviors, body esteem, societal pressure to be thin, self-efficacy related to of dieting, and pressure to be thin within their sports clubs. The intervention clubs received an intervention called "Body Sense: A Positive Body Image Initiative For Female Athletes." This program provided education regarding unique body sizes and shapes, the pressure o diet or restrict food, physical activity as a source of enjoyment, the importance of positive self-esteem, management of stress, balance between participation in sports and life, and overall body health.

The results of the study showed that the athletes who participated in the intervention program had lower internalization scores ($p=0.028$), which showed that

athletes may have not been as likely to respond to the social pressure to be thin as they were before the intervention. No significant changes were found for body esteem; appearance (p=0.132), weight (p=0.059), attribution (p=0.867), and self-efficacy (0.591) did not indicate any significant changes. Overall, this study concluded that athletes did perceive a reduction in pressure to be thin after the intervention, even though there were not any changes in body esteem found in the study. There are, however, a few limitations that are important to consider. The period of data analysis was shorter in this study, and the authors point out that perhaps different results would have been obtained if another survey was given after a longer period of time after the intervention. This study also did not measure how compliant participants were with different components of the intervention program, such as reading the newsletters as an assignment. This could have influenced their response to their intervention if they did not fully participate in it and were not as engaged. This study did receive a positive rating despite its limitations.

Martinsen et al. (2014) examined the effectiveness of a one-year intervention program on preventing eating disorders among high school athletes. Four hundred sixty-five first-year student athletes, including males and females from sixteen different Norwegian Elite Sport High Schools were followed throughout high school from 2008 to 2011. Seven of the schools made up the control group, and nine of the schools made up the intervention group. These athletes represented fifty different sports, and for the purpose of research, these sports were divided into weight-sensitive sports such as gymnastics and non-weight sensitive sports such as basketball. The intervention consisted of mental training through Facebook posts where participants learned ways to boost self-esteem and education on nutrition as well as adolescent development. Lectures,

teamwork activities, and homework assignments were included as part of this intervention. The first author and another researcher conducted the lectures. Coaches also received education on how to best approach eating disorders and low self-esteem with their athletes. Athletes took a pretest before the intervention, a posttest after the intervention, and another posttest nine months after the intervention; a clinical interview by the researchers took place during the pretest and the second posttest. These tests consisted of a questionnaire focusing on training history, nutritional history, history, oral contraceptive use, menstrual history, dieting history, weight history, history of weight control methods, injuries, eating disorder history, and standardized questions from the Eating Disorders Inventory-2 and the Contingent Self-Esteem Scale. The participants at the control schools did not receive any education.

Results showed that no new cases of eating disorders developed at the intervention schools among females, whereas at the control schools, thirteen percent of the students had developed new cases of an eating disorder and had met the criteria for either bulimia nervosa or eating disorder not otherwise specified. The researchers concluded that new cases of eating disorders among elite athletes could be possibly prevented through a year-long intervention program. One strength of the study is that schools were randomly assigned to the intervention group and control group. It also evaluated more long-term effects of the treatment with the second posttest. A weakness of the study is that it only focused on elite high school athletes, so the results may not necessarily transfer to average high school athletes. In addition, there were several different parts of the intervention, thus it is not clear which contributed the most to the prevention of eating disorders. Overall, this study demonstrates the effectiveness of

preventing eating disorders through education and demonstrates a way that eating disorders can be prevented on a large scale. Perhaps if this program was developed into a universal curriculum for all student athletes, particularly those in sports that are more weight-sensitive, it could make an even larger impact in eating disorder prevention (Martinsen et al, 2014).

Details on each of these articles can be found in table 2 below, and copies of the data extraction worksheet and the QCC checklist for each article can be found in the appendix.

Table 2 Overview Table

Author and rating	Study Design and Purpose	Population	Intervention	Conclusions
Author: Becker et al Year: 2011 Rating: +	Study Purpose: To determine whether either of the two interventions could be beneficial in preventing the development of eating disorders. Study Design: pilot study, randomized exploratory intervention	Female college students at a competitive NCAA division III university (participant were excluded if they current have an ED). Age 18-22 years.	One group was athlete-modified dissonance prevention. The other group was healthy weight intervention. Risk factors for ED were assessed before treatment, after treatment, 6 weeks after treatment, and 1 year after treatment.	Both interventions reduced the following behaviors: dietary restraint, bulimic pathology, concerns with shape/weight, thin-ideal internalization, and negative affect after 1 year. Additionally, there was an increase in students who sought medical treatment for the female athlete triad.
Author: Smith el al Year: 2008 Rating: +	Study purpose: to determine the effectiveness of	Population: 29 NCAA Division I female athletes who	Participants were divided into the following groups:	A cognitive-dissonance based intervention can be helpful in

	interventions in reducing body dissatisfaction, dietary restriction, negative affect Study design: randomized controlled trial	showed dissatisfaction with their bodies. Avg age 19.32 years.	cognitive dissonance, healthy weight, and control.	preventing ED perhaps more than the other interventions mentioned based on the study, but more research is needed/redesign of program is needed to account for other factors.
Author: Abood et al Year: 2000 Rating: +	Purpose of study: to uncover ways to decrease drive for thinness and dissatisfaction of the female body among female athletes Study design: randomized controlled trial	Population: 70 female college athletes from a NCAA Division 1 university. Average age 19	Experimental and comparison group; experimental group received 8 week intervention which addressed self-esteem, performance pressure, nutrition knowledge, nutrition beliefs/myths related to athletic performance, stress management	Intervention showed decreased drive for thinness and decreased body dissatisfaction, shows promise for ED prevention
Author: Stewart et al Rating: +	Purpose of study: to evaluate factors that contribute to a response by female athletes to an intervention program for female athletes Study design: randomized control trial	Population: 157 female collegiate athletes	Surveys were analyzed that were completed by participants who were divided into two groups: the cognitive dissonance-based program and the healthy	Participation in lean vs nonlean sports did not appear to affect responses to the interventions. The factors that did appear to influence these interventions and perhaps make them less effective were pre-existing pathology,

			weight program.	dietary restraint, negative affect, and shape concern.
Author: Laramee et al Rating: +	Study purpose: to look at a nutrition intervention and its effectiveness among female athletes in reducing the desire to restrict dietary intake Study design: randomized control trial	Population: female athletes, ages 12-17	An intervention group and a comparison group received nutrition education weekly. The intervention group received nutrition education that addressed people's reasoning to lose weight or restricting dietary intake (theory based behavior change)	The intervention group showed a lower intention to restrict the diet when compared with the control group, showing that an intervention with a theory based component may be useful in preventing eating disorders among nutrition athletes.
Buchholz et al Rating: +	Study purpose: Determine how effective a prevention program that focuses on reducing body image and minimizing pressure to be thin among female athletes. Study design: Randomized control trial	Population: 62 female gymnasts, aged 11-18 years, from 7 different gymnastics clubs	Four of the seven clubs received the intervention program that promoted body image and aimed to reduce pressure to be thin.	Athletes did perceive a reduction in pressure to be thin, even though there were not any changes in body esteem found in the study.

Martinsen et al Rating:+	Study purpose: to determine if a school-base one year intervention program is effective in preventing eating disorders in athletes	Population: 465 elite high school athletes, included both male and female	The intervention group learned various mental training techniques in order to improve self-esteem. Education on nutrition and physiological development was also provided.	This intervention program was effective in preventing new cases of eating disorders from developing when compared with the control group.

Conclusion Statement:

Nutrition interventions such as the cognitive dissonance intervention, the healthy weight intervention, the theory based intervention, or other nutrition interventions focused on promoting a healthy attitude towards eating, may be effective in the prevention of eating disorders among female collegiate athletes. This may prove particularly useful in reducing drive for thinness and decreased body satisfaction which are behaviors that increase risk of eating disorders. Dietary restraint, body shape/weight concerns, bulimic pathology, thin-ideal internalization, and negative affect all can potentially be reduced with preventative nutrition interventions. Exact nutrition interventions are still being studied although some success was found in each of the nutrition interventions analyzed. Response to eating disorder interventions did not appear to be affected by whether the participants were involved in lean vs non-lean sports but did appear to be affected by pre-existing pathology, dietary restraint, negative affect, and shape concern. The fact that

nutrition interventions are effective in reducing behaviors that increase risk for eating disorders, indicates that coaches and involved families should be aware of risk behaviors, and implement interventions as needed, since they could prevent long-term complications such as chronic bone disease and infertility if an eating disorder were to manifest itself.

This is a Grade I conclusion as the studies are generally free from design flaws and findings are generally consistent.

CHAPTER 5: CONCLUSION

Overall Summary

All seven studies focused on different methods of preventing eating disorders in female athletes. The article by Becker et al. (2012) showed that dietary restraint, bulimic pathology, concerns with shape and weight, negative affect, and thin-ideal internalization were reduced one year after receiving the intervention. This was shown in both intervention groups: a cognitive-dissonance prevention program and the healthy weight program. The article Smith et al. (2008) showed cognitive-dissonance based intervention may be helpful in preventing eating disorders, but the study recognized that more research was needed in order to address the many factors that contribute to eating disorder development. The article written by Abood et al (2000) showed that the intervention group experienced a decrease in drive for thinness and body dissatisfaction, which demonstrated potential value of the program in eating disorder prevention. The article by Stewart et al. (2014) took the data from the previously mentioned Becker et al. (2012) and analyzed additional factors that may have contributed to the results and influenced the outcomes of the studies. This study showed that whether the participants were in lean or non lean sports did not seem to affect the responses to the interventions. Pre-existing bulimic pathology, negative affect, and shape concern did appear to contribute to the effect of the interventions according to the study conducted by Stewart et al (2014). The article Laramee et al. (2017) showed that there was lower intention to restrict the diet when compared with the control group, which demonstrated the success of this theory-based style of intervention. The study by Buccholz et al. (2008) et al

showed that there was not any changes in body esteem, but there was a reduction in pressure to be thin after the intervention. Martinsen et al. (2014) was actually able to show that the intervention program prevented new cases of eating disorders from developing when compared with the control group, thus proving its effectiveness. These studies all demonstrated the potential success of their interventions in different ways, but still all showed reduction of certain eating disorder risk factors that could make their nutrition interventions valuable for future research.

Participants

The study by Becker et al. (2012) utilized a population of 157 female collegiate athletes at an NCAA division III university, as long they did not have a current eating disorder. The study Smith et al (2008) used a population if 29 female athletes who had demonstrated body dissatisfaction and competed in their sports at an NCAA division I level. The study by Abood et al. (2000) used a population of 70 female college athletes at an NCAA division I level. The study by Stewart et al. (2014) used a population of 157 female collegiate athletes. The study by Laramee et al.(2017) used a population sample of 70 Female athletes between the ages of 12-17. The study by Buccholz et al. (2008) used 62 female gymnasts between the ages of 11-18. Martinsen et al. (2014) utilized 465 high school students, both male and female. The study conducted by Martinsen el al. (2014) had a considerably larger sample size than the other studies. The lowest sample size was in Smith et al (2008). Overall, the sample sizes ranged from 29-465, which may have contributed to a variety of results and made a difference in the comparison of the studies. Four of the studies also focused on college athletes, whereas three of the studies

focused on high school athletes. Additionally, Martinsen at al was the only study to include both males and females, which could have contributed to results.

Nutrition Interventions

The nutrition interventions in the study by Becker et al. (2012) were the cognitive dissonance program and the healthy weight intervention. The intervention groups in the Smith et al. (2008) study were cognitive dissonance, healthy weight, and control. In the study Becker et al (2012), there was a comparison and an experimental group. The experimental group completed an intervention that focused on nutrition knowledge, pressure of performance, self-esteem, stress management, and nutrition myths related to performance in athletics. In the Stewart et al. (2014) study, surveys were completed by the cognitive-dissonance based program and the healthy weight program. In the Laramee et al. (2017) study, there was an intervention group that received a theory of planned behavior-based intervention as well as a control group. In Bucccholz et al. (2008) the intervention group received an intervention that promoted body image and reduced the pressure to be thin and was compared with a control group. In Martinsen et al (2014), the intervention group learned various mental training techniques in order to improve self-esteem. Education on nutrition and physiological development was also provided. The results from the intervention group were compared with that of the control group.

All studies consisted of groups that went through an intervention designed to prevent eating disorders. Interventions differed in the behavioral theory they were based on, but they were all attempting to do something similar: reduce eating disorder

symptoms or risk factors to prove the value of a nutrition intervention as a tool for preventing eating disorders in athletes.

Limitations

The major limitations of these studies are related to the subject matter itself. In measuring such items as self-esteem or body dissatisfaction, obtaining accurate results is only possible if participants are honest in their responses to survey questions. Some individuals may not think that their behaviors would be considered disordered eating, and this could skew results. Additionally, because these studies aim to look at the prevention of eating disorders, the results/success of the studies are limited as true success would determining if eating disorders were avoided in the future. Additionally, it is not possible to know if these specific individuals would have still remained free of disordered eating if they had not received the intervention. These studies try to account for this by using specific scales and scores in order to determine the results, but the area of eating disorders is still a complex psychological subject that can be influenced by many different factors. Additionally, some of these studies were done at different levels of collegiate athletics; NCAA division I is often a much different environment than division III since athletes are competing against one another for scholarship money in division I. It would be more conclusive if these studies were conducted among the same level of athletics.

Applications to Practice/Future Research

This research could apply directly to dietetics practice, particularly at larger colleges that have a sports dietitian on staff. This dietitian could provide preventative education sessions such as the ones in the study in an attempt to reduce disordered eating.

One of the major aspects of this paper mentioned in the literature review was the female athlete triad. Perhaps a method of screening to identify risk factors for the female athlete triad could be implemented for incoming female athletes, in coordination with a requirement for a physical to be obtained. There could even be survey distributed at the beginning of an athletic season. The downside to a survey that relies on self-reporting is that the validity is dependent on the athletes being truthful in their self-reporting, which served as a limitation in many studies mentioned throughout this paper. This method of screening, however, would be very important in preventing future health problems, as earlier sections in this paper pointed out the damaging effects that the female athlete triad can have on long-term bone health.

Additionally, several of the factors mentioned in the studies of the evidence analysis project related to such aspects as negative body image, dietary restriction, and low-self esteem. Perhaps if female athletes had an initial meeting with a team sports dietitian, then they could address some of the athlete's goals for weight management and staying healthy in college and help the athlete to form a healthy plan to prevent compromising their performance and health by resorting to other disordered eating methods. A team sports dietitian could also be helpful in providing a basic introduction seminar to healthy eating and athletics, utilizing the information from the studies focusing on which nutrition interventions were successful. They also could help athletes to form a healthy relationship with food rather than linking food with fear.

Future research could compare more specific programs and complete studies on a larger scale, perhaps at a larger university with a larger sample size of athletes. Additionally, colleges could be selected that are at similar collegiate levels. One major

area of future research that could be developed are nutritional screening programs to identify athletes at risk of disordered eating. Perhaps studies could compare the response to a group of athletes who met with a dietitian to create a meal plan versus a group of athletes who recorded their caloric intake on their own. Screening programs could also be in place for females to report their caloric intake to their coaches or for a medical professional to be involved if a female athlete's period is absent for too long. Studies could look also look specifically at energy availability vs caloric intake versus the energy output of athletes to determine risk for the female athlete triad or to determine if this is a major area to focus on in keeping athletes healthy.

Additionally, future studies could establish a way to measure success of nutrition interventions that is not as dependent on the self-reporting of athletes. These studies could utilize more objective measures in order to standardize a nutrition program or regimen that could be used universally as a method for eating disorder prevention. Overall, numerous additional studies would need to be conducted in order to create such a program and utilize objective measures.

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APPENDIX: DATA EXTRACTION WORKSHEETS AND QUALITY CRITERIA CHECKLISTS

Academy of Nutrition and Dietetics
Evidence Analysis Library® Worksheet Template and Quality Criteria Checklist: Primary Research

Citation	Becker et al
Study Design	Randomized control trial
Class	A
Quality Rating	☒ + (Positive) ☐ - (Negative) ☐ ⊘ (Neutral)
Research Purpose	To determine whether either of the two interventions could be beneficial in preventing the development of eating disorders.
Inclusion Criteria	female collegiate athletes who competed in sports (from several different teams) at a specific NCAA division III university, from the fall of 2007 to the spring of 2009. Age range =18-22 years
Exclusion Criteria	Partcipants who met the criteria for eating disorder, incomplete baseline data.
Description of Study Protocol	Recruitment: Study design worked with the university to require all female athletes to go through this intervention program, and athletes chose whether or not they wanted to participate in the study. Design: Each team completed the intervention within their respective team. 50% of each team was placed into the AM-DPB group and 50% was placed into the AM-HWI group. Three sessions occurred a three week period, and each session was 60-80 minutes. Blinding used (if applicable): n/a Intervention (if applicable): The AM-DBP group had sessions that focused primarily on providing information regarding the female athlete triad and body image among athletes. The AM-HWI group was focused on provifing information about the female athlete triad as well as focused more on speciifc weight goals/weight ideals for athletes and focused on results from dietary restriction. Statistical Analysis: Independent samples t test, Hierarchical Linear Modeling

Data Collection Summary	Timing of Measurements: preintervetion, post-intervention, 6 week follow up, 1 year follow up Dependent Variables: thin-deal internalization, dietary restraint, bulimic pathology, shape concern, weight concern, negative affect Independent Variables: AM-DBP and AM-HWI Control Variables: n/a
Description of Actual Data Sample	Initial: 177 (0 Males 177 Females) Attrition (final N): 168 Age: 18-22 Ethnicity: primarily caucasion Other relevant demographics: n/a Anthropometrics: n/a Location: NCAA Division III university
Summary of Results	Key Findings: Reduction in thin-ideal internalization, dietary restraint, bulimic pathology, shape and weight concern, negative affect at 6 weeks in both interventions. Reduction in bulimic pathology, shape and weight concern, and negative affect at 1 year in both interventions. Other Findings: Qualitive findings indicated that the athletes might prefer the AM-HWI intervention.
Author Conclusion	Both interventions can potentially contribute to preenting eating disorders in female athletes, but future research is needed especially when comparing these interventions in more competitive collegiate programs.
Reviewer Comments	*n/a*
Funding Source	7659 from the grant MH 077659 National Institutes of Health;

Quality Criteria Checklist: Primary Research

Symbols Used	***Explanation***
+	***Positive*** *– Indicates that the report has clearly addressed issues of inclusion/exclusion, bias, generalizability, and data collection and analysis*
--	***Negative*** *– Indicates that these issues have not been adequately addressed.*
⊘	***Neutral*** *– indicates that the report is neither exceptionally strong nor exceptionally week*

Select a rating from the drop-down menu ↓

Relevance Questions		
1. Would implementing the studied intervention or procedure (if found successful) result in improved outcomes for the patients/clients/population group? (NA for some Epi studies)	1	Yes
2. Did the authors study an outcome (dependent variable) or topic that the patients/clients/population group would care about?	2	Yes
3. Is the focus of the intervention or procedure (independent variable) or topic of study a common issue of concern to dietetics practice?	3	Yes
4. Is the intervention or procedure feasible? (NA for some epidemiological studies)	4	Yes

If the answers to all of the above relevance questions are "Yes," the report is eligible for designation with a plus (+) on the Evidence Quality Worksheet, depending on answers to the following validity questions.

Validity Questions		
1. Was the <u>research question</u> clearly stated?	1	Yes
1.1. Was the specific intervention(s) or procedure (independent variable(s)) identified?	1.1	Yes
1.2. Was the outcome(s) (dependent variable(s)) clearly indicated?	1.2	Yes
1.3. Were the target population and setting specified?	1.3	Yes
2. Was the <u>selection</u> of study subjects/patients free from bias?	2	Yes
2.1. Were inclusion/exclusion criteria specified (e.g., risk, point in disease progression, diagnostic or prognosis criteria), and with sufficient detail and without omitting criteria critical to the study?	2.1	Yes
2.2. Were criteria applied equally to all study groups?	2.2	Yes
2.3. Were health, demographics, and other characteristics of subjects described?	2.3	Yes
2.4. Were the subjects/patients a representative sample of the relevant population?	2.4	Yes
3. Were <u>study groups comparable</u>?	3	Yes
3.1. Was the method of assigning subjects/patients to groups described and unbiased? (Method of randomization identified if RCT)	3.1	Yes
3.2. Were distribution of disease status, prognostic factors, and other factors (e.g., demographics) similar across study groups at baseline?	3.2	Yes
3.3. Were concurrent controls used? (Concurrent preferred over historical controls.)	3.3	N/A
3.4. If cohort study or cross-sectional study, were groups comparable on important confounding factors and/or were preexisting differences accounted for by using appropriate adjustments in statistical analysis?	3.4	N/A
3.5. If case control study, were potential confounding factors comparable for cases and controls? (If case series or trial with subjects serving as own control, this criterion is not applicable. Criterion may not be applicable in some cross-sectional studies.)	3.5	N/A
3.6. If diagnostic test, was there an independent blind comparison with an appropriate reference standard (e.g., "gold standard")?	3.6	Yes

4. Was method of handling <u>withdrawals</u> described?	4	Yes

4.1. Were follow up methods described and the same for all groups?	4.1	Yes
4.2. Was the number, characteristics of withdrawals (i.e., dropouts, lost to follow up, attrition rate) and/or response rate (cross-sectional studies) described for each group? (Follow up goal for a strong study is 80%.)	4.2	Yes
4.3. Were all enrolled subjects/patients (in the original sample) accounted for?	4.3	Yes
4.4. Were reasons for withdrawals similar across groups	4.4	Yes
4.5. If diagnostic test, was decision to perform reference test not dependent on results of test under study?	4.5	Yes
5. Was <u>blinding</u> used to prevent introduction of bias?	5	Unclear
5.1. In intervention study, were subjects, clinicians/practitioners, and investigators blinded to treatment group, as appropriate?	5.1	Unclear
5.2. Were data collectors blinded for outcomes assessment? (If outcome is measured using an objective test, such as a lab value, this criterion is assumed to be met.)	5.2	Unclear
5.3. In cohort study or cross-sectional study, were measurements of outcomes and risk factors blinded?	5.3	N/A
5.4. In case control study, was case definition explicit and case ascertainment not influenced by exposure status?	5.4	N/A
5.5. In diagnostic study, were test results blinded to patient history and other test results?	5.5	N/A
6. Were <u>intervention</u>/therapeutic regimens/exposure factor or procedure and any comparison(s) described in detail? Were <u>intervening factors</u> described?	6	Yes
6.1. In RCT or other intervention trial, were protocols described for all regimens studied?	6.1	Yes
6.2. In observational study, were interventions, study settings, and clinicians/provider described?	6.2	N/A
6.3. Was the intensity and duration of the intervention or exposure factor sufficient to produce a meaningful effect?	6.3	Yes
6.4. Was the amount of exposure and, if relevant, subject/patient compliance measured?	6.4	Yes
6.5. Were co-interventions (e.g., ancillary treatments, other therapies) described?	6.5	Yes
6.6. Were extra or unplanned treatments described?	6.6	Yes
6.7. Was the information for 6.4, 6.5, and 6.6 assessed the same way for all groups?	6.7	Yes
6.8. In diagnostic study, were details of test administration and replication sufficient?	6.8	N/A
7. Were <u>outcomes</u> clearly defined and the <u>measurements valid and reliable</u>?	7	Yes
7.1. Were primary and secondary endpoints described and relevant to the question?	7.1	Yes
7.2. Were nutrition measures appropriate to question and outcomes of concern?	7.2	Yes
7.3. Was the period of follow-up long enough for important outcome(s) to occur?	7.3	Yes
7.4. Were the observations and measurements based on standard, valid, and reliable data collection instruments/tests/procedures?	7.4	Yes
7.5. Was the measurement of effect at an appropriate level of precision?	7.5	Yes
7.6. Were other factors accounted for (measured) that could affect outcomes?	7.6	Yes
7.7. Were the measurements conducted consistently across groups?	7.7	Yes

8. Was the <u>statistical analysis</u> appropriate for the study design and type of outcome indicators?	8	Yes
8.1. Were statistical analyses adequately described the results reported appropriately?	8.1	Yes
8.2. Were correct statistical tests used and assumptions of test not violated?	8.2	Yes
8.3. Were statistics reported with levels of significance and/or confidence intervals?	8.3	Yes
8.4. Was "intent to treat" analysis of outcomes done (and as appropriate, was there an analysis of outcomes for those maximally exposed or a dose-response analysis)?	8.4	Unclear
8.5. Were adequate adjustments made for effects of confounding factors that might have affected the outcomes (e.g., multivariate analyses)?	8.5	Yes
8.6. Was clinical significance as well as statistical significance reported?	8.6	Yes
8.7. If negative findings, was a power calculation reported to address type 2 error?	8.7	Unclear
9. **Are <u>conclusions supported by results</u> with biases and limitations taken into consideration?**	9	Yes
9.1. Is there a discussion of findings?	9.1	Yes
9.2. Are biases and study limitations identified and discussed?	9.2	Yes
10. Is bias due to study's <u>funding or sponsorship</u> unlikely?	10	Yes
10.1. Were sources of funding and investigators' affiliations described?	10.1	Yes
10.2. Was there no apparent conflict of interest?	10.2	Yes
MINUS/NEGATIVE (-) *If most (six or more) of the answers to the above validity questions are "No," the report should be designated with a minus (-) symbol on the Evidence Worksheet.*		
NEUTRAL (∅) *If the answers to validity criteria questions 2, 3, 6, and 7 do not indicate that the study is exceptionally strong, the report should be designated with a neutral (∅) symbol on the Evidence Worksheet.*		
PLUS/POSITIVE (+) *If most of the answers to the above validity questions are "Yes" (including criteria 2, 3, 6, 7 and at least one additional "Yes"), the report should be designated with a plus symbol (+) on the Evidence Worksheet.*		

Academy of Nutrition and Dietetics
Evidence Analysis Library® Worksheet Template and
Quality Criteria Checklist: Primary Research

Citation	Smith et al
Study Design	Randomized control trial
Class	A
Quality Rating	☒ + (Positive) ☐ - (Negative) ☐ ⊘ (Neutral)
Research Purpose	To determine the effectiveness of interventions in reducing body dissatisfaction, dietary restriction, negative affect
Inclusion Criteria	female collegiate athletes at an NCAA division 1 university in the Southwest
Exclusion Criteria	none
Description of Study Protocol	Recruitment: Data was collected from all male/female athletes at the university, this data was used to recruit athletes who were not satisfied with their bodies. Design: Sample was divided into groups: healthy weight (n=7), cognitive dissonance (n=12) and control (n=10). Three one hour meetings occurred during a period of three weeks. Blinding used (if applicable): n/a Intervention (if applicable): The dissonance group received an intervention that was designed to alter behaviors/attitdues. The healthy weight group focused on overall nutrition/achieving a healthy weight without going too in depth about attitudes toward body image. Statistical Analysis: repeated measures of analyses of variance, and exploratory post-hoc dependent sample t tests within each group
Data Collection Summary	Timing of Measurements: Measured at two different times Dependent Variables: Bulimia test revised, importance of being thin and attractive, importance of being physically fit and in shape, satisfaction with body, dutch restrained eating scale, body shape questionairrre-revised, stress level, shame/guilt. Independent Variables: cognitive-dissonance, healthy weight Control Variables: control group

Description of Actual Data Sample	Initial: 29 (0 Males 29 Females) Attrition (final N): 29 Age: avg= 19.32 years Ethnicity: primarily caucasion (82%) Other relevant demographics: participants in a variety of sports Anthropometrics: BMI 23.51 Location: NCAA Division I univeristy in the Southwest
Summary of Results	Key Findings: A cognitive-dissonance based intervention can be helpful in preventing ED, but more research is needed/redesign of program is needed to account for other factors. Other Findings: --
Author Conclusion	Cognigitive-dissoance interventions cans reduce disatisfaction with the bdoy, negative affect, dieting, idordered eating, and internalization among collegiate female athletes. Future research is needed to determine the effectiveness on an even broder level.
Reviewer Comments	
Funding Source	Not listed

Quality Criteria Checklist: Primary Research

Symbols Used	Explanation
+	**Positive –** Indicates that the report has clearly addressed issues of inclusion/exclusion, bias, generalizability, and data collection and analysis
--	**Negative –** Indicates that these issues have not been adequately addressed.
⊘	**Neutral** – indicates that the report is neither exceptionally strong nor exceptionally week

Select a rating from the drop-down menu ↓

Relevance Questions		
5. Would implementing the studied intervention or procedure (if found successful) result in improved outcomes for the patients/clients/population group? (NA for some Epi studies)	1	Yes
6. Did the authors study an outcome (dependent variable) or topic that the patients/clients/population group would care about?	2	Yes
7. Is the focus of the intervention or procedure (independent variable) or topic of study a common issue of concern to dietetics practice?	3	Yes
8. Is the intervention or procedure feasible? (NA for some epidemiological studies)	4	Yes

If the answers to all of the above relevance questions are "Yes," the report is eligible for designation with a plus (+) on the Evidence Quality Worksheet, depending on answers to the following validity questions.		
Validity Questions		
11. Was the <u>research question</u> clearly stated?	1	Yes
11.1. Was the specific intervention(s) or procedure (independent variable(s)) identified?	1.1	Yes
11.2. Was the outcome(s) (dependent variable(s)) clearly indicated?	1.2	Yes
11.3. Were the target population and setting specified?	1.3	Yes
12. Was the <u>selection</u> of study subjects/patients free from bias?	2	Yes
12.1. Were inclusion/exclusion criteria specified (e.g., risk, point in disease progression, diagnostic or prognosis criteria), and with sufficient detail and without omitting criteria critical to the study?	2.1	Yes
12.2. Were criteria applied equally to all study groups?	2.2	Yes
12.3. Were health, demographics, and other characteristics of subjects described?	2.3	Yes
12.4. Were the subjects/patients a representative sample of the relevant population?	2.4	Yes
13. Were <u>study groups comparable</u>?	3	Yes
13.1. Was the method of assigning subjects/patients to groups described and unbiased? (Method of randomization identified if RCT)	3.1	Yes
13.2. Were distribution of disease status, prognostic factors, and other factors (e.g., demographics) similar across study groups at baseline?	3.2	Yes
13.3. Were concurrent controls used? (Concurrent preferred over historical controls.)	3.3	Yes
13.4. If cohort study or cross-sectional study, were groups comparable on important confounding factors and/or were preexisting differences accounted for by using appropriate adjustments in statistical analysis?	3.4	N/A
13.5. If case control study, were potential confounding factors comparable for cases and controls? (If case series or trial with subjects serving as own control, this criterion is not applicable. Criterion may not be applicable in some cross-sectional studies.)	3.5	N/A
13.6. If diagnostic test, was there an independent blind comparison with an appropriate reference standard (e.g., "gold standard")?	3.6	N/A

14. Was method of handling <u>withdrawals</u> described?	4	N/A
14.1. Were follow up methods described and the same for all groups?	4.1	N/A
14.2. Was the number, characteristics of withdrawals (i.e., dropouts, lost to follow up, attrition rate) and/or response rate (cross-sectional studies) described for each group? (Follow up goal for a strong study is 80%.)	4.2	N/A
14.3. Were all enrolled subjects/patients (in the original sample) accounted for?	4.3	N/A
14.4. Were reasons for withdrawals similar across groups	4.4	N/A
14.5. If diagnostic test, was decision to perform reference test not dependent on results of test under study?	4.5	N/A
15. Was <u>blinding</u> used to prevent introduction of bias?	5	Yes
15.1. In intervention study, were subjects, clinicians/practitioners, and investigators blinded to treatment group, as appropriate?	5.1	Unclear
15.2. Were data collectors blinded for outcomes assessment? (If outcome is measured using an objective test, such as a lab value, this criterion is assumed to be met.)	5.2	Yes

15.3. In cohort study or cross-sectional study, were measurements of outcomes and risk factors blinded?	5.3	N/A
15.4. In case control study, was case definition explicit and case ascertainment not influenced by exposure status?	5.4	N/A
15.5. In diagnostic study, were test results blinded to patient history and other test results?	5.5	N/A
16. Were <u>intervention</u>/therapeutic regimens/exposure factor or procedure and any comparison(s) described in detail? Were <u>intervening factors</u> described?	6	Yes
16.1. In RCT or other intervention trial, were protocols described for all regimens studied?	6.1	Yes
16.2. In observational study, were interventions, study settings, and clinicians/provider described?	6.2	N/A
16.3. Was the intensity and duration of the intervention or exposure factor sufficient to produce a meaningful effect?	6.3	Yes
16.4. Was the amount of exposure and, if relevant, subject/patient compliance measured?	6.4	Yes
16.5. Were co-interventions (e.g., ancillary treatments, other therapies) described?	6.5	N/A
16.6. Were extra or unplanned treatments described?	6.6	N/A
16.7. Was the information for 6.4, 6.5, and 6.6 assessed the same way for all groups?	6.7	Yes
16.8. In diagnostic study, were details of test administration and replication sufficient?	6.8	N/A
17. Were <u>outcomes</u> clearly defined and the <u>measurements valid and reliable</u>?	7	Yes
17.1. Were primary and secondary endpoints described and relevant to the question?	7.1	Yes
17.2. Were nutrition measures appropriate to question and outcomes of concern?	7.2	Yes
17.3. Was the period of follow-up long enough for important outcome(s) to occur?	7.3	Yes
17.4. Were the observations and measurements based on standard, valid, and reliable data collection instruments/tests/procedures?	7.4	Yes
17.5. Was the measurement of effect at an appropriate level of precision?	7.5	Yes
17.6. Were other factors accounted for (measured) that could affect outcomes?	7.6	Yes
17.7. Were the measurements conducted consistently across groups?	7.7	Yes

18. Was the <u>statistical analysis</u> appropriate for the study design and type of outcome indicators?	8	Yes
18.1. Were statistical analyses adequately described the results reported appropriately?	8.1	Yes
18.2. Were correct statistical tests used and assumptions of test not violated?	8.2	Yes
18.3. Were statistics reported with levels of significance and/or confidence intervals?	8.3	Yes
18.4. Was "intent to treat" analysis of outcomes done (and as appropriate, was there an analysis of outcomes for those maximally exposed or a dose-response analysis)?	8.4	Unclear
18.5. Were adequate adjustments made for effects of confounding factors that might have affected the outcomes (e.g., multivariate analyses)?	8.5	Unclear
18.6. Was clinical significance as well as statistical significance reported?	8.6	Yes

18.7. If negative findings, was a power calculation reported to address type 2 error?	8.7	N/A
19. **Are <u>conclusions supported by results</u> with biases and limitations taken into consideration?**	9	Yes
19.1. Is there a discussion of findings?	9.1	Yes
19.2. Are biases and study limitations identified and discussed?	9.2	Yes
20. Is bias due to study's <u>funding or sponsorship</u> unlikely?	10	Unclear
20.1. Were sources of funding and investigators' affiliations described?	10.1	No
20.2. Was there no apparent conflict of interest?	10.2	Yes
MINUS/NEGATIVE (-) *If most (six or more) of the answers to the above validity questions are "No," the report should be designated with a minus (-) symbol on the Evidence Worksheet.*		
NEUTRAL (∅) *If the answers to validity criteria questions 2, 3, 6, and 7 do not indicate that the study is exceptionally strong, the report should be designated with a neutral (∅) symbol on the Evidence Worksheet.*		
PLUS/POSITIVE (+) *If most of the answers to the above validity questions are "Yes" (including criteria 2, 3, 6, 7 and at least one additional "Yes"), the report should be designated with a plus symbol (+) on the Evidence Worksheet.*		

Academy of Nutrition and Dietetics
Evidence Analysis Library® Worksheet Template and
Quality Criteria Checklist: Primary Research

Academy of Nutrition and Dietetics

Citation	Abbod
Study Design	Randomized control trial
Class	A
Quality Rating	☒ + (Positive) ☐ - (Negative) ☐ ⊘ (Neutral)
Research Purpose	to decrease the risk factors for eating disorder development among female athletes
Inclusion Criteria	female collegiate athletes at a division I university
Exclusion Criteria	none listed
Description of Study Protocol	Recruitment: 70 athletes were randomly selected to participate. Letters were sent out to coaches. Design: Participants were divided into an experimental group and a comparison group. The experimental group was provided with the health education intervention. Blinding used (if applicable): n/a Intervention (if applicable): focused on promoting healthy behaviors and postive attitudes. Lasted for 8 weeks. Statistical Analysis: baseline means, standard deviations, analysis of covariance, 2 tailed t test, multiple regression
Data Collection Summary	Timing of Measurements: pretest administered 1 week before intervention period began. Post-test administered 2 weeks after intervention period ended. Dependent Variables: body dissatisfaction, drive for thinness, self-esteem, self-rated anxiety, sport competition anxiety, nutrition beliefs/myths, nutrition knowledge Independent Variables: experimental group, comparison group Control Variables: n/a
Description of Actual Data Sample	Initial: 70 (0 Males 70 Females) Attrition (final N): 67

	Age: 19 (average) Ethnicity: mostly Caucasian Other relevant demographics: n/a Anthropometrics: n/a Location: Division I university
Summary of Results	Key Findings: Participants in the intervention group had lower scores in the categories of drive for thinness and body dissatiscation. The partipcants in the comparison group scored lower in the categories of self-esteem and nutrition knowledge. The educational intervention was found to be linked to a decreased drive for thinness, which in turn was linked to increased body satisfaction. Other Findings: n/a.
Author Conclusion	The intervention may be helpful in preventing eating disorders among female athletes.
Reviewer Comments	*n/a*
Funding Source	not listed

Quality Criteria Checklist: Primary Research

Symbols Used	*Explanation*
+	***Positive –*** *Indicates that the report has clearly addressed issues of inclusion/exclusion, bias, generalizability, and data collection and analysis*
--	***Negative –*** *Indicates that these issues have not been adequately addressed.*
⊘	***Neutral*** *– indicates that the report is neither exceptionally strong nor exceptionally week*

Select a rating from the drop-down menu ↓

Relevance Questions		
9. Would implementing the studied intervention or procedure (if found successful) result in improved outcomes for the patients/clients/population group? (NA for some Epi studies)	1	Yes
10. Did the authors study an outcome (dependent variable) or topic that the patients/clients/population group would care about?	2	Yes
11. Is the focus of the intervention or procedure (independent variable) or topic of study a common issue of concern to dietetics practice?	3	Yes
12. Is the intervention or procedure feasible? (NA for some epidemiological studies)	4	Yes
If the answers to all of the above relevance questions are "Yes," the report is eligible for designation with a plus (+) on the Evidence Quality Worksheet, depending on answers to the following validity questions.		
Validity Questions		
21. Was the <u>research question</u> clearly stated?	1	Yes
21.1. Was the specific intervention(s) or procedure (independent variable(s)) identified?	1.1	Yes
21.2. Was the outcome(s) (dependent variable(s)) clearly indicated?	1.2	Yes
21.3. Were the target population and setting specified?	1.3	Yes
22. Was the <u>selection</u> of study subjects/patients free from bias?	2	Yes
22.1. Were inclusion/exclusion criteria specified (e.g., risk, point in disease progression, diagnostic or prognosis criteria), and with sufficient detail and without omitting criteria critical to the study?	2.1	Yes
22.2. Were criteria applied equally to all study groups?	2.2	Yes
22.3. Were health, demographics, and other characteristics of subjects described?	2.3	Yes
22.4. Were the subjects/patients a representative sample of the relevant population?	2.4	Yes
23. Were <u>study groups comparable</u>?	3	Yes
23.1. Was the method of assigning subjects/patients to groups described and unbiased? (Method of randomization identified if RCT)	3.1	Yes
23.2. Were distribution of disease status, prognostic factors, and other factors (e.g., demographics) similar across study groups at baseline?	3.2	Yes
23.3. Were concurrent controls used? (Concurrent preferred over historical controls.)	3.3	Yes

23.4. If cohort study or cross-sectional study, were groups comparable on important confounding factors and/or were preexisting differences accounted for by using appropriate adjustments in statistical analysis?	3.4	N/A
23.5. If case control study, were potential confounding factors comparable for cases and controls? (If case series or trial with subjects serving as own control, this criterion is not applicable. Criterion may not be applicable in some cross-sectional studies.)	3.5	Yes
23.6. If diagnostic test, was there an independent blind comparison with an appropriate reference standard (e.g., "gold standard")?	3.6	N/A

24. Was method of handling <u>withdrawals</u> described?	4	Yes
24.1. Were follow up methods described and the same for all groups?	4.1	Yes
24.2. Was the number, characteristics of withdrawals (i.e., dropouts, lost to follow up, attrition rate) and/or response rate (cross-sectional studies) described for each group? (Follow up goal for a strong study is 80%.)	4.2	Yes
24.3. Were all enrolled subjects/patients (in the original sample) accounted for?	4.3	Yes
24.4. Were reasons for withdrawals similar across groups	4.4	Unclear
24.5. If diagnostic test, was decision to perform reference test not dependent on results of test under study?	4.5	N/A
25. Was <u>blinding</u> used to prevent introduction of bias?	5	Unclear
25.1. In intervention study, were subjects, clinicians/practitioners, and investigators blinded to treatment group, as appropriate?	5.1	Unclear
25.2. Were data collectors blinded for outcomes assessment? (If outcome is measured using an objective test, such as a lab value, this criterion is assumed to be met.)	5.2	Unclear
25.3. In cohort study or cross-sectional study, were measurements of outcomes and risk factors blinded?	5.3	N/A
25.4. In case control study, was case definition explicit and case ascertainment not influenced by exposure status?	5.4	Unclear
25.5. In diagnostic study, were test results blinded to patient history and other test results?	5.5	N/A
26. Were <u>intervention</u>/therapeutic regimens/exposure factor or procedure and any comparison(s) described in detail? Were <u>intervening factors</u> described?	6	Yes
26.1. In RCT or other intervention trial, were protocols described for all regimens studied?	6.1	Yes
26.2. In observational study, were interventions, study settings, and clinicians/provider described?	6.2	N/A
26.3. Was the intensity and duration of the intervention or exposure factor sufficient to produce a meaningful effect?	6.3	Yes
26.4. Was the amount of exposure and, if relevant, subject/patient compliance measured?	6.4	Yes
26.5. Were co-interventions (e.g., ancillary treatments, other therapies) described?	6.5	N/A
26.6. Were extra or unplanned treatments described?	6.6	N/A
26.7. Was the information for 6.4, 6.5, and 6.6 assessed the same way for all groups?	6.7	Yes
26.8. In diagnostic study, were details of test administration and replication sufficient?	6.8	N/A
27. Were <u>outcomes</u> clearly defined and the <u>measurements valid and reliable</u>?	7	Yes
	7.1	Yes

27.1. Were primary and secondary endpoints described and relevant to the question?	7.2	Yes
27.2. Were nutrition measures appropriate to question and outcomes of concern?	7.3	Yes
27.3. Was the period of follow-up long enough for important outcome(s) to occur?	7.4	Yes
27.4. Were the observations and measurements based on standard, valid, and reliable data collection instruments/tests/procedures?	7.5	Yes
27.5. Was the measurement of effect at an appropriate level of precision?	7.6	Yes
27.6. Were other factors accounted for (measured) that could affect outcomes?	7.7	Yes
27.7. Were the measurements conducted consistently across groups?		

28. Was the <u>statistical analysis</u> appropriate for the study design and type of outcome indicators?	8	Yes
28.1. Were statistical analyses adequately described the results reported appropriately?	8.1	Yes
28.2. Were correct statistical tests used and assumptions of test not violated?	8.2	Yes
28.3. Were statistics reported with levels of significance and/or confidence intervals?	8.3	Yes
28.4. Was "intent to treat" analysis of outcomes done (and as appropriate, was there an analysis of outcomes for those maximally exposed or a dose-response analysis)?	8.4	N/A
28.5. Were adequate adjustments made for effects of confounding factors that might have affected the outcomes (e.g., multivariate analyses)?	8.5	Yes
28.6. Was clinical significance as well as statistical significance reported?	8.6	Yes
28.7. If negative findings, was a power calculation reported to address type 2 error?	8.7	N/A
29. **Are <u>conclusions supported by results</u> with biases and limitations taken into consideration?**	9	Yes
29.1. Is there a discussion of findings?	9.1	Yes
29.2. Are biases and study limitations identified and discussed?	9.2	Yes
30. Is bias due to study's <u>funding or sponsorship</u> unlikely?	10	Unclear
30.1. Were sources of funding and investigators' affiliations described?	10.1	No
30.2. Was there no apparent conflict of interest?	10.2	Unclear

MINUS/NEGATIVE (-)

If most (six or more) of the answers to the above validity questions are "No," the report should be designated with a minus (-) symbol on the Evidence Worksheet.

NEUTRAL (∅)

If the answers to validity criteria questions 2, 3, 6, and 7 do not indicate that the study is exceptionally strong, the report should be designated with a neutral (∅) symbol on the Evidence Worksheet.

PLUS/POSITIVE (+)

If most of the answers to the above validity questions are "Yes" (including criteria 2, 3, 6, 7 and at least one additional "Yes"), the report should be designated with a plus symbol (+) on the Evidence Worksheet.

Academy of Nutrition and Dietetics
Evidence Analysis Library® Worksheet Template and
Quality Criteria Checklist: Primary Research

Citation	Stewart
Study Design	Randomized control trial
Class	A
Quality Rating	☒ + (Positive) ☐ - (Negative) ☐ ⊘ (Neutral)
Research Purpose	evaluate the effectiveness of reducing risk factors of eating disorders in female athletes
Inclusion Criteria	female athletes competing in a NCAA division III sport
Exclusion Criteria	participants who met criteraia for a clinically significant eating disorder
Description of Study Protocol	Recruitment: n/a Design: used the data from the study conducted by Becker et al (baseline and post-data) to rest for a moderator effect with the types of sports teams. Also used the data to test for predictor effects for the following Blinding used (if applicable): n/a Intervention (if applicable): n/a Statistical Analysis: ANCOVA, effect size
Data Collection Summary	Timing of Measurements: baseline and post-intervention data was used from Becker study Dependent Variables: predictor variables (bulimic pathology, dietary restraint, shape concern, weight concern, thin idea, negative affec, R^2) Independent Variables: sport team type Control Variables: n/a
Description of Actual Data Sample	Initial: 157 (Males 157 Females) Attrition (final N): 157 Age: 18-22 years Ethnicity: primarily Caucasian Other relevant demographics: n/a Anthropometrics: BMI 16.0-37.78

	Location: NCAA division III university
Summary of Results	Key Findings: Athletes who participated in non-lean sports and received the AM-DBP intervention showed more improvement in negative affect than athletes in non-lean sports who completed the AM-HWI intervention. If athletes had higher baseline dietary restraint, shape concern, and negative affect scores, then there was less response to both interventions. Other Findings: n/a
Author Conclusion	Lean vs nonlean sports may not have a large effct in response to eatnig disorder prevention programs. Pre-existing bulimic pathology, negative effect, concern with body shape, and dietary restraint may influence the reponse to eatinng disorder prevention attempts.
Reviewer Comments	*n/a*
Funding Source	Pennington Biomedical Research Center

Quality Criteria Checklist: Primary Research

Symbols Used	Explanation
+	**Positive –** Indicates that the report has clearly addressed issues of inclusion/exclusion, bias, generalizability, and data collection and analysis
--	**Negative –** Indicates that these issues have not been adequately addressed.
⃠	**Neutral** – indicates that the report is neither exceptionally strong nor exceptionally week

Select a rating from the drop-down menu ↓

Relevance Questions		
13. Would implementing the studied intervention or procedure (if found successful) result in improved outcomes for the patients/clients/population group? (NA for some Epi studies)	1	Yes
14. Did the authors study an outcome (dependent variable) or topic that the patients/clients/population group would care about?	2	Yes
15. Is the focus of the intervention or procedure (independent variable) or topic of study a common issue of concern to dietetics practice?	3	Yes
16. Is the intervention or procedure feasible? (NA for some epidemiological studies)	4	Yes
If the answers to all of the above relevance questions are "Yes," the report is eligible for designation with a plus (+) on the Evidence Quality Worksheet, depending on answers to the following validity questions.		

Validity Questions		
31. Was the <u>research question</u> clearly stated?	1	Yes
31.1. Was the specific intervention(s) or procedure (independent variable(s)) identified?	1.1	Yes
31.2. Was the outcome(s) (dependent variable(s)) clearly indicated?	1.2	Yes
31.3. Were the target population and setting specified?	1.3	Yes
32. Was the <u>selection</u> of study subjects/patients free from bias?	2	Yes
32.1. Were inclusion/exclusion criteria specified (e.g., risk, point in disease progression, diagnostic or prognosis criteria), and with sufficient detail and without omitting criteria critical to the study?	2.1	Yes
32.2. Were criteria applied equally to all study groups?	2.2	Yes
32.3. Were health, demographics, and other characteristics of subjects described?	2.3	Yes
32.4. Were the subjects/patients a representative sample of the relevant population?	2.4	Yes
33. Were <u>study groups comparable</u>?	3	Yes
33.1. Was the method of assigning subjects/patients to groups described and unbiased? (Method of randomization identified if RCT)	3.1	Yes
33.2. Were distribution of disease status, prognostic factors, and other factors (e.g., demographics) similar across study groups at baseline?	3.2	Yes
33.3. Were concurrent controls used? (Concurrent preferred over historical controls.)	3.3	Yes
33.4. If cohort study or cross-sectional study, were groups comparable on important confounding factors and/or were preexisting differences accounted for by using appropriate adjustments in statistical analysis?	3.4	N/A
33.5. If case control study, were potential confounding factors comparable for cases and controls? (If case series or trial with subjects serving as own control, this criterion is not applicable. Criterion may not be applicable in some cross-sectional studies.)	3.5	Yes
33.6. If diagnostic test, was there an independent blind comparison with an appropriate reference standard (e.g., "gold standard")?	3.6	N/A

34. Was method of handling <u>withdrawals</u> described?	4	Yes
34.1. Were follow up methods described and the same for all groups?	4.1	Yes
34.2. Was the number, characteristics of withdrawals (i.e., dropouts, lost to follow up, attrition rate) and/or response rate (cross-sectional studies) described for each group? (Follow up goal for a strong study is 80%.)	4.2	Yes
34.3. Were all enrolled subjects/patients (in the original sample) accounted for?	4.3	Yes
34.4. Were reasons for withdrawals similar across groups	4.4	Yes
34.5. If diagnostic test, was decision to perform reference test not dependent on results of test under study?	4.5	N/A
35. Was <u>blinding</u> used to prevent introduction of bias?	5	Unclear
35.1. In intervention study, were subjects, clinicians/practitioners, and investigators blinded to treatment group, as appropriate?	5.1	Unclear
35.2. Were data collectors blinded for outcomes assessment? (If outcome is measured using an objective test, such as a lab value, this criterion is assumed to be met.)	5.2	Unclear

35.3. In cohort study or cross-sectional study, were measurements of outcomes and risk factors blinded?	5.3	N/A
35.4. In case control study, was case definition explicit and case ascertainment not influenced by exposure status?	5.4	Unclear
35.5. In diagnostic study, were test results blinded to patient history and other test results?	5.5	N/A
36. Were <u>intervention</u>/therapeutic regimens/exposure factor or procedure and any comparison(s) described in detail? Were <u>intervening factors</u> described?	6	Yes
36.1. In RCT or other intervention trial, were protocols described for all regimens studied?	6.1	Yes
36.2. In observational study, were interventions, study settings, and clinicians/provider described?	6.2	N/A
36.3. Was the intensity and duration of the intervention or exposure factor sufficient to produce a meaningful effect?	6.3	Yes
36.4. Was the amount of exposure and, if relevant, subject/patient compliance measured?	6.4	Unclear
36.5. Were co-interventions (e.g., ancillary treatments, other therapies) described?	6.5	N/A
36.6. Were extra or unplanned treatments described?	6.6	N/A
36.7. Was the information for 6.4, 6.5, and 6.6 assessed the same way for all groups?	6.7	Yes
36.8. In diagnostic study, were details of test administration and replication sufficient?	6.8	N/A
37. Were <u>outcomes</u> clearly defined and the <u>measurements valid and reliable</u>?	7	Yes
37.1. Were primary and secondary endpoints described and relevant to the question?	7.1	Yes
37.2. Were nutrition measures appropriate to question and outcomes of concern?	7.2	Yes
37.3. Was the period of follow-up long enough for important outcome(s) to occur?	7.3	Yes
37.4. Were the observations and measurements based on standard, valid, and reliable data collection instruments/tests/procedures?	7.4	Yes
37.5. Was the measurement of effect at an appropriate level of precision?	7.5	Yes
37.6. Were other factors accounted for (measured) that could affect outcomes?	7.6	Yes
37.7. Were the measurements conducted consistently across groups?	7.7	Yes

38. Was the <u>statistical analysis</u> appropriate for the study design and type of outcome indicators?	8	Yes
38.1. Were statistical analyses adequately described the results reported appropriately?	8.1	Yes
38.2. Were correct statistical tests used and assumptions of test not violated?	8.2	Yes
38.3. Were statistics reported with levels of significance and/or confidence intervals?	8.3	Yes
38.4. Was “intent to treat” analysis of outcomes done (and as appropriate, was there an analysis of outcomes for those maximally exposed or a dose-response analysis)?	8.4	Unclear
38.5. Were adequate adjustments made for effects of confounding factors that might have affected the outcomes (e.g., multivariate analyses)?	8.5	Yes
	8.6	Yes

38.6. Was clinical significance as well as statistical significance reported? 38.7. If negative findings, was a power calculation reported to address type 2 error?	8.7	N/A
39. **Are <u>conclusions supported by results</u> with biases and limitations taken into consideration?**	9	Yes
39.1. Is there a discussion of findings?	9.1	Yes
39.2. Are biases and study limitations identified and discussed?	9.2	Yes
40. Is bias due to study's <u>funding or sponsorship</u> unlikely?	10	Yes
40.1. Were sources of funding and investigators' affiliations described?	10.1	Yes
40.2. Was there no apparent conflict of interest?	10.2	Yes
MINUS/NEGATIVE (-) *If most (six or more) of the answers to the above validity questions are "No," the report should be designated with a minus (-) symbol on the Evidence Worksheet.*		
NEUTRAL (∅) *If the answers to validity criteria questions 2, 3, 6, and 7 do not indicate that the study is exceptionally strong, the report should be designated with a neutral (∅) symbol on the Evidence Worksheet.*		
PLUS/POSITIVE (+) *If most of the answers to the above validity questions are "Yes" (including criteria 2, 3, 6, 7 and at least one additional "Yes"), the report should be designated with a plus symbol (+) on the Evidence Worksheet.*		

Academy of Nutrition and Dietetics
Evidence Analysis Library® Worksheet Template and
Quality Criteria Checklist: Primary Research

Academy of Nutrition and Dietetics

Citation	Laramee et al
Study Design	Randomized Control Trial
Class	A
Quality Rating	☒ + (Positive) ☐ - (Negative) ☐ ⊘ (Neutral)
Research Purpose	To look at a nutrition intervention and its effectiveness among female athletes in reducing the desire to restrict dietary intake.
Inclusion Criteria	Female athletes
Exclusion Criteria	none
Description of Study Protocol	Recruitment: There were five coaches from two high schools and 1 spots club who wanted their athletes to have the chance to participate in the intervention if they chose to voluntarily. Cluster randomization was utilized. Design: Participants were divided into either the comparison group or the intervention group. The comparison group received three 60 minute sessions which focused on nutrition education, including educational topics such as energy needs in athletes and the importance of macronutrients. The intervention group also received three 60 minute sessions that provided nutrition education and also promoted behavior change through a theory based intervention Blinding used (if applicable): unclear Intervention (if applicable): 60 minute education sessions 3xweek for 2 groups, intervention and control Statistical Analysis: multivariate regression models, mixed models for repeated measures
Data Collection Summary	Timing of Measurements: data collected at baseline, after the three week intervention, and after 8-12 week follow-up Dependent Variables: intention to use dietary restriction to lose weight, nutrition knowledge Independent Variables: comparison group, intervention group Control Variables: n/a

Description of Actual Data Sample	Initial: (0 Males 70 Females) Attrition (final N): 70 Age: 12-17 years Ethnicity: not specified Other relevant demographics: none Anthropometrics: weight/height/BMI measured Location: Quebec City
Summary of Results	Key Findings: Intention to restrict dietary behaviors showed a significant change P<=0.03. Attitude (p<0.62), subjective norm (p<0.46) and perceived behavioral control (p<0.57) did not show a significant effect.
Author Conclusion	The intervention group showed a lower intention to restrict the diet when compared with the control group, showing that an intervention with a theory based component may be useful in preventing eating disorders among athletes.
Reviewer Comments	*n/a*
Funding Source	Danone Institute of Canada

Quality Criteria Checklist: Primary Research

Symbols Used	Explanation
+	**Positive –** Indicates that the report has clearly addressed issues of inclusion/exclusion, bias, generalizability, and data collection and analysis
--	**Negative –** Indicates that these issues have not been adequately addressed.
⊘	**Neutral** – indicates that the report is neither exceptionally strong nor exceptionally week

Select a rating from the drop-down menu ↓

Relevance Questions		
17. Would implementing the studied intervention or procedure (if found successful) result in improved outcomes for the patients/clients/population group? (NA for some Epi studies)	1	Yes
18. Did the authors study an outcome (dependent variable) or topic that the patients/clients/population group would care about?	2	Yes
19. Is the focus of the intervention or procedure (independent variable) or topic of study a common issue of concern to dietetics practice?	3	Yes
20. Is the intervention or procedure feasible? (NA for some epidemiological studies)	4	Yes
If the answers to all of the above relevance questions are "Yes," the report is eligible for designation with a plus (+) on the Evidence Quality Worksheet, depending on answers to the following validity questions.		

Validity Questions		
41. Was the <u>research question</u> clearly stated?	1	Yes
41.1. Was the specific intervention(s) or procedure (independent variable(s)) identified?	1.1	Yes
41.2. Was the outcome(s) (dependent variable(s)) clearly indicated?	1.2	Yes
41.3. Were the target population and setting specified?	1.3	Yes
42. Was the <u>selection</u> of study subjects/patients free from bias?	2	Yes
42.1. Were inclusion/exclusion criteria specified (e.g., risk, point in disease progression, diagnostic or prognosis criteria), and with sufficient detail and without omitting criteria critical to the study?	2.1	Yes
42.2. Were criteria applied equally to all study groups?	2.2	Yes
42.3. Were health, demographics, and other characteristics of subjects described?	2.3	Yes
42.4. Were the subjects/patients a representative sample of the relevant population?	2.4	Yes
43. Were <u>study groups comparable</u>?	3	Yes
43.1. Was the method of assigning subjects/patients to groups described and unbiased? (Method of randomization identified if RCT)	3.1	Yes
43.2. Were distribution of disease status, prognostic factors, and other factors (e.g., demographics) similar across study groups at baseline?	3.2	Yes
43.3. Were concurrent controls used? (Concurrent preferred over historical controls.)	3.3	Yes
43.4. If cohort study or cross-sectional study, were groups comparable on important confounding factors and/or were preexisting differences accounted for by using appropriate adjustments in statistical analysis?	3.4	N/A
43.5. If case control study, were potential confounding factors comparable for cases and controls? (If case series or trial with subjects serving as own control, this criterion is not applicable. Criterion may not be applicable in some cross-sectional studies.)	3.5	Yes
43.6. If diagnostic test, was there an independent blind comparison with an appropriate reference standard (e.g., "gold standard")?	3.6	N/A

44. Was method of handling <u>withdrawals</u> described?	4	Yes
44.1. Were follow up methods described and the same for all groups?	4.1	Yes
44.2. Was the number, characteristics of withdrawals (i.e., dropouts, lost to follow up, attrition rate) and/or response rate (cross-sectional studies) described for each group? (Follow up goal for a strong study is 80%.)	4.2	Yes
44.3. Were all enrolled subjects/patients (in the original sample) accounted for?	4.3	Yes
44.4. Were reasons for withdrawals similar across groups	4.4	Unclear
44.5. If diagnostic test, was decision to perform reference test not dependent on results of test under study?	4.5	N/A
45. Was <u>blinding</u> used to prevent introduction of bias?	5	Unclear
45.1. In intervention study, were subjects, clinicians/practitioners, and investigators blinded to treatment group, as appropriate?	5.1	Unclear
45.2. Were data collectors blinded for outcomes assessment? (If outcome is measured using an objective test, such as a lab value, this criterion is assumed to be met.)	5.2	Unclear

45.3. In cohort study or cross-sectional study, were measurements of outcomes and risk factors blinded?	5.3	N/A
45.4. In case control study, was case definition explicit and case ascertainment not influenced by exposure status?	5.4	Unclear
45.5. In diagnostic study, were test results blinded to patient history and other test results?	5.5	N/A
46. Were <u>intervention</u>/therapeutic regimens/exposure factor or procedure and any comparison(s) described in detail? Were <u>intervening factors</u> described?	6	Yes
46.1. In RCT or other intervention trial, were protocols described for all regimens studied?	6.1	Yes
46.2. In observational study, were interventions, study settings, and clinicians/provider described?	6.2	N/A
46.3. Was the intensity and duration of the intervention or exposure factor sufficient to produce a meaningful effect?	6.3	Yes
46.4. Was the amount of exposure and, if relevant, subject/patient compliance measured?	6.4	Unclear
46.5. Were co-interventions (e.g., ancillary treatments, other therapies) described?	6.5	N/A
46.6. Were extra or unplanned treatments described?	6.6	N/A
46.7. Was the information for 6.4, 6.5, and 6.6 assessed the same way for all groups?	6.7	Yes
46.8. In diagnostic study, were details of test administration and replication sufficient?	6.8	N/A
47. Were <u>outcomes</u> clearly defined and the <u>measurements valid and reliable</u>?	7	Yes
47.1. Were primary and secondary endpoints described and relevant to the question?	7.1	Yes
47.2. Were nutrition measures appropriate to question and outcomes of concern?	7.2	Yes
47.3. Was the period of follow-up long enough for important outcome(s) to occur?	7.3	Yes
47.4. Were the observations and measurements based on standard, valid, and reliable data collection instruments/tests/procedures?	7.4	Yes
47.5. Was the measurement of effect at an appropriate level of precision?	7.5	Yes
47.6. Were other factors accounted for (measured) that could affect outcomes?	7.6	Yes
47.7. Were the measurements conducted consistently across groups?	7.7	Yes

48. Was the <u>statistical analysis</u> appropriate for the study design and type of outcome indicators?	8	Yes
48.1. Were statistical analyses adequately described the results reported appropriately?	8.1	Yes
48.2. Were correct statistical tests used and assumptions of test not violated?	8.2	Yes
48.3. Were statistics reported with levels of significance and/or confidence intervals?	8.3	Yes
48.4. Was “intent to treat” analysis of outcomes done (and as appropriate, was there an analysis of outcomes for those maximally exposed or a dose-response analysis)?	8.4	Unclear
48.5. Were adequate adjustments made for effects of confounding factors that might have affected the outcomes (e.g., multivariate analyses)?	8.5	Yes
	8.6	Yes

48.6. Was clinical significance as well as statistical significance reported? 48.7. If negative findings, was a power calculation reported to address type 2 error?	8.7	N/A
49. **Are <u>conclusions supported by results</u> with biases and limitations taken into consideration?**	9	Yes
49.1. Is there a discussion of findings?	9.1	Yes
49.2. Are biases and study limitations identified and discussed?	9.2	Yes
50. Is bias due to study's <u>funding or sponsorship</u> unlikely?	10	Yes
50.1. Were sources of funding and investigators' affiliations described?	10.1	Yes
50.2. Was there no apparent conflict of interest?	10.2	Yes
MINUS/NEGATIVE (-) *If most (six or more) of the answers to the above validity questions are "No," the report should be designated with a minus (-) symbol on the Evidence Worksheet.*		
NEUTRAL (∅) *If the answers to validity criteria questions 2, 3, 6, and 7 do not indicate that the study is exceptionally strong, the report should be designated with a neutral (∅) symbol on the Evidence Worksheet.*		
PLUS/POSITIVE (+) *If most of the answers to the above validity questions are "Yes" (including criteria 2, 3, 6, 7 and at least one additional "Yes"), the report should be designated with a plus symbol (+) on the Evidence Worksheet.*		

Academy of Nutrition and Dietetics
Evidence Analysis Library® Worksheet Template and
Quality Criteria Checklist: Primary Research

Citation	Buccholz et al
Study Design	Randomized Control Trial
Class	A
Quality Rating	☒ + (Positive) ☐ - (Negative) ☐ ⊘ (Neutral)
Research Purpose	To determine the effectiveness of a prevention program that focuses on reducing body image and minimizing pressure to be thin among female athletes
Inclusion Criteria	Female athletes
Exclusion Criteria	None
Description of Study Protocol	Recruitment: Invitations to participate in study sent to gymnastic clubs Design: The gymnasts completed questionnaires before and after the intervention. These questionnaires measured eating attitudes and behaviors, body esteem, societal pressure to be thin, self-efficacy related to of dieting, and pressure to be thin within their sports clubs. The intervention clubs received an intervention called "Body Sense: A Positive Body Image Initiative For Female Athletes." Intervention: Four of the seven clubs received the intervention program that promoted body image and aimed to reduce pressure to be thin. The intervention clubs received an intervention called "Body Sense: A Positive Body Image Initiative For Female Athletes." This program provided education regarding unique body sizes and shapes, resisting pressures to diet or restrict food, associating physical activity with enjoyment, the importance of positive self-esteem, managing stress, balance between participation in sports and life, and overall body health. Blinding used (if applicable): n/a Intervention (if applicable): Four of the seven clubs received the intervention program that promoted body image and aimed to reduce pressure to be thin. Statistical Analysis: linear mixed effect model, independent samples T test, multivariate analysis
Data Collection Summary	Timing of Measurements: before and after the intervention Dependent Variables: perceptions of pressure to be thin within their sports clubs, self-efficacy over dieting pressures, awareness and

	internalization of societal pressure to be thin, body esteem, and eating attitudes and behaviors Independent Variables: intervention clubs, control clubs
Description of Actual Data Sample	Initial: (0 Males 62 Females) Attrition (final N): Age: 11-18 Ethnicity: n/a Other relevant demographics: n/a Anthropometrics: none listed Location: Ontario, Canada
Summary of Results	Key Findings: The results of the study showed that the athletes who participated in the intervention program had lower internalization scores (p=0.028), which showed that athletes may have not been as likely to respond to the social pressure to be thin as they were before the intervention. No significant changes were found for body esteem; appeareance (p=0.132), weight (p=0.059), attribution (p=0.867), and self-efficacy (0.591) did not indicate any significant changes.
Author Conclusion	Overall, this study concluded that athletes did perceive a reduction in pressure to be thin after the intervention, even though there were not any changes in body esteem found in the study.
Reviewer Comments	*n/a*
Funding Source	Ontario Ministry of Health and Long-Term Care

Quality Criteria Checklist: Primary Research

Symbols Used	Explanation
+	**Positive –** Indicates that the report has clearly addressed issues of inclusion/exclusion, bias, generalizability, and data collection and analysis
--	**Negative –** Indicates that these issues have not been adequately addressed.
⊘	**Neutral** – indicates that the report is neither exceptionally strong nor exceptionally week

Select a rating from the drop-down menu ↓

Relevance Questions		
21. Would implementing the studied intervention or procedure (if found successful) result in improved outcomes for the patients/clients/population group? (NA for some Epi studies)	1	Yes
22. Did the authors study an outcome (dependent variable) or topic that the patients/clients/population group would care about?	2	Yes
23. Is the focus of the intervention or procedure (independent variable) or topic of study a common issue of concern to dietetics practice?	3	Yes

24. Is the intervention or procedure feasible? (NA for some epidemiological studies)	4	Yes
If the answers to all of the above relevance questions are "Yes," the report is eligible for designation with a plus (+) on the Evidence Quality Worksheet, depending on answers to the following validity questions.		
Validity Questions		
51. Was the <u>research question</u> clearly stated?	1	Yes
51.1. Was the specific intervention(s) or procedure (independent variable(s)) identified?	1.1	Yes
51.2. Was the outcome(s) (dependent variable(s)) clearly indicated?	1.2	Yes
51.3. Were the target population and setting specified?	1.3	Yes
52. Was the <u>selection</u> of study subjects/patients free from bias?	2	Yes
52.1. Were inclusion/exclusion criteria specified (e.g., risk, point in disease progression, diagnostic or prognosis criteria), and with sufficient detail and without omitting criteria critical to the study?	2.1	Yes
52.2. Were criteria applied equally to all study groups?	2.2	Yes
52.3. Were health, demographics, and other characteristics of subjects described?	2.3	Yes
52.4. Were the subjects/patients a representative sample of the relevant population?	2.4	Yes
53. Were <u>study groups comparable</u>?	3	Yes
53.1. Was the method of assigning subjects/patients to groups described and unbiased? (Method of randomization identified if RCT)	3.1	Yes
53.2. Were distribution of disease status, prognostic factors, and other factors (e.g., demographics) similar across study groups at baseline?	3.2	Yes
53.3. Were concurrent controls used? (Concurrent preferred over historical controls.)	3.3	Yes
53.4. If cohort study or cross-sectional study, were groups comparable on important confounding factors and/or were preexisting differences accounted for by using appropriate adjustments in statistical analysis?	3.4	N/A
53.5. If case control study, were potential confounding factors comparable for cases and controls? (If case series or trial with subjects serving as own control, this criterion is not applicable. Criterion may not be applicable in some cross-sectional studies.)	3.5	Yes
53.6. If diagnostic test, was there an independent blind comparison with an appropriate reference standard (e.g., "gold standard")?	3.6	N/A

54. Was method of handling <u>withdrawals</u> described?	4	Yes
54.1. Were follow up methods described and the same for all groups?	4.1	Yes
54.2. Was the number, characteristics of withdrawals (i.e., dropouts, lost to follow up, attrition rate) and/or response rate (cross-sectional studies) described for each group? (Follow up goal for a strong study is 80%.)	4.2	Yes
54.3. Were all enrolled subjects/patients (in the original sample) accounted for?	4.3	Yes
54.4. Were reasons for withdrawals similar across groups	4.4	Unclear
54.5. If diagnostic test, was decision to perform reference test not dependent on results of test under study?	4.5	N/A
55. Was <u>blinding</u> used to prevent introduction of bias?	5	Unclear

55.1. In intervention study, were subjects, clinicians/practitioners, and investigators blinded to treatment group, as appropriate?	5.1	Unclear
55.2. Were data collectors blinded for outcomes assessment? (If outcome is measured using an objective test, such as a lab value, this criterion is assumed to be met.)	5.2	Unclear
55.3. In cohort study or cross-sectional study, were measurements of outcomes and risk factors blinded?	5.3	N/A
55.4. In case control study, was case definition explicit and case ascertainment not influenced by exposure status?	5.4	Unclear
55.5. In diagnostic study, were test results blinded to patient history and other test results?	5.5	N/A
56. Were <u>intervention</u>/therapeutic regimens/exposure factor or procedure and any comparison(s) described in detail? Were <u>intervening factors</u> described?	6	Yes
56.1. In RCT or other intervention trial, were protocols described for all regimens studied?	6.1	Yes
56.2. In observational study, were interventions, study settings, and clinicians/provider described?	6.2	N/A
56.3. Was the intensity and duration of the intervention or exposure factor sufficient to produce a meaningful effect?	6.3	Yes
56.4. Was the amount of exposure and, if relevant, subject/patient compliance measured?	6.4	Unclear
56.5. Were co-interventions (e.g., ancillary treatments, other therapies) described?	6.5	N/A
56.6. Were extra or unplanned treatments described?	6.6	N/A
56.7. Was the information for 6.4, 6.5, and 6.6 assessed the same way for all groups?	6.7	Yes
56.8. In diagnostic study, were details of test administration and replication sufficient?	6.8	N/A
57. Were <u>outcomes</u> clearly defined and the <u>measurements valid and reliable</u>?	7	Yes
57.1. Were primary and secondary endpoints described and relevant to the question?	7.1	Yes
57.2. Were nutrition measures appropriate to question and outcomes of concern?	7.2	Yes
57.3. Was the period of follow-up long enough for important outcome(s) to occur?	7.3	Yes
57.4. Were the observations and measurements based on standard, valid, and reliable data collection instruments/tests/procedures?	7.4	Yes
57.5. Was the measurement of effect at an appropriate level of precision?	7.5	Yes
57.6. Were other factors accounted for (measured) that could affect outcomes?	7.6	Yes
57.7. Were the measurements conducted consistently across groups?	7.7	Yes

58. Was the <u>statistical analysis</u> appropriate for the study design and type of outcome indicators?	8	Yes
58.1. Were statistical analyses adequately described the results reported appropriately?	8.1	Yes
58.2. Were correct statistical tests used and assumptions of test not violated?	8.2	Yes
58.3. Were statistics reported with levels of significance and/or confidence intervals?	8.3	Yes

58.4. Was "intent to treat" analysis of outcomes done (and as appropriate, was there an analysis of outcomes for those maximally exposed or a dose-response analysis)?	8.4	Unclear
58.5. Were adequate adjustments made for effects of confounding factors that might have affected the outcomes (e.g., multivariate analyses)?	8.5	Yes
58.6. Was clinical significance as well as statistical significance reported?	8.6	Yes
58.7. If negative findings, was a power calculation reported to address type 2 error?	8.7	N/A
59. **Are <u>conclusions supported by results</u> with biases and limitations taken into consideration?**	9	Yes
59.1. Is there a discussion of findings?	9.1	Yes
59.2. Are biases and study limitations identified and discussed?	9.2	Yes
60. Is bias due to study's <u>funding or sponsorship</u> unlikely?	10	Yes
60.1. Were sources of funding and investigators' affiliations described?	10.1	Yes
60.2. Was there no apparent conflict of interest?	10.2	Yes

MINUS/NEGATIVE (-)

If most (six or more) of the answers to the above validity questions are "No," the report should be designated with a minus (-) symbol on the Evidence Worksheet.

NEUTRAL (∅)

If the answers to validity criteria questions 2, 3, 6, and 7 do not indicate that the study is exceptionally strong, the report should be designated with a neutral (∅) symbol on the Evidence Worksheet.

PLUS/POSITIVE (+)

If most of the answers to the above validity questions are "Yes" (including criteria 2, 3, 6, 7 and at least one additional "Yes"), the report should be designated with a plus symbol (+) on the Evidence Worksheet.

Academy of Nutrition and Dietetics
Evidence Analysis Library® Worksheet Template and
Quality Criteria Checklist: Primary Research

Citation	Martinsen et al
Study Design	Randomized Control Trial
Class	A
Quality Rating	☒ + (Positive) ☐ - (Negative) ☐ ⊘ (Neutral)
Research Purpose	to determine if a school-base one year intervention program is effective in preventing eating disorders in athletes
Inclusion Criteria	Female athletes
Exclusion Criteria	None
Description of Study Protocol	Recruitment: All first years students attending Elite Sport High Schools in Norway were invited to participate. There were 16 schools total. 9 schools were placed into the intervention group, and 7 schools were place in the control group after randomization. Design: Athletes took a pretest before the intervention, a posttest after the intervention, and another posttest nine months after the intervention; a clinical interview by the researchers took place during the pretest and the second posttest. Intervention: The intervention group learned various mental training techniques in order to improve self-esteem. Education on nutrition and physiological development was also provided. Blinding used (if applicable): The researcher who conducted the randomization did not take part in the intervention. Statistical Analysis: Fischer exact test, independent sample t test, multiple logistic regression
Data Collection Summary	Timing of Measurements: pre-intervention, immediately post intervention, 9 months after the intervention, Dependent Variables: reporting symptoms associated with eating disorders, development on eating disorder according to DSM IV criteria Independent Variables: control group, intervention group
Description of Actual Data Sample	Initial: 611 (included both male and female, exact number of each gender not specified Attrition (final N): 465 Age: high school students Ethnicity: not listed Other relevant demographics: not listed Anthropometrics: not listed Location: Elite Sport High Schools in Norway

Summary of Results	Key Findings: No new cases of eating disorders developed in the intervention schools, but 13% of the participants at the control schools developed an eating disorder that met the DSM-IV criteria for an eating disorder.
Author Conclusion	Conclusion: The intervention program was effective in preventing new cases of eating disorders from developing when compared with the control group.
Reviewer Comments	*n/a*
Funding Source	

Quality Criteria Checklist: Primary Research

Symbols Used	Explanation
+	**Positive –** Indicates that the report has clearly addressed issues of inclusion/exclusion, bias, generalizability, and data collection and analysis
--	**Negative –** Indicates that these issues have not been adequately addressed.
⊘	**Neutral** – indicates that the report is neither exceptionally strong nor exceptionally week

Select a rating from the drop-down menu ↓

Relevance Questions		
25. Would implementing the studied intervention or procedure (if found successful) result in improved outcomes for the patients/clients/population group? (NA for some Epi studies)	1	Yes
26. Did the authors study an outcome (dependent variable) or topic that the patients/clients/population group would care about?	2	Yes
27. Is the focus of the intervention or procedure (independent variable) or topic of study a common issue of concern to dietetics practice?	3	Yes
28. Is the intervention or procedure feasible? (NA for some epidemiological studies)	4	Yes
If the answers to all of the above relevance questions are "Yes," the report is eligible for designation with a plus (+) on the Evidence Quality Worksheet, depending on answers to the following validity questions.		
Validity Questions		
61. Was the <u>research question</u> clearly stated?	1	Yes
61.1. Was the specific intervention(s) or procedure (independent variable(s)) identified?	1.1	Yes
61.2. Was the outcome(s) (dependent variable(s)) clearly indicated?	1.2	Yes
61.3. Were the target population and setting specified?	1.3	Yes
62. Was the <u>selection</u> of study subjects/patients free from bias?	2	Yes
62.1. Were inclusion/exclusion criteria specified (e.g., risk, point in disease progression, diagnostic or prognosis criteria), and with sufficient detail and without omitting criteria critical to the study?	2.1	Yes
	2.2	Yes

62.2. Were criteria applied equally to all study groups?	2.3	Yes
62.3. Were health, demographics, and other characteristics of subjects described?		
62.4. Were the subjects/patients a representative sample of the relevant population?	2.4	Yes
63. Were <u>study groups comparable</u>?	3	Yes
63.1. Was the method of assigning subjects/patients to groups described and unbiased? (Method of randomization identified if RCT)	3.1	Yes
63.2. Were distribution of disease status, prognostic factors, and other factors (e.g., demographics) similar across study groups at baseline?	3.2	Yes
63.3. Were concurrent controls used? (Concurrent preferred over historical controls.)	3.3	Yes
63.4. If cohort study or cross-sectional study, were groups comparable on important confounding factors and/or were preexisting differences accounted for by using appropriate adjustments in statistical analysis?	3.4	N/A
63.5. If case control study, were potential confounding factors comparable for cases and controls? (If case series or trial with subjects serving as own control, this criterion is not applicable. Criterion may not be applicable in some cross-sectional studies.)	3.5	Yes
63.6. If diagnostic test, was there an independent blind comparison with an appropriate reference standard (e.g., "gold standard")?	3.6	N/A

64. Was method of handling <u>withdrawals</u> described?	4	Yes
64.1. Were follow up methods described and the same for all groups?	4.1	Yes
64.2. Was the number, characteristics of withdrawals (i.e., dropouts, lost to follow up, attrition rate) and/or response rate (cross-sectional studies) described for each group? (Follow up goal for a strong study is 80%.)	4.2	Yes
64.3. Were all enrolled subjects/patients (in the original sample) accounted for?	4.3	Yes
64.4. Were reasons for withdrawals similar across groups	4.4	Yes
64.5. If diagnostic test, was decision to perform reference test not dependent on results of test under study?	4.5	N/A
65. Was <u>blinding</u> used to prevent introduction of bias?	5	Unclear
65.1. In intervention study, were subjects, clinicians/practitioners, and investigators blinded to treatment group, as appropriate?	5.1	Unclear
65.2. Were data collectors blinded for outcomes assessment? (If outcome is measured using an objective test, such as a lab value, this criterion is assumed to be met.)	5.2	Unclear
65.3. In cohort study or cross-sectional study, were measurements of outcomes and risk factors blinded?	5.3	N/A
65.4. In case control study, was case definition explicit and case ascertainment not influenced by exposure status?	5.4	Unclear
65.5. In diagnostic study, were test results blinded to patient history and other test results?	5.5	N/A
66. Were <u>intervention</u>/therapeutic regimens/exposure factor or procedure and any comparison(s) described in detail? Were <u>intervening factors</u> described?	6	Yes
66.1. In RCT or other intervention trial, were protocols described for all regimens studied?	6.1	Yes
66.2. In observational study, were interventions, study settings, and clinicians/provider described?	6.2	N/A
	6.3	Yes

66.3. Was the intensity and duration of the intervention or exposure factor sufficient to produce a meaningful effect?	6.4	Unclear
66.4. Was the amount of exposure and, if relevant, subject/patient compliance measured?	6.5	N/A
66.5. Were co-interventions (e.g., ancillary treatments, other therapies) described?	6.6	N/A
66.6. Were extra or unplanned treatments described?	6.7	Yes
66.7. Was the information for 6.4, 6.5, and 6.6 assessed the same way for all groups?		
66.8. In diagnostic study, were details of test administration and replication sufficient?	6.8	N/A
67. Were <u>outcomes</u> clearly defined and the <u>measurements valid and reliable</u>?	7	Yes
67.1. Were primary and secondary endpoints described and relevant to the question?	7.1	Yes
67.2. Were nutrition measures appropriate to question and outcomes of concern?	7.2	Yes
67.3. Was the period of follow-up long enough for important outcome(s) to occur?	7.3	Yes
67.4. Were the observations and measurements based on standard, valid, and reliable data collection instruments/tests/procedures?	7.4	Yes
67.5. Was the measurement of effect at an appropriate level of precision?	7.5	Yes
67.6. Were other factors accounted for (measured) that could affect outcomes?	7.6	Yes
67.7. Were the measurements conducted consistently across groups?	7.7	Yes

68. Was the <u>statistical analysis</u> appropriate for the study design and type of outcome indicators?	8	Yes
68.1. Were statistical analyses adequately described the results reported appropriately?	8.1	Yes
68.2. Were correct statistical tests used and assumptions of test not violated?	8.2	Yes
68.3. Were statistics reported with levels of significance and/or confidence intervals?	8.3	Yes
68.4. Was "intent to treat" analysis of outcomes done (and as appropriate, was there an analysis of outcomes for those maximally exposed or a dose-response analysis)?	8.4	Unclear
68.5. Were adequate adjustments made for effects of confounding factors that might have affected the outcomes (e.g., multivariate analyses)?	8.5	Yes
68.6. Was clinical significance as well as statistical significance reported?	8.6	Yes
68.7. If negative findings, was a power calculation reported to address type 2 error?	8.7	N/A
69. **Are <u>conclusions supported by results</u> with biases and limitations taken into consideration?**	9	Yes
69.1. Is there a discussion of findings?	9.1	Yes
69.2. Are biases and study limitations identified and discussed?	9.2	Yes
70. Is bias due to study's <u>funding or sponsorship</u> unlikely?	10	Yes
70.1. Were sources of funding and investigators' affiliations described?	10.1	Yes
70.2. Was there no apparent conflict of interest?	10.2	Yes
MINUS/NEGATIVE (-) *If most (six or more) of the answers to the above validity questions are "No," the report should be designated with a minus (-) symbol on the Evidence Worksheet.*		
NEUTRAL (∅)		

If the answers to validity criteria questions 2, 3, 6, and 7 do not indicate that the study is exceptionally strong, the report should be designated with a neutral (∅) symbol on the Evidence Worksheet.
PLUS/POSITIVE (+) *If most of the answers to the above validity questions are "Yes" (including criteria 2, 3, 6, 7 and at least one additional "Yes"), the report should be designated with a plus symbol (+) on the Evidence Worksheet.*