THE PREVALENCE OF DISORDERED EATING AND MENSTRUAL DYSFUNCTION IN FEMALE COLLEGIATE ATHLETES

A THESIS

Submitted to the Faculty of the School of Graduate Studies and Research of California University of Pennsylvania in partial fulfillment of the requirements for the degree of

Master of Science

by

Latonia Sue Allen

Research Adviser, Dr. Carol Biddington

California, Pennsylvania

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CALIFORNIA, PA

THESIS APPROVAL

Graduate Athletic Training Education

We hereby approve the Thesis of

Latonia S. Allen
Candidate for the degree of Master of Science

Date                      Faculty
4-24-06                    Carol Biddington
4-24/06                    Dr. Carol Biddington (Chairperson)
11-21/06                   Dr. Chris Harman

Dr. John Roh
Dr. Chris Harman
ACKNOWLEDGEMENTS

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I would especially like to thank the athletes, coaches, and athletic trainers from Alderson Broaddus College, Wheeling Jesuit University, and Frostburg State University for their willingness to participate in my study.
A special thanks to Southmoreland High School’s coaches, athletes, Dennis Zeiger, and Ruth Joyce. I have loved every moment of being your athletic trainer and friend. I will miss all of you so much. You will always hold a special place in Josh and my heart.

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Last but not least, I would also like to thank my family for always pushing me to succeed and strive to reach all my goals. I love you Mommy, Lamar, Lonnie, and Dad.
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</table>
Introduction

In the past two decades, there has been an increase in exposure for female athletes. It is estimated that since the passage of Title IX, female participation in high school sports has increased 600%.\(^1\) Regardless of gender, there is a 50% chance of injury or illness for any sport. However, the type of injury/illness associated with women may be different. Therefore, an awareness of injuries and illnesses particular to women needs to become more prevalent.

For most women, sports participation is a positive experience, providing better health, well being, and physical fitness.\(^2\) But for some, the desire to succeed in athletics, along with the pressure to adhere to an ideal body weight, can cause restrictive eating and weight reduction behaviors that negatively affect performance, health, and well being.\(^3\) The demands and pressures that are placed on female athletes can be unimaginable. These stresses can come from parents, coaches, teachers, friends, or even the individual. Female athletes frequently report feeling pressure from teammates and coaches to achieve a certain body weight.\(^4\) Furthermore, society can be a big factor in a female’s feelings of inadequacy. For example,
a woman is expected to be thin and toned but curvy in all the right places. To be too thin is unhealthy and is an unrealistic expectation of most women. It is very common, for these pressures from a multitude of sources, to cause certain disorders in the individual.

These disorders are commonly called the female athlete triad, which is composed of disordered eating, amenorrhea, and osteoporosis. Disordered eating can range from simply skipping meals to anorexia and bulimia nervosa. Amenorrhea is the cessation, loss, or irregularity of a woman’s menstrual cycle. Osteoporosis is bone loss and deterioration, which can be increased by the presence of the above two disorders. For this reason, the focus of this study is disordered eating and menstrual dysfunction in Division II and III collegiate female athletes.

The percentage of female athletes that suffer from disordered eating is believed to be 62%. Inadequate dietary intake can’t only affect performance but also lead to serious medical problems. Although disordered eating can occur in any sport, it seems to occur more in aesthetic, endurance, repetitive movement sports, and weight-classification sports such as gymnastics, swimming, distance running, ballet, ice skating, tennis, soccer, basketball.
Disordered eating combined with physical stress of training often causes inadequate nutrient intake due to poor food choices and skipping meals. This low caloric intake then leads to nutrient deficiencies, including calcium. Balanced nutrition, which includes adequate calcium and Vitamin D, is usually recommended to prevent osteoporosis. Diets low in calories and/or protein and excessive exercise have been found to be related to menstrual dysfunction in female athletes.

Eighty percent of college-age women have normal menstrual cycles (25-35 days) while the other 20% have either oligomenorrhea, less than eight menstrual cycles per year; or amenorrhea, the cessation of the menstrual cycle. Amenorrhea is the most extreme form of menstrual dysfunction in that it has been linked to decreases in vertebral bone density and an increased risk of injury. It is quite common in athletic women, with studies showing up to 44%. Even when normal menstrual cycles resume, bone loss is not completely reversible, thus increasing the risk of osteoporotic fractures later in life. Numerous studies have associated the frequency of menstrual irregularity with the age of the athletes, low body fat percentage, bodyweight changes, and training intensity. For example, the body fat hypothesis suggests that menstrual cycle
disturbances increase once the female athlete is below a certain body fat percentage threshold. However, recent research indicates that menstrual disturbances may not be caused by bodyweight loss or low body fat levels alone, but combined with a host of other factors.\textsuperscript{10} Several studies stated that no one factor can be singled out as the primary cause of athletic amenorrhea.\textsuperscript{11}

In a study completed by Thompson and Gabriel,\textsuperscript{12} the incidence of disordered eating and menstrual dysfunction in the female athletic population was explored. Findings indicated that 8.6\% and 33.4\% of the collegiate athletes reported eating disorders and menstrual dysfunction, respectively. Disordered eating affected 11.1\% of the non-collegiate athletes surveyed and menstrual dysfunction affected 16.7\% of the non-collegiate athletes surveyed. Almost 6\% of collegiate athletes, and none of the other women, reported both menstrual dysfunction and disordered eating.

These two disorders are in direct relationship with each other. When a female alters her eating habits but continues to exercise intensely or at the same level, her menstrual cycle could very well be paying the price, along with the rest of her body. This study aims to send a message to athletic trainers and educators who work with
female athletes. While sports are just a game, these athletes need to learn that they are not only playing on the court or the field, but they are playing with their health as well.

This study will attempt to answer the following question: 1) How does age, type of sport, body mass index, age at menarche, and minutes of exercise per week affect disordered eating?
METHODS

This section will include the following subsections: research design, subjects, instruments, procedures, hypotheses, and data analysis.

Research Design

A descriptive design was used for this study. The dependent variables were disordered eating and menstrual dysfunction. The independent variables were age, type of sport, body mass index, age at menarche, and minutes of exercise per week.

The strength of the study is the reliable instruments the researcher used. One limitation to the study is that the researcher used only three schools, however, the study involved college athletes from six sports.

Subjects

The number of subjects was 97. Subjects were Division II and III female athletes, which participated in six different sports: 1) cross-country, 2) volleyball, 3) basketball, 4) softball, 5) soccer, and 6) track. The
subjects were chosen through sampling of convenience from Alderson-Broaddus College, Wheeling Jesuit University, and Frostburg State University. Informed Consent (Appendix C1) was obtained from all individuals prior to the study.

Instrumentation

The Eating Attitudes Test (EAT-26) along with a demographics section that has additional specific questions, was used to assess the participant’s preoccupation with weight and appearance, eating behaviors, body dissatisfaction, and menstrual irregularity. The specific questions included a focus on the individual’s menstrual history and current status, her amount of exercise per week, previous eating disorder issues, and hormonal contraceptive use to regulate menstruation.

The combination of the EAT-26, demographics section, and specific questions was titled the Eating Behaviors and Menstrual History Questionnaire (Appendix C2).

Internal consistency reliability coefficients for the score of the Eating Attitudes Test have ranged between .70 and .88.\

Demographics included age, class rank, sport, height, and weight. History of eating disorders, amount of exercise
per week of the participant, and questions on the function of their menstrual cycle were analyzed through specific questions. Eating disorders were assessed with the question, "Have you ever been told or perceived that you had an eating disorder?" Those who answer "yes" were classified as having a past or current eating disorder. The women were asked, "How many times a week do you engage in vigorous physical sessions?" and also "On average, how many minutes per session do you exercise?" Their reported minutes of exercise per day were multiplied by the number of times they reported exercising each week to determine their total minutes of exercise each week. Participants were asked their age at menarche and to indicate their current menstrual status by choosing between these responses: have not started menstruation, have not had a menstrual period for six months, have a menstrual period every six weeks, or have menstrual periods every 25-35 days. Those who did not have menstrual periods every 25-35 days were classified as having menstrual dysfunction. The participants were also questioned about their usage of hormonal contraceptives and if their usage is to regulate their menstrual cycle.

The Eating Attitudes Test consists of 26 questions requiring an option of "always", "usually", "often", "sometimes", and "never".
“sometimes”, “rarely”, or “never”. There are four additional questions that ask about 1) eating binges, 2) making yourself vomit, 3) the use of weight controlling substances, and 4) past eating disorder treatment. For all items except question #25, each of the responses received the following value: 3 points for “always”, 2 points for “usually”, 1 point for “often”, and 0 points for “sometimes”, “rarely”, and “never”. For item #25, the responses received these values: 0 points for “always”, “usually”, and “often”, 1 point for “sometimes”, 2 points for “rarely”, and 3 points for “never”.

After scoring each item, the scores are added for a total score. If the total score was greater than 20, the participant had a disordered eating issue and technically should be referred for counseling. If the answer to the other four questions is “yes”, the participant also has or had been affected by disordered eating and should also be referred to counseling.

After the participants complete the survey, the researcher evaluated the surveys. The researcher applied the point values to the responses and added the values to reach a total score.
Procedures

The California University Institutional Review Board for Protection of Human Subjects Form (Appendix C3) was completed and sent to the Institutional Review Board at California University of Pennsylvania. Institutional Review Board approval was obtained before the study began. After IRB approval, the researcher sent a letter to the athletic trainers (Appendix C4) at the chosen schools in requesting their assistance in administering and overseeing the study. The researcher then asked the athletic trainer to obtain a time when the female athletes would be able to meet. At that time, the informed consent (Appendix C1) and Eating Behaviors and Menstrual History Questionnaire (Appendix C2) were distributed to the female participants.

Hypothesis

The following hypothesis is based on a review of the literature and the intuition of the researcher.

1. Age, type of sport, body mass index, age at menarche, and minutes of exercise per week will be significant predictors of disordered eating.
Data Analysis

The level of significance was set at $\alpha = .05$ to test the acceptability of the stated hypothesis.

1. A regression analysis was used to determine if age, type of sport, body mass index, age at menarche, and minutes of exercise per week were significant predictors of disordered eating.
RESULTS

Demographic Data

The sample consisted of athletes from Alderson Broaddus College (n = 46), Wheeling Jesuit University (n = 32), and Frostburg State University (n = 19). This sample consisted of 97 female athletes. The age range of the athletes within this sample ranged from 18 to 23 years (19.90±1.33). Height for the athletes ranged from 60 inches to 74 (66.54±2.78). Weight for the athletes ranged from 100 to 250 pounds (140.88±24.96). Body mass index (BMI) values for the athletes ranged from 17.6 to 33.9 (22.30±3.16). The amount of exercise sessions per week ranged from 2 to 7 times (5.94±.90). The amount of minutes per each exercise session ranged from 30 to 180 (92.22±38.74). The total amount of minutes spent exercising per week ranged from 30 to 1260 (554.38±259.23). Class rank, sport, category of BMI value, past perception of eating disorder, current menstrual status, painful menstruation, age at menarche, oral contraceptive use and its use to regulate menstruation, eating binges, self induced vomiting, weight control methods, eating disorder treatment, and current disordered eating issues were also
examined. The frequencies are reported in the following tables.

Table 1. Frequency Table of Class Rank

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<tr>
<th>Class Rank</th>
<th>Frequency</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Freshman</td>
<td>24</td>
<td>24.7</td>
</tr>
<tr>
<td>Sophomore</td>
<td>21</td>
<td>21.6</td>
</tr>
<tr>
<td>Junior</td>
<td>26</td>
<td>26.8</td>
</tr>
<tr>
<td>Senior</td>
<td>26</td>
<td>26.8</td>
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</table>

Table 2. Frequency Table of Sport

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<tr>
<th>Sport</th>
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</thead>
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<td>Volleyball</td>
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<td>17.5</td>
</tr>
<tr>
<td>Basketball</td>
<td>17</td>
<td>17.5</td>
</tr>
<tr>
<td>Softball</td>
<td>23</td>
<td>23.7</td>
</tr>
<tr>
<td>Track</td>
<td>14</td>
<td>14.4</td>
</tr>
<tr>
<td>Cross Country</td>
<td>18</td>
<td>18.6</td>
</tr>
<tr>
<td>Soccer</td>
<td>8</td>
<td>8.2</td>
</tr>
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</table>

Table 3. Frequency Table of BMI

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<thead>
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<th>BMI</th>
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<tr>
<td>Below 18.5</td>
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<td>7.2</td>
</tr>
<tr>
<td>18.5-24.9</td>
<td>73</td>
<td>75.3</td>
</tr>
<tr>
<td>25.0-29.9</td>
<td>13</td>
<td>13.4</td>
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<tr>
<td>30.0 and above</td>
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Table 4. Frequency Table of Past Perception of Eating Disorder

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<td>Yes</td>
<td>13</td>
<td>13.4</td>
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Table 5. Frequency Table for Current Menstrual Status

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<th>Current Menstrual Status</th>
<th>Frequency</th>
<th>Percent</th>
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</thead>
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<tr>
<td>Have not started menstruation</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Have not had a menstrual period for six months</td>
<td>4</td>
<td>4.1</td>
</tr>
<tr>
<td>Have a menstrual period every six weeks</td>
<td>19</td>
<td>19.6</td>
</tr>
<tr>
<td>Have menstrual periods every 25-35 days</td>
<td>74</td>
<td>76.3</td>
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Table 6. Frequency Table for Painful Menstruation

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<td>No</td>
<td>39</td>
<td>40.2</td>
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<tr>
<td>Yes</td>
<td>58</td>
<td>59.8</td>
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Table 7. Frequency Table for Age at Menarche

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<td>9</td>
<td>2</td>
<td>2.1</td>
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<td>11</td>
<td>8</td>
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<td>12</td>
<td>26</td>
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<td>13</td>
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<td>22.7</td>
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<td>4</td>
<td>4.1</td>
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<td>18</td>
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Table 8. Frequency Table for Oral Contraceptive Usage

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<tr>
<td>No</td>
<td>41</td>
<td>42.3</td>
</tr>
<tr>
<td>Yes</td>
<td>56</td>
<td>57.7</td>
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</tbody>
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Table 9. Frequency Table for Menstrual Regulation

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<th>Menstrual Regulation</th>
<th>Frequency</th>
<th>Percent</th>
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<tr>
<td>No</td>
<td>26</td>
<td>26.8</td>
</tr>
<tr>
<td>Yes</td>
<td>43</td>
<td>44.3</td>
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Table 10. Frequency Table for Eating Binges

<table>
<thead>
<tr>
<th>Eating Binges</th>
<th>Frequency</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>No</td>
<td>86</td>
<td>88.7</td>
</tr>
<tr>
<td>Yes</td>
<td>11</td>
<td>11.3</td>
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</table>

Table 11. Frequency Table for Self-Induced Vomiting

<table>
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<tr>
<th>Vomiting</th>
<th>Frequency</th>
<th>Percent</th>
</tr>
</thead>
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<tr>
<td>No</td>
<td>91</td>
<td>93.8</td>
</tr>
<tr>
<td>Yes</td>
<td>6</td>
<td>6.2</td>
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Table 12. Frequency Table for Weight Control Methods

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<td>82.5</td>
</tr>
<tr>
<td>Yes</td>
<td>17</td>
<td>17.5</td>
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</table>

Table 13. Frequency Table for Eating Disorder Treatment

<table>
<thead>
<tr>
<th>Eating Disorder Treatment</th>
<th>Frequency</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>No</td>
<td>95</td>
<td>97.9</td>
</tr>
<tr>
<td>Yes</td>
<td>2</td>
<td>2.1</td>
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Table 14. Frequency Table for Current Disordered Eating Issues

<table>
<thead>
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<th>Disordered Eating</th>
<th>Frequency</th>
<th>Percent</th>
</tr>
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<td>82</td>
<td>84.5</td>
</tr>
<tr>
<td>Yes</td>
<td>15</td>
<td>15.5</td>
</tr>
</tbody>
</table>
Hypothesis Testing

The level of significance used for testing the hypothesis was set at an alpha level of .05.

Hypothesis 1: Age, type of sport, body mass index, age at menarche, and minutes of exercise per week will be significant predictors of disordered eating.

A regression analysis was used to determine if age, type of sport, body mass index, age at menarche, and minutes of exercise per week were significant predictors of disordered eating. The results of the analysis are presented below in Table 15.

Table 15. Regression Analysis of Disordered Eating

<table>
<thead>
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<th>Variable</th>
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<th>SE B</th>
<th>β</th>
<th>P</th>
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<tbody>
<tr>
<td>Age</td>
<td>.178</td>
<td>.827</td>
<td>.022</td>
<td>.830</td>
</tr>
<tr>
<td>Sport</td>
<td>-.783</td>
<td>.701</td>
<td>-.115</td>
<td>.267</td>
</tr>
<tr>
<td>BMI</td>
<td>.478</td>
<td>.357</td>
<td>.141</td>
<td>.184</td>
</tr>
<tr>
<td>Menarche</td>
<td>1.99</td>
<td>.635</td>
<td>.340</td>
<td>.002</td>
</tr>
<tr>
<td>Total Ex</td>
<td>-.004</td>
<td>.004</td>
<td>-.096</td>
<td>.357</td>
</tr>
</tbody>
</table>

Predicted Variable: Disordered Eating
Predictor Variables: Age, Class Rank, Sport, BMI, Menarche, Total Ex
* Adjusted R²=.055, R²=.104
† P < .05

Conclusion: A regression analysis was calculated examining the effect of age, type of sport, body mass index, age at menarche, and minutes of exercise per week on
disordered eating. The regression equation was not significant ($F_{5,91} = 2.12, p > .05$) with an $R^2$ of .104. Age, type of sport, body mass index, and minutes of exercise per week can’t be used to predict disordered eating. However, age at menarche was significant as a disordered eating predictor ($P < .05$). The multiple correlation coefficient ($R$), using all the predictors simultaneously, is .323 and the adjusted $R^2$ is .055, meaning that only 6% of the variance in disordered eating can be predicted from age, type of sport, body mass index, age at menarche, and minutes of exercise per week.

Additional Findings

Several tests were conducted using the demographic part of the questionnaire along with the total score of the disordered eating section of the questionnaire in an attempt to discover additional findings.

An independent-samples $t$ test was calculated comparing the mean scores of two groups, those who answered yes and no to the question, “Have you ever been told or perceived to have a eating disorder” for their total disordered eating scores. A significant difference was found between the means of the two groups ($t_{95} = 3.60, P < .01$). The mean
of the group who answered yes was significantly higher (18.92 ± 13.23) than the mean of the group who answered no (8.05 ± 9.60). The results of the analysis are presented below in Table 16.

<table>
<thead>
<tr>
<th>Variable</th>
<th>n</th>
<th>M</th>
<th>SD</th>
<th>t</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>No</td>
<td>84</td>
<td>8.05</td>
<td>9.60</td>
<td>3.60</td>
<td>.001*</td>
</tr>
<tr>
<td>Yes</td>
<td>13</td>
<td>18.92</td>
<td>13.23</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*A P < .01

A Pearson Product Moment Correlation was calculated for the relationship between subjects’ BMI and age at menarche. A strong negative correlation was found ($r_{95} = - .300, P < .01$), indicating a significant negative linear relationship between the two variables. Athletes with higher values of BMI experience an earlier age at menarche. The results of the analysis are presented below in Table 17.

<table>
<thead>
<tr>
<th>Variable</th>
<th>n</th>
<th>r</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>BMI Scores &amp; Age at Menarche</td>
<td>97</td>
<td>-.300</td>
<td>.003</td>
</tr>
</tbody>
</table>

*A P < .01
A one-way ANOVA was computed comparing the BMI values of the athletes among the sports. A significant difference was found among the sports ($F_{5,91} = 4.35$, $P < .01$). This analysis revealed that athletes who participated in cross-country had lower BMI values (20.03±1.54) than athletes who participated in softball (24.20±2.99). Athletes who participated in track (21.78±4.28), soccer (22.82±1.68), volleyball (22.01±2.44), and basketball (22.57±3.38) were not significantly different from any sport for BMI values. The results of the analysis are presented below in Table 18 and Figure 1.

Table 18. Sport Differences for BMI

<table>
<thead>
<tr>
<th>Sports</th>
<th>1</th>
<th>2</th>
</tr>
</thead>
<tbody>
<tr>
<td>CrossCountry</td>
<td>20.029</td>
<td></td>
</tr>
<tr>
<td>Track</td>
<td>21.776</td>
<td>21.776</td>
</tr>
<tr>
<td>Volleyball</td>
<td>22.013</td>
<td>22.013</td>
</tr>
<tr>
<td>Basketball</td>
<td>22.569</td>
<td>22.569</td>
</tr>
<tr>
<td>Soccer</td>
<td>22.824</td>
<td>22.824</td>
</tr>
<tr>
<td>Softball</td>
<td></td>
<td>24.204</td>
</tr>
</tbody>
</table>
Figure 1. Sport Differences for BMI
DISCUSSION

Discussion of Results

This study focused on the prevalence of disordered eating and menstrual dysfunction in collegiate female athletes. The researcher examined how age, type of sport, body mass index, age at menarche, and minutes of exercise per week can affect disordered eating and menstrual dysfunction.

Hypothesis 1 stated that age, type of sport, body mass index, age at menarche, and minutes of exercise per week would be predictors of disordered eating. The researcher proposed that these factors would influence whether or not the athletes were currently dealing with disordered eating issues. This statement is also supported by past research, where certain consistencies were found when evaluating these same independent variables.

There was no significant data showing that these factors are predictors of disordered eating. Findings showed that only 6% of the variance in disordered eating can be predicted from these variables. Even though the data does not show any significance in the research, these factors are still crucial for predetermining those
individuals that are susceptible to dealing with disordered eating issues.

Athletic trainers need to be aware of these predictors because according to past research, they do have a direct relationship with disordered eating. Knowledge, awareness, and education for athletic trainers, coaches, and athletes are essential to lessen the occurrence of disordered eating. Athletic trainers, coaches, and athletes should combine to form a team in attempt to recognize and alleviate the problem at the source. Female athletes’ health and lifestyle, not just today, but for the future, depends on it.

In addition to hypothesis testing, analyses were also performed on the demographics section of the questionnaire to discover additional findings. First, a comparison of mean scores of two groups, those who answered yes and no to the question “Have you ever been told or perceived to have an eating disorder”, for their total disordered eating scores. A significant difference was found between the means of the two groups. The mean of the group who answered yes was significantly higher than the mean of the group that answered no. This tells athletic trainers that those individuals who are creating suspicion in their minds, are more likely to be dealing with disordered
eating. If someone confides in you as a friend of the person, you should listen to their opinions and feelings, and take them seriously. From the data gathered from just three schools, the researcher found it to be significant that if a person was told or perceived to have an eating disorder, then the score on the questionnaire was more likely to be higher. In some cases, scores were greater than 20, which meant that they were currently involved in disordered eating habits. Past studies have shown that those with a history of an eating disorder had a great investment in trying to reduce their weight than the others.12

The next additional finding was for the relationship between subjects’ body mass index (BMI) and age at menarche. A strong negative correlation was found which indicated a significant linear relationship between BMI and age at menarche. This result proclaims that athletes with higher values of BMI experience an earlier age at menarche. Girls who develop quicker and earlier are more likely to experience menarche sooner than those girls who appear to be undeveloped. This signals a warning sign for menstrual dysfunction. If you have a college athlete whose BMI value is very low, for instance below 18.5, this tells you they are underweight and could be experiencing amenorrhea or
dysmenorrhea. Beals and Manor’s\(^4\) study indicated that while the prevalence of eating disorders is low in female collegiate athletes, many are at risk for an eating disorder, which places them at an increased risk for menstrual irregularity. Athletes at risk for eating disorders more frequently reported menstrual irregularity.\(^4\)

Lastly, BMI values of the athletes among the different sports were evaluated. A significant difference was found between athletes that participated in cross-country and those who participated in softball. There was no significant difference among the other sports. This result reflects previous data. Lean sport (cross country, track, ballet, gymnastics, etc) athletes are more likely to have lower BMI values and a higher frequency of dealing with disordered eating and menstrual dysfunction. In Reinking and Alexander’s\(^{14}\) research study, lean sport athletes had a higher score on body dissatisfaction and lower actual and desired body weight than non-lean sport athletes. Their data suggested that lean sport athletes are at greater risk for disordered eating than athletes in non-lean sports.\(^{14}\)

From the results of the data, it is safe to say that there is a problem with disordered eating and menstrual dysfunction in the college setting. Coaches and athletic trainers need to strive to constantly learn more about the
issues that are affecting their female athletes.

Conclusions

Table 14 is a frequency table for those who were found to have a disordered eating issue, scoring higher than a 20 on the questionnaire. Out of 97 athletes that were surveyed, 15 are currently dealing with disordered eating issues. This affirms that in a small sample of Division II and III colleges in West Virginia and Maryland, 15.5% of the female athletes are dealing with disordered eating. The problem has not ceased or gone away. Female athletes are still suffering from a negative body image mentality, poor eating habits, and an increasing amount of exercise time. The demand and load that is put on their bodies is continuing to grow while the way they take care of their bodies is not improving.

Results basically reiterate past research. Even though some of the data was not significant, this does not mean that it is not consequential. Age, type of sport, body mass index, age at menarche, and minutes of exercise are still predictors of disordered eating. They can forewarn athletic trainers of underlying issues the female athletes may be experiencing. Body mass index and age at
menarche are in direct relationship with one another. It is no secret that predominantly, females with lower levels of BMI will not experience menarche until a later time in life. And for those that have been perceived or confronted about having a disordered eating problem, the odds are that they are living with an obstacle. The research not only reiterates the findings that are out there, it confirms that there are ways to predetermine who is at risk for disordered eating and menstrual dysfunction.

Recommendations

The research findings are undeniably significant to the field of athletic training. The results are straight to the point and clarify exactly what athletic trainers need to be evaluating. The results are from six different sports, which most high schools or universities have athletes participating in. Athletic trainers would be able to see the sports that have the highest number of athletes dealing with disordered eating and menstrual dysfunction. They would also gain the knowledge of BMI and its effect on the two variables. Athletic trainers may realize that they should ask age at menarche on the pre-participation physical form to gain knowledge on those individuals that
are at risk for developing osteoporosis later in life. This study would be an asset for athletic trainers to read and understand to make improvements in the education of the coaches and athletes at their facility. The researcher aims to inform the schools that participated in the study, that there is in fact an issue with disordered eating and menstrual dysfunction amongst their athletes. The researcher will suggest the athletic departments conduct seminars or in-service training or increase awareness and knowledge through their own means, of the severity of disordered eating and menstrual dysfunction.
REFERENCES


12. Thompson S, Gabriel M. Risk factors for the female


APPENDIX A
Review of the Literature
Review of the Literature

Athletic activity level of the female gender has dramatically increased over the years. This increased participation by women in collegiate sports has brought improved awareness of the unique physiological and behavioral responses of women in athletic activity.\(^1\) Over the past decade sports medicine health care providers have become more aware of the unique health concerns for athletic women. With an increase in participation, the incidence of a triad of disorders, particular to women have also increased. The female athlete triad almost exclusively occurs in the athletic population. The components of the triad are disordered eating, menstrual dysfunction, and osteoporosis. They are intricately related to each other and combine to influence the health of female athletes.\(^2\)

Disordered eating and menstrual dysfunction have a distinct relationship when it comes to female athletes. The majority of research shows that individuals suffering from disordered eating face a higher risk of developing menstrual dysfunction. The two have similar causes and precursors to their appearance in the female athlete.
The purpose of this Review of the Literature will focus on three sections:
1) The Female Athlete Triad, 2) Disordered Eating, and 3) Menstrual Dysfunction. There will be a summary of the Review of Literature at the end.

The Female Athlete Triad

The female athlete driven to excel in her sport and willing to go to any length to achieve success may be at risk for developing one, two, or all three components of the Female Athlete Triad. The Female Athlete Triad refers to three interrelated health problems seen in females. These problems include: low energy availability, menstrual disorders, and weak bones. In the extreme, these problems may be expressed as disordered eating, amenorrhea, and osteoporosis.³

Low energy availability is the key problem causing the other components of the Triad. The energy in food is used by the body for several basic processes: cellular maintenance, warmth, immunity, growth, movement, and reproduction. Energy used for one of these processes is not available for the others. For athletes, energy
availability may be thought of as the amount of today’s
dietary energy remaining after exercise for the body’s
other processes. By reducing their dietary energy intake
or by increasing their energy expenditure athletes may
lower their energy availability so far that the body’s
other processes can’t function properly. Because female
athletes tend to eat less than would be expected for their
level of physical activity, their diet and exercise habits
tend to distribute them along a spectrum of energy
availability between energy balance and extreme low energy
availability.³

Disordered eating is a term that includes the full
spectrum of abnormal eating behaviors, ranging from simple
dieting to clinical eating disorders. The term “disordered
eating” is used rather than eating disorders because the
athlete’s eating does not have to be disordered to the
point of a clinical eating disorder (i.e., anorexia nervosa
or bulimia nervosa) in order for the other two components
of the Female Athlete Triad to occur.⁴

Disordered eating can be inadvertent, such as when an
athlete mistakenly eats too little to adequately fuel her
physical activity and her caloric needs for activities of
everyday living. However, the most serious and the most
difficult cases to treat involve athletes who are willfully
restricting their caloric intake for the purpose of becoming thinner or leaner.⁴

Although low energy availability may be caused by increasing energy expenditure without any reduction in energy intake, for some athletes disordered eating may be the first step in developing the Triad. In an effort to improve performance, athletes often try to lose weight or body fat. Disordered eating by severely limiting food intake, constantly weighing and/or measuring foods, eating secretly, refusing to eat in front of others, and abusing laxatives impedes performance and results in dehydration, malnourishment, and unhealthy weight loss, as well as psychological difficulties such as food/weight obsession, depression, and anxiety.³

When too little energy is available after exercise, a female’s body reduces energy expenditure in other processes, for example, suppressing menstrual function. Because energy expenditure during exercise reduces the amount of energy available, female athletes can be at risk for menstrual disorders. Female athletes who restrict their dietary intake or practice disordered eating behaviors are at even higher risk.³ Amenorrhea is the name for a female dealing with the loss of menstruation.

When too little energy is available after exercise,
the female athlete’s body also reduces energy expenditure by slowing the turnover of bone tissue. This turnover is how bones grow and heal. Impairing this can be very harmful to young athletes since 50% of bone mass accumulates during the teenage years, and low bone mass is a major risk factor for fractures. In addition, the loss of menstrual cycles reduces the body’s production of estrogen, which normally restrains the rate of bone resorption. An amenorrheic athlete can lose 5% of her bone mass in one year. Poor eating habits may also decrease the intake of calcium, vitamins, and minerals that the athlete needs to build and repair bone. The condition can continue to worsen and lead to osteoporosis. Osteoporosis is a disease characterized by low bone mass and deterioration of bone tissue, resulting in bone fragility and increased risk of fracture.

No studies were found documenting the prevalence of the triad as a whole among female athletes. This is due to the difficulty of simultaneously and accurately assessing all three disorders that make up the triad. Most of the current prevalent data are derived from studies with small sample sizes, obtained from single sports, and examining either disordered eating or menstrual dysfunction. Data from these studies estimates that 62% of female athletes
suffer from disordered eating and 79% from menstrual dysfunction. Few studies have investigated the prevalence of eating disorders and/or menstrual dysfunction among female college athletes participating in a wide range of sports. Small or unrepresentative sample sizes, inappropriate eating disorder instruments, and a lack of control for oral contraceptive use have been a burden to the majority who have researched the topic of the Female Athlete Triad.

Disordered Eating

Causes of Disordered Eating

The causes of disordered eating in women are complex and involve social, psychological, and physiologic factors. Risk factors contributing to disordered eating in athletic females include social pressures to be beautiful and thin, poor self-esteem, family dysfunction, sexual abuse, dieting, and biological factors. In athletes, additional factors may encourage disordered eating, including self imposed expectations of athletic perfection and a belief in the inverse relationship between body size and performance. Rosen et al found that 32% of the female collegiate athlete sampled practiced pathogenic weight control behaviors and
70% of those athletes believed such practices were harmless.

According to Dr. Tracy Ray, nutrition plays a major role in the issues of the Triad, especially disordered eating. Inadequate dietary intake can not only affect performance but also leads to serious medical problems. The spectrum of disordered eating can range from calories, protein, or fat restriction to more ominous diagnoses of anorexia nervosa and bulimia nervosa. Because of this high incidence, athletic trainers should be aware of the risk factors.

Affects on Both Genders

Drossman et al found that anorexia has a 19 to 1 female to male incidence, and McNab reported that 90-95% of anorexics are women. Crisp found that females are 10 times more likely than males to develop anorexia. Button and Whitehouse administered the EAT to college students and found a 6.3% female incidence and a 0% male incidence. Nattiv and Lynch report that 15% to 62% of female athletes appear to have pathogenic weight control behaviors.

Gender and Race

Johnson et al researched the idea of gender and race
on self-esteem and the occurrence of disordered eating. A total of 1445 student athletes from Division I school were surveyed. White female athletes reported significantly lower self-esteem than black female, black male, and white male athletes. Black female athlete’s self esteem was equal to both black and white male athletes. White female athletes reported a significantly higher drive for thinness, body dissatisfaction, and more disturbed eating behaviors than black female and both groups of male athletes. This study indicates that white female athletes appear to be most at risk for eating disorders.

Pre-Participation Physical Exam

Specific questioning in the pre-participation physical exam could be beneficial. Red flags in the history include use of dietary pills or laxatives, excessive exercise, and self induced vomiting. An athlete who struggles with low self-esteem, poor coping skills, and perceived loss of control, perfectionism, obsessive-compulsive traits, depression, anxiety, or history of sexual or physical abuse should be monitored closely.

Non-Athletes vs. Athletes

Although disordered eating can occur in any sport,
studies seem to have proven that it is more prevalent in aesthetic, endurance, and weight classification sports such as gymnastics, swimming, and distance running. In Beals and Manor’s study, the prevalence of disorders of the female athlete triad in college athletes participating in aesthetic, endurance, and team/anaerobic sports were examined. A health/medical, dieting questionnaire, the Eating Attitudes Test (EAT), and the Eating Disorder Inventory (EDI) Body Dissatisfaction Subscale assessed the athletes. The percentage of athletes reporting a clinical diagnosis of anorexia or bulimia was 3.3% and 2.3%. The percentage of athletes with scores indicating at risk behavior for an eating disorder were 15.2% using the EAT and 32.4% using the EDI. A similar percentage of athletes in aesthetic, endurance, and team/anaerobic sports reported a clinical diagnose of anorexia or bulimia. However, athletes in aesthetic sports scored significantly higher on the EAT (13.5±10.9) than athletes in endurance (10.0±9.3) or team/anaerobic sports (9.9±9.0). Athletes at risk for eating disorders more frequently reported menstrual irregularity (p=.004). This data indicated that while the prevalence of eating disorders is low in female collegiate athletes, many are at risk for an eating disorder, which places them at an increased risk for menstrual
irregularity.\textsuperscript{5}

Mark F. Reinking and Laura E. Alexander\textsuperscript{1} conducted a similar study. They compared disordered eating symptoms between collegiate athletes (in lean and non-lean sports) and non-athletes. Symptoms associated with disordered eating were assessed using the Eating Disorders Inventory-2, a self-report measure of 91 items, and self reported weight and menstrual function. The athletes had significantly lower scores in body dissatisfaction. No difference in mean body weight was noted between the two groups, but the non-athlete group had significantly lower desired body weight. Lean sport athletes had a higher score on body dissatisfaction and lower actual and desired body weight than non-lean sport athletes. A total of 7.1\% of the collegiate athletes and 12.9\% of the non-athletes were classified as having a high risk for disordered eating. Within the athlete sample, the high-risk group included 2.9\% of the non-lean sport athletes and 25\% of the lean sport athletes. Regarding the exercise habits of the non-athletes, they found that 56.4\% of these women exercised three days or fewer per week and 43.6\% exercised four or more days per week. A total of 85\% of the female non-athletes performed some type of aerobic exercise, with 69.4\% performing strengthening exercises and
53.2% performing flexibility exercises. This data suggested that the female non-athletes had variable physical activity levels but most individuals reported some physical exercise weekly. In their study, female athletes did not exhibit more disordered eating symptoms than women who did not participate in collegiate sports. However, their data suggests that lean sport athletes are at greater risk for disordered eating than athletes in non-lean sports. Also, the female athletes had a significantly lower Body Dissatisfaction score than the non-athletes, indicating greater satisfaction with their body shape and size. This particular finding is consistent with the results of the meta-analysis by Smolak et al,15 who reported results were less disordered in athletes than in non-athletes.  

C. Ravaldi,16 doctor at Florence University Medical School, evaluated ballet dancers, female gymnasts, and female controls. The subjects completed the Body Uneasiness Test, the State Trait Anxiety Inventory, and the Eating Disorder Examination. Prevalence rates were high among ballet dancers with 1.8% having anorexia nervosa, 2.7% having bulimia nervosa, and 22.1% have unspecified eating disorders. Gymnasts followed closely with 2.6% having anorexia nervosa and 18% having unspecified eating
disorders. They concluded that people who participate in sports that emphasize thinness may have a greater than normal body unease and inappropriate eating attitudes and behaviors.\textsuperscript{16}

In Thompson and Gabriel’s\textsuperscript{17} study, their attention was on eating disorders, performance related injuries, menstrual dysfunction, and exercise time among undergraduate female collegiate athletes and non-athletes. Demographic information showed a mean age, weight, height, and BMI for all women to be 21.90 years, 132.9 pounds, 65.67 inches, and 21.64, respectively. When answering the question “Have you ever perceived or been told that you have an eating disorder?” 8.6\% of the athletes and 11.1\% non-athletes said yes. Weight reduction was the result of a history of an eating disorder and BMI. Those with a history of an eating disorder had a great investment in trying to reduce their weight than the others. Minutes of exercise per week were found to be significantly higher for the collegiate athletes as compared to the non-athletes, and those with a history of eating disorders as compared to those with no history.\textsuperscript{17}

In a study of eating disorder prevalence for track and field athletes, Hausenblas and McNally\textsuperscript{18} discovered enlightening results. Higher active non-athletes had a
higher prevalence of eating disorders than the athletes and the lower active non-athletes. There were no differences between the types of events the athletes participated in for eating disorder symptoms.\textsuperscript{18}

Disordered Eating Studies

In the only large United States survey to date, Johnson et al\textsuperscript{19} examined the prevalence of disordered eating in 1445 collegiate athletes. A self developed dieting and body image questionnaire and three subscales (body dissatisfaction, bulimia, and drive for thinness) of the Eating Disorder Inventory, were used to assess the athletes. The results indicated that 1.1\% of the female athletes met the diagnostic criteria (American Psychiatric Association's Diagnostic and Statistical Manual of Mental Disorders, DSM IV) for bulimia nervosa, 9.2\% presented with sub clinical bulimia, and 38\% could be considered at risk for developing bulimia. While none of the female athletes met the DSM IV diagnostic criteria for anorexia nervosa, 9.2\% exhibited behaviors consistent with sub clinical anorexia, and 35\% were at risk for developing anorexia.\textsuperscript{5}

Body Image

A common theme in the majority of the research done on
eating disorders is the concept of body image, as is the case in the study by Krane et al.,\textsuperscript{20} where they examined body satisfaction and related concerns in the exercise and sports setting. The athletes were divided into categories based on how much of their body shape was discernible in their uniforms. The women completed the Eating Disorder Inventory, Social Physique Anxiety Scale (SPAS), and a background questionnaire. Their primary hypothesis was not supported. The exercisers and athletes in different types of uniforms did not differ in body dissatisfaction, drive for thinness, bulimia, and SPA. Additional results revealed that the exercisers had significantly lower perfectionism compared to the athletes in baggy or mixed uniforms.\textsuperscript{20}

In a study of eating disorder prevalence for track and field athletes, Hausenblas and McNally\textsuperscript{18} found both consistent and inconsistent results. Women had a greater drive for thinness and body dissatisfaction symptoms and a higher prevalence of eating disorders than men. Non-athletes reported greater body dissatisfaction symptoms than the athletes.

An advertisement for Kellogg’s Special K\textsuperscript{®} cereal once depicted an 18-month-old girl wearing nothing but a diaper, sitting with a worried look on her face. The cartoon like
caption that projected from her lips asked the question, “Do I look fat?” This ad reflects the common concern with weight and the fear of fat with which many women in contemporary American culture have struggled for decades. Our society reinforces a narrowly defined ideal to which female bodies are compared. Markula describes this ideal body as “firm but shapely, fit but sexy, strong but thin.” Attainment of this ideal is difficult, if not impossible, for most women. However, females are inundated with cultural messages as to its importance. Popular cultural icons such as models, movie and TV stars, and even professional female athletes display and validate this ideal slender and well-toned female body.

This cultural standard for thinness as the ideal influences the way that many women perceive their bodies. Aspiring towards attaining this ideal, many women are dissatisfied with their body shape and are preoccupied with the fat on their bodies. These negative perceptions about one’s body size and weight often are distorted and may lead to negative affective states and unhealthy behaviors. Body dissatisfaction is a precursor to unhealthy eating behaviors and it predicts the severity of these eating problems.

Many researchers have tried to understand the
relationship among the cultural ideal body, body satisfaction, eating and exercise behaviors. These issues appear to be significant in sport and exercise environment. In both settings, women may perceive others as evaluating their physique and skill level. Women often engage in exercise to acquire the ideal female body suggesting that self-presentation serve as a motive for exercise. Accordingly, research shows that women report they exercise to reduce their weight and body fat and to increase muscle tone. It seems that the fitness craze for women is more about the pursuit of thinness than the pursuit of good health. Women who exercise primarily to obtain an ideal body may be at an increased risk for serious health problems, such as eating disorders.

Two environments where there is pressure to conform to a certain body shape are aerobic exercise classes and competitive sports. Exercise and sport settings present additional pressures on females to have perfect bodies. In the athletic environment, many athletes and coaches believe that it is necessary to maintain a certain body shape and weight for optimal athletic performance. Athletes and coaches believe that excess weight inhibits speed, endurance, and agility and it increases fatigue. Conversely, leanness is believed to enhance performance.
In addition, some sports emphasize aesthetic appeal, or the athlete’s appearance during performance. One negative impact of these performance concerns is shown in the numerous studies revealing a disturbing incidence of disordered eating patterns in competitive sports. Also, researchers have cautioned that athletes may be at risk for developing unhealthy weight management strategies.29

To determine whether certain athletes are at greater risk of disturbed eating and body dissatisfaction, athletes in lean and non-lean sports have often been compared. Athletes classified in lean sports when “appearance or weight are important for success, such as gymnastics,” and in non-lean sports when “weight is non central, such as basketball”.30 Generally it has been suggested that lean sport athletes would be more likely to engage in disordered eating patterns. However, empirical evidence for this conclusion is equivocal. Some studies have found that lean sport athletes are more likely to be weight preoccupied or eating disordered, while others have found no differences between lean and non-lean sport athletes.31 It would seem that all athletes would benefit from being lean, therefore, the lean and non-lean distinction may not be an exact precursor for eating disorders. Looking into different sport groups, athletes competing in aesthetic and endurance
sports reported the highest prevalence of menstrual dysfunction. Most studies have shown that athletes competing in aesthetic sports had a higher prevalence of eating disorders. This could explain the high occurrence of menstrual dysfunction in this sport group.32

Perhaps because female athletes are susceptible to cultural pressures to maintain an ideal body shape, it is not the type of sport that impacts concerns about body size and the likelihood of unhealthy eating. Female athletes who feel that others are evaluating their body may be at greater risk. Some suggest that a female athlete’s uniform may increase the perception of evaluation; especially those uniforms that reveal body shape and size.20 Gill and Overdorff28 found that the uniforms of cheerleaders were known as a large source of pressure to maintain low body weight. This also applies to gymnasts, figure skaters, volleyball players, and swimmers.33

**Conclusion**

Making sense out of the research on disordered eating can be difficult, because study results have either been consistent or divergent with the next study. This problem is largely due to different research methods, the amount or type of participants, the sports chosen to study, eating
disorder measures, and statistical analyses. However three themes are consistent across the research findings on disordered eating. First, the risk of disordered eating behaviors is greater in female athletes than in male athletes. Secondly, the risk of disordered eating is greater in those sports that emphasize leanness or body image, particularly at higher levels of competition. And thirdly, disordered eating may be central to the development of the triad. For example, two research teams have shown that disordered eating causes menstrual irregularity.²

Because disordered eating is complex with many causes and fatal consequences, especially for young athletes, its effects in this population are profound, and prevention and education should be stressed.³⁴ Athletic trainers share a large part of the responsibility in determining those athletes that need guidance. If athletic trainers are educated on disordered eating, they will able determine those athletes earlier and attempt to form a trusting relationship with them.
Menstrual Dysfunction

Precursors of Menstrual Dysfunction

What sets the female gender apart from the male is the dynamic rhythmicity of the reproductive cycle. Menstrual dysfunction may be caused by anatomic abnormalities; hypothalamic, pituitary, or other endocrine dysfunction; ovarian failure; or genetic defects. According to Elzi Volk, there are many hypotheses to the etiology behind menstrual irregularity. Body fat composition, diet, training volume and intensity, and energy balance are these theories. Also included, are the uses of anabolic steroids, which inhibit ovulation and induce amenorrhea. The exact patho-physiological mechanism for developing amenorrhea has not yet been defined. Abnormal patterns of endogenous hypothalamic secretion of gonadotropin releasing hormone, with decreased production of luteinizing hormone, is a mechanism considered to decrease production of estrogen. Although low body fat is commonly associated with amenorrhea, the critical body fat hypothesis has not been substantiated. Women with normal body fat may also experience hypothalamic amenorrhea. Amenorrhea can be the result of hormonal imbalances, psychiatric disorders, eating disorders, malnutrition, excessive thinness or
fatness, rapid weight loss, body fat content too low, and excessive physical conditioning. Additional causes are drugs, chronic illness, Turner’s syndrome (a chromosomal problem at birth), the absence of a vagina or uterus, and an imperforated hymen (lack of an opening to allow menstrual blood through). The high prevalence of menstrual dysfunction may be explained by psychological stress or genetic factors. It has been claimed that amenorrhea is caused by the women’s psychological preoccupation with weight and thinness, which in turn may lead to weight loss. Also, to optimize performance, some athletes diet which causes them to suffer from energy deficiency. Recent research suggests that lack of energy could be a main cause of menstrual dysfunction. This could explain the high amount of athletes competing in lean sports that suffer with menstrual dysfunction.

In a Norwegian study, menarcheal age, training volume, and BMI contributed greatly to explaining menstrual dysfunction in the athletes. The amount of physical activity did not seem to be a significant factor.

Normal Menstrual Cycle

The median age at menarche is 12.9 years. The length of a normal menstrual cycle is highly variable. A normal
Menstrual cycle is characterized by a cycle length of 28 days and a duration flow of 4 days.\(^{37}\)

A study done by Chen and Chen\(^ {39}\) on menstrual distress in adolescent girls determined some basic facts. The ages of the subjects ranged between 15 and 20 (mean, 16.98 years). The mean onset age of menarche was 12.31 years (range, 10-15 years), mean duration of menstruation was 6.99 days (range, 2-10 days), and mean frequency of menstruation was 28.10 days (range, 20-45 days).\(^ {39}\) In Beal’s and Manore’s study,\(^ {5}\) the mean age of menarche for the whole sample was 13.2±1.6 years.

**Amenorrhea**

Menstrual disorders are a common problem in adolescents and adult athletes. The common menstrual disorders are amenorrhea, abnormal/excessive uterine bleeding, dysmenorrhea, and premenstrual syndrome.\(^ {35}\) The primary menstrual dysfunction is amenorrhea, or lack of menstruation. The criteria includes:

- one menstrual period during the last ten months
- less than three menstrual cycles per year
- the absence of periods from 3-12 months\(^ {36}\)

Athletes frequently experience irregular menstrual bleeding patterns, which can include several months of
amenorrhea. Amenorrhea may be caused by anatomic abnormalities; hypothalamic, pituitary, or other endocrine dysfunction; ovarian failure; or genetic defects. Amenorrhea can be primary (never menstruated) or secondary (i.e., menarche, but no periods for three consecutive months). Primary amenorrhea is defined as the absence of menses by 16 years of age in the presence of normal secondary sexual characteristics or by 14 years of age when there is no visual secondary sexual characteristics development.35

Amenorrhea occurs nearly 20 times more frequently in female athletes compared to the general population. According to a recent review of the literature by Elzi Volk,36 amenorrhea is reported to exist in up to 50% of female athletes.

Low body fat levels, exercise, emotional stress, and disordered eating can disrupt the sex hormones. The long-term complications of untreated athletic amenorrhea are infertility, high blood cholesterol, osteoporosis, and premature aging.40

Dietary Restriction/Weight Loss

Some authors propose that amenorrhea may be a consequence of dietary restriction or weight loss. Some
correlations are seen in athletes with diets low in fat and lack of carbohydrate intake. It may or may not be the major cause, but a nutritional deficiency will lead to body fat loss and could bring on menstrual irregularity.36

**Low Body Fat**

A popular mechanism proposed in the sports circles for amenorrhea is low body fat. Although low body fat is indeed commonly associated with amenorrhea and other menstrual cycle irregularities, the research has not conclusively proven that there is a critical level of body fat necessary to maintain regular cycles. As well, female athletes with adequate body fat may still experience menstrual irregularities. Conversely, many lean athletes do not experience amenorrhea. The rate of body mass loss may be more critical than the absolute amount of body fat lost. After all, muscle tissue and the skeleton, not just body fat, also determine the total body mass. Therefore, alterations in both lean body mass and body fat may be important in concluding if a critical body fat level is a valid hypothesis for causing amenorrhea.36

The connection between menstrual disorders and body fat mass was examined among ballet dancers and non-athletic girls. Stokic et al37 recognized through past research,
that the critical amount of body fat leading to amenorrhea is below 17%, while 22% is needed for regular menstruation. Body fatness values for most athletes range from 12 to 16% depending on the sport. For female athletes who participate in aesthetic-acrobatic activities (like ballet and gymnastics) and strenuous endurance sports, low body fat is desirable because it is believed to enhance performance. These sportswomen are those with the highest prevalence of amenorrhea.41

Stokic et al37 found some interesting facts in his study. Body weight (51.48±5.01 vs. 57.53±7.57kg), body height (166.55±6.07 vs. 169.66±6.30cm.) and BMI (18.56±1.53 vs. 19.969±2.12kg/m²) were significantly lower in ballet dancers than the control group. When evaluating BMI values, it was noticed that underweight subjects were present in both groups, but to a greater extent in the group of ballet dancers (50%). Most subjects from the control group had normal body weight (73.3%) compared with the group of ballet dancers, where it was 50%. Pre-obesity was found only in the non-athletic girls (3.3%). No subject from the control group had any menstrual cycle disorders, while the presence of amenorrhea in the group of ballet dancers was 20% and 10% having oligomenorrhea. Ballet
dancers frequently had later appearance of menarche (from 14-16 years), and menstrual cycles longer than 30-60 days, compared with non-athletic girls. They correlated age at menarche and menstrual cycle duration with BMI and body FAT%, finding a negative correlation among ballet dancers between duration of the menstrual cycle with BMI and body FAT%.37

The following tables show the body mass index references for adults, and the desirable ranges of percent body fat. Table 19 is based on the criteria given by the World Health Organization.40 Table 20 is from the Tanita TBF-310 Body Composition Analyzer.40

Table 19. BMI Compared To Nutrition Level

<table>
<thead>
<tr>
<th>BMI (kg/m²)</th>
<th>Nutrition Level</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt; 18.5</td>
<td>Underweight</td>
</tr>
<tr>
<td>18.5-24.9</td>
<td>Normal Weight</td>
</tr>
<tr>
<td>25-29.9</td>
<td>Overweight</td>
</tr>
<tr>
<td>&gt;30</td>
<td>Obesity</td>
</tr>
</tbody>
</table>

Table 20. Age and Gender Differences of Body Fat Percentage

<table>
<thead>
<tr>
<th>Age</th>
<th>Women</th>
<th>Men</th>
</tr>
</thead>
<tbody>
<tr>
<td>14-29</td>
<td>17-24%</td>
<td>14-20%</td>
</tr>
<tr>
<td>&gt;30</td>
<td>20-27%</td>
<td>17-23%</td>
</tr>
</tbody>
</table>
Length of Training

Increasing evidence demonstrates a relationship between the length of training and menstrual irregularities. While short-term exercise elicits a transient change in some hormone levels, prolonged and extreme exercise induces significant changes in gonadotropin plasma levels and additional hormones. Other mechanisms that occur with exercise, such as lower ovarian blood circulation and an increase in metabolism changes in metabolic clearance rate of endogenous hormones, may also contribute to menstrual disorders. In the research, there are many inconsistencies due to cycle phase duration and other areas that lead to conflicting data.\textsuperscript{36}

Medications and Drugs

Few studies take into consideration medications and drugs that may alter hormone levels, such as anabolic steroids and oral contraceptives.\textsuperscript{36} Referring back to Beals and Manore’s study,\textsuperscript{5} menstrual irregularity was reported by 31% of the athletes using oral contraceptives. Most studies do not want any participants that are currently taking oral contraceptives. The reason behind this is that some women take oral contraceptives to regulate their
menstrual cycle, which means that they are fixing the problem that could be in existence if they were not taking the pill. In other cases, women that are taking oral contraceptives for the sole purpose of preventing pregnancy, may not realize it but the pill is positively affecting their menstrual cycle. Oral contraceptives regulate a female’s hormones, no matter what the primary reason for taking them is.

Menstrual Irregularity in Different Sports Settings

In Beal’s and Manore’s study, athletes participating in aesthetic sports were significantly older than those in endurance and team/anaerobic sports when they reached age of menarche. Delayed menarche was reported by 7.4% of all athletes, and significantly more athletes in aesthetic versus endurance and team/anaerobic sports reported delayed menarche. Oral contraceptive use was reported by 26.7% of the athletes, and a similar percentage of athletes within each sport type reported using oral contraceptives. There were 31% of the athletes not using oral contraceptives experiencing irregular menstrual cycles, and there were no differences between the sport groups in the prevalence of self reported menstrual disorders. Athletes not using oral contraceptives were also asked to document the number of
menstrual cycles that had occurred over the preceding 12 months to determine the prevalence of menstrual dysfunction. Only 1% of all these athletes reported no menstrual cycles, while 11.9% reported having less than 6 cycles, and 8.4% reported having more than 12 cycles in the past year. More athletes participating in aesthetic sports than endurance and team/anaerobic sports reported not having a menstrual cycle in the past year.5

Other influences behind menstrual disorders are the expectation to perform, the cultural emphasis on thinness, personality traits such as compulsiveness and perfectionism, and psychological factors such as poor coping skills, low self esteem, and family pressures.42

The Relationship between Menstrual Dysfunction and Disordered Eating

A study of menstrual and eating disorders among NCAA athletes, completed by Griffith et al,43 proved that menstrual disorders are one clue to undiagnosed eating disorders among elite female athletes. The gymnasts and cross- county runners had higher rates of amenorrhea (gymnast’s 60.6% and cross country runners, 59.8%) than athletes in other sport categories. Gymnasts reached age at menarche was 15.2 years. Gymnasts who had amenorrhea at
any time had a significantly lower body fat percentage (mean: 13.4%) than gymnasts without a history of amenorrhea. Cross-country runners had a significantly longer duration of amenorrhea (mean: 8.6 months) and a lower body mass index (mean: 18.0) when they were amenorrheic than women in other sports. The age at which they reached their lowest weight while amenorrheic was 15.9 years, and the mean age at which they began restricting food was 14.3 years. The amenorrheic runners also had a mean body fat of 9.0%. Seventy percent of the amenorrheic athletes in both sports were found to have disordered eating behaviors.43

Conclusion

For most women, sports participation is a positive experience providing better health, well being, and physical fitness. For some, the desire to succeed in athletics along with numerous pressures can turn something fun into something extremely dangerous to a female’s health. Menstrual disorders can avalanche into problems that will not just surface now but will continue to emerge for the rest of the women’s lives. The question is what are athletic trainers going to do about it? This study is aimed at determining the age, sport, and body type of female athletes that are precursors to facing menstrual and
eating disorders. Through gains in knowledge about these conditions, athletic trainers will be more prepared and equipped to dealing with the problem at its source.

Summary

The female athlete is a unique individual who can experience numerous benefits and consequences of sport participation. Two prices to pay are disordered eating and menstrual dysfunction, which are the focus of the review of literature.

Disordered eating is said to be a precursor of menstrual dysfunction. Many researchers have focused on eating disorders in different types of sport environments. They have combined this topic with the concepts of body image, exercise duration and intensity, and Body Mass Index. Disordered eating includes anorexia nervosa, bulimia nervosa, and any form of food limitation. Disordered eating can be dangerous with long-term side effects that could haunt the individual in more ways than she could ever imagine.

Menstrual dysfunction can surface from anatomic abnormalities, ovarian failure, genetic defects, and exercise. The criteria can be anywhere from a missed
period to the absence of menstruation for several months. Those who participate in aesthetic and endurance sports are most at risk for developing this condition. Researchers are still struggling to find the exact cause or relationship of what factors can predispose individuals to menstrual dysfunction.

The precursors or predictors of disordered eating and menstrual dysfunction are very similar. The causes vary from psychological issues like stress or body satisfaction, to physiological problems like energy deficit. There is not just one cause but a knowledgeable athletic trainer should be able to narrow it down and identify the source of the issue.
APPENDIX B

THE PROBLEM
The Problem

Statement of the Problem

In today’s world of sports, people are taking a hard look at the risks that female athletes are being jeopardized with due to their involvement in athletics. More women are participating in sport activities and training has become progressively more intense. Researchers in all aspects of the topic have done numerous studies. Some have focused on female athletes and the concepts of eating disorders, amenorrhea, and osteoporosis. Also tied into these studies has been the correlation of body mass index and its effect on the menstrual cycle and disordered eating. Researchers have also looked at which sports are more common to produce these effects in their athletes.

The purpose of this study is to compare disordered eating and menstrual dysfunction of college athletes participating in lean and non-lean sports. The goal is to see the correlation of these issues among female college athletes and which variables are most significant in the causes of disordered eating and menstrual dysfunction.
Definition of Terms

The following terms have been defined for the purposes of this study:

1) **Age at Menarche** - the age when a female experiences her first menstrual period.

2) **Normal Menstrual Cycle** - the functioning of glands and reproductive organs of the uterus that prepares a woman’s body for childbirth. Consist of three phases over a 28-30 day time span.

3) **Amenorrhea** - the absence or abnormal cessation of menstrual periods and can be classified as primary or secondary.

4) **Primary Amenorrhea** - if menstrual bleeding has never occurred by age 14 and the patient has no secondary sex characteristics or age 16 if secondary sex characteristics are present.

5) **Secondary Amenorrhea** - the absence of menstruation for three months if previous menses were regular, or six months if previous menses were irregular.

6) **Disordered Eating** - a term that places emphasis on the spectrum of pathological patterns of eating. A person does not consume the healthy amount of nutrients needed to sustain life.
7) **Eating Disorder** - harmful practices of weight control that result in undue harm to the body.

8) **Body Mass Index (BMI)** - An index of a person’s weight in relation to height, determined by multiplying the weight in pounds by 705 and dividing by the square of the height in inches.

9) **Anorexia Nervosa** - according to the Diagnostic and Statistic Manual of the American Psychiatric Association, anorexia nervosa is defined as

   a. Refusal to maintain body weight at or above a minimally normal weight for age and height (e.g., weight loss leading to maintenance of body weight less than 85% of that expected; or failure to make expected weight gain during period of growth, leading to body weight less than 85% of that expected.)
   
   b. Intense fear of gaining weight or becoming fat even when underweight.
   
   c. Disturbance in the way one’s body weight or shape is perceived; undue influence of body weight or shape on self-evaluation, or denial of the seriousness of current low body weight.
   
   d. In post-menarchal females, a woman is considered to have amenorrhea if her periods
occur only following hormone, e.g., estrogen, and administration.

10) **Bulimia Nervosa** – according to the Diagnostic and Statistic Manual of the American Psychiatric Association, bulimia nervosa is defined as

e. Recurrent episodes of binge eating. An episode of binge eating is characterized by both of the following:

i. Eating in a discrete period (e.g., within any two-hour period) an amount of food that is definitely larger than most people would eat during a similar period of time and under similar circumstances, and

ii. A sense of lack of control over eating during the episode (e.g., a feeling that one cannot stop eating or control what or how much one is eating).

f. Recurrent, inappropriate compensatory behavior to prevent weight gain, such as self-induced vomiting, misuse of laxatives, diuretics, or other medications, fasting, or excessive exercise.

g. The binge eating and inappropriate
compensatory behaviors both occur, on average, at least twice a week for three months.

h. Self-evaluation is unduly influenced by body shape and weight.

i. The disturbance does not occur exclusively during episodes of anorexia nervosa.

11) **Body Image** – one’s own perception of themselves as they view themselves in a mirror.

**Basic Assumptions**

There are several basic assumptions the research will use during this study.

1) All responses will be answered honestly and to the best of their knowledge.

2) No subject will receive assistance from any individual or any outside sources on any question.

3) The sample is a representative of the population of the Division II and III female collegiate athletes in West Virginia and Maryland.
Limitations of the Study

The following are possible limitations of the study:

1) The study will consist of Division II and III collegiate female athletes from six sports at three schools.

2) Due to the sensitivity of the questions the subjects are expected to answer, some answers may not be answered honestly.

Significance of the Study

Athletic trainers should possess adequate knowledge on this topic when working with female athletics. This is because the effect of exercise and nutrition on a woman’s body is an important focal aspect of sports pathology. It is crucial for athletic trainers to have awareness and seek out those females who could possibly be in jeopardy in relation to their health. There are numerous risks for females with eating disorders and menstrual dysfunction, especially when they are actively involved in athletics at an intense level. These conditions require proper and prompt management, and to do this, athletic trainers must be educated on these conditions of the female body.

This study will examine the disordered eating patterns
and menstrual dysfunction in female athletes. Disordered eating and menstrual dysfunction in athletes from different sports will be evaluated.

This study is important to female athletes and athletic trainers. An increase in the education of female athletes and athletic trainers on the hazards of eating disorders and menstrual dysfunction has the potential to improve overall health.
APPENDIX C

ADDITIONAL METHODS
APPENDIX CI

INFORMED CONSENT
Informed Consent Form

1. Latonia Sue Allen, who is a graduate athletic training student, has requested my participation in a research study at this institution. The title of the research is Prevalence of Disordered Eating and Menstrual Dysfunction in Female Collegiate Athletes.

2. I have been informed that the purpose of the research is to determine the prevalence of disordered eating and menstrual dysfunction in a sample of schools in West Virginia and Maryland. Athletes from cross country, volleyball, basketball, softball, soccer, and track will be used from three schools. A variety of sports are desired to find those sports that are at “high risk” for these conditions.

3. My participation will involve filling out a disordered eating and menstrual dysfunction questionnaire.

4. There are no foreseeable risks or discomforts by participating in this study.

5. There are no feasible alternative procedures available for this study.

6. I understand that the possible benefit of my participation in the research is for athletic trainers to become more aware and knowledgeable on disordered eating and menstrual dysfunction. If the athletic trainers are educated and comfortable with the topics, they will be more capable to help females who are struggling with one or both of these issues.

7. I understand that the results of the research study may be published but that my name or identity will not be revealed. In order to maintain confidentiality of my records, Latonia Allen will not allow the placement of any name on any document and will make sure to use subject codes.

8. I have been informed that I will not be compensated for my participation.

9. I have been informed that any questions I have concerning the research study or my participation in
it, before or after my consent, will be answered by Latonia Allen, 234 Second St. Apartment E, California, PA 15419, (724) 317-8593, all2930@cup.edu, and Dr. Carol Biddington, 250 University Ave., California, PA 15419, (724) 938-5944, biddington@cup.edu.

10. I understand that written responses may be used in quotations for publication but my identity will remain anonymous.

11. I have read the above information. The nature, demands, risks, and benefits of the project have been explained to me. I knowingly assume the risks involved, and understand that I may withdraw my consent and discontinue participation at any time without penalty or loss of benefit to myself. In signing this consent form, I am not waiving any legal claims, rights, or remedies. A copy of this consent form will be given to me upon my request.

Subject’s name_____________________________Date________
Other signature(if appropriate)________________________
Date_________

12. I certify that I have explained to the above individual the nature and purpose, the potential benefits, and possible risks associated with participation in this research study, have answered any questions that have been raised, and have witnessed the above signature.

13. I have provided the subject/participant a copy of this signed consent document upon their request.

Signature of investigator __________________Date______

Approved by the California University of Pennsylvania Institutional Review Board
APPENDIX C2

EATING BEHAVIORS AND MENSTRUAL HISTORY QUESTIONNAIRE
Subject Code_______

Eating Behaviors and Menstrual History Questionnaire

*Please answer all questions honestly and to the best of your knowledge, without any assistance. Please understand that this questionnaire is voluntary. If you feel uncomfortable answering any question, please feel free to leave it blank.

Age:_____

Class Rank:____________

Sport:_______________

Height:_____________

Weight:_____________

Have you ever been told or perceived that you had an eating disorder?

Yes:______ No:_______

Concerning your menstrual cycle, choose one of the following:

Have not started menstruation_______
Have not had a menstrual period for six months_______
Have a menstrual period every six weeks_______
Have menstrual periods every 25-35 days_______

Do you experience painful menstrual cycles?

Yes:______ No:_______

Age at first menstrual cycle: _______

How many times a week do you engage in vigorous physical activity? _______

How many minutes per session do you usually exercise? _______
Do you use a form of female hormonal contraceptive (ex. birth control pills, the patch, the shot)?

Yes:_______ No:________

If you answered “yes” to the previous question, please answer the next question.

Do you use this contraceptive to regulate your menstrual cycle?

Yes:_______ No:________

Please circle a response for each of the following statements:

1. Am terrified about being overweight
   Always   Usually   Often   Sometimes   Rarely   Never

2. Avoid eating when I am hungry
   Always   Usually   Often   Sometimes   Rarely   Never

3. Find myself preoccupied with food
   Always   Usually   Often   Sometimes   Rarely   Never

4. Have gone on eating binges where I feel that I may not be able to stop
   Always   Usually   Often   Sometimes   Rarely   Never

5. Cut my food into small pieces
   Always   Usually   Often   Sometimes   Rarely   Never

6. Aware of the calorie content of foods that I eat
   Always   Usually   Often   Sometimes   Rarely   Never

7. Particularly avoid foods with high carbohydrate content (i.e. bread, rice, potatoes, etc.)
   Always   Usually   Often   Sometimes   Rarely   Never
8. Feel that others would prefer if I ate more
   Always Usually Often Sometimes Rarely Never
9. Vomit after I have eaten
   Always Usually Often Sometimes Rarely Never
10. Feel extremely guilty after eating
    Always Usually Often Sometimes Rarely Never
11. Am preoccupied with a desire to be thinner
    Always Usually Often Sometimes Rarely Never
12. Think about burning up calories when I exercise
    Always Usually Often Sometimes Rarely Never
13. Other people think that I am too thin
    Always Usually Often Sometimes Rarely Never
14. Am preoccupied with the thought of having fat on my body
    Always Usually Often Sometimes Rarely Never
15. Take longer than others to eat my meals
    Always Usually Often Sometimes Rarely Never
16. Avoid foods with sugar in them
    Always Usually Often Sometimes Rarely Never
17. Eat diet foods
    Always Usually Often Sometimes Rarely Never
18. Feel that food controls my life
    Always Usually Often Sometimes Rarely Never
19. Display self-control around food
   Always   Usually   Often   Sometimes   Rarely   Never
20. Feel that others pressure me to eat
   Always   Usually   Often   Sometimes   Rarely   Never
21. Give too much time and thought to food
   Always   Usually   Often   Sometimes   Rarely   Never
22. Feel uncomfortable after eating sweets
   Always   Usually   Often   Sometimes   Rarely   Never
23. Engage in dieting behavior
   Always   Usually   Often   Sometimes   Rarely   Never
24. Like my stomach to be empty
   Always   Usually   Often   Sometimes   Rarely   Never
25. Enjoy trying new rich foods
   Always   Usually   Often   Sometimes   Rarely   Never
26. Have the impulse to vomit after meals
   Always   Usually   Often   Sometimes   Rarely   Never

Total Score_________

Please respond to the following questions:

1) Have you gone on eating binges where you feel that you may not be able to stop? (Eating much more than most people would eat under the same circumstances)
   No______  Yes______
   How many times in the last 6 months?______

2) Have you ever made yourself sick (vomited) to control your weight or shape?
   No______  Yes______
   How many times in the last 6 months?______
3) Have you ever used laxatives, diet pills, or diuretics (water pills) to control your weight or shape?
   No______ Yes______
   How many times in the last 6 months?______

4) Have you ever been treated for an eating disorder?
   No______ Yes______
   When?______
Scoring the Eating Attitudes Test:

For all items except #25, each of the responses receives the following value:

- Always = 3
- Usually = 2
- Often = 1
- Sometimes = 0
- Rarely = 0
- Never = 0

For item #25, the responses receive these values:

- Always = 0
- Usually = 0
- Often = 0
- Sometimes = 1
- Rarely = 2
- Never = 3

After scoring each item, add the scores for a total. If your total score is greater than 20, the participant has a disordered eating issue, and realistically should be seen by a counselor. If the participant answered “yes” to any of the last four yes/no questions, they are also considered to have a disordered eating issue.

Approved by the California University of Pennsylvania Institutional Review Board
APPENDIX C3

INSTITUTIONAL REVIEW BOARD
Institutional Review Board (IRB) approval is required before beginning any research and/or data collection involving human subjects.

(Reference IRB Policies and Procedures for clarification)

Project Title: Prevalence of Disordered Eating and Menstrual Dysfunction in Division II Female Collegiate Athletes

Researcher/Project Director: Lutonia Sue Allen

Phone #: 724-317-8593 E-mail Address: afl2930@cup.edu

Faculty Sponsor (if required): Dr. Carol Biddington

Department: Health Science and Sport Studies

Project Dates: January 2006 to March 2006

Sponsoring Agent (if applicable):

Project to be Conducted at: California University of Pennsylvania

Project Purpose: ☑ Thesis ☐ Research ☐ Class Project ☐ Other

Keep a copy of this form for your records.

Required IRB Training

The training requirement can be satisfied by completing the online training session at... A copy of your certification of training must be attached to this IRB Protocol. If you have completed the training at an earlier date and have already provided documentation to the California University of Pennsylvania Grants Office, please provide the following:

Previous Project Title

Date of Previous IRB Protocol

Draft, April 7, 2005
Please attach a typed, detailed summary of your project AND complete items 2 through 6.

1. Provide an overview of your project-proposal describing what you plan to do and how you will go about doing it. Include any hypothesis (es) or research questions that might be involved and explain how the information you gather will be analyzed. For a complete list of what should be included in your summary, please refer to Appendix B of the IRB Policies and Procedures Manual.

The purpose of this study is to determine the prevalence of disordered eating and menstrual dysfunction in Division II female collegiate athletes. After IRB approval, I will mail a letter to the Athletic Directors of the schools I have chosen to research, asking for their permission to use their school in my study. The Certified Athletic Trainer at each of the schools will be contacted and asked to administer the informed consent and surveys to the members of six sports teams from these three Division II universities in West Virginia. Cross Country, volleyball, basketball, softball, soccer, and track will be the sports chosen from Alderson Broaddus College, West Virginia Wesleyan College, and Davis and Elkins College. This study will attempt to answer the following questions: 1) Is there an increased incidence of menstrual dysfunction among female athletes identified with disordered eating? 2) How does the type of sport, age, Body Mass Index, age at Menarche, and hours of exercise per week affect a) disordered eating and b) menstrual dysfunction? The level of significance will be set at α ≤ .05 to test the acceptability of the stated hypotheses. 1. A Pearson Product Moment Correlation will be used to determine if there is a positive relationship between disordered eating and menstrual dysfunction. 2. A regression analysis will be used to determine if age, type of sport, Body Mass Index, age at Menarche, and minutes of exercise per week will be significant predictors of a) disordered eating and b) menstrual dysfunction.

2. Section 46.11 of the Federal Regulations state that research proposals involving human subjects must satisfy certain requirements before the IRB can grant approval. You should describe in detail how the following requirements will be satisfied. Be sure to address each area separately.

   a. How will you ensure that any risks to subjects are minimized? If there are potential risks, describe what will be done to minimize these risks. If there are risks, describe why the risks to participants

Draft, April 7, 2005
are reasonable in relation to anticipated benefits.
There are no foreseeable risks.

b. How will you ensure that the selection of subjects is equitable? Take into account your purpose(s).
Be sure you address research problems involving vulnerable populations such as children,
prisoners, pregnant women, mentally disabled persons, and economically or educationally
disadvantaged persons. If this is an in-class project describe how you will minimize the possibility
that students will feel coerced.

1. A Certified Athletic Trainer at each of the specific universities will be administering the informed
censurement and questionnaire to the six pre-chosen sports teams. The only people in the room when the
study is performed will be the Certified Athletic Trainer and the participants to limit the students
feeling coerced. The athletes will volunteer to participate.

c. How will you obtain informed consent from each participant or the subject's legally authorized
representative and ensure that all consent forms are appropriately documented? Be sure to attach a
copy of your consent form to the project summary.

1. Informed consent will be the first document administered to the participants before the study
will begin.

d. Show that the research plan makes provisions to monitor the data collected to insure the safety of all
subjects. The includes the privacy of subjects' responses and provisions for maintaining the security
and confidentiality of the data.

1. No names will be placed on the questionnaire to ensure the safety of all subjects. The
questionnaires once collected will be kept in a secure area where only the researcher will have access to.

3. Check the appropriate box(es) that describe the subjects you plan to use.

☐ Adult volunteers ☐ Mentally Disabled People
☐ CAL University Students ☐ Economically Disadvantaged People
☐ Other Students ☐ Educationally Disadvantaged People
☐ Prisoners ☐ Fetuses or fetal material
☐ Pregnant Women ☐ Children Under 18
☐ Physically Handicapped People ☐ Neonates

1. Is remuneration involved in your project? ☐ Yes or ☐ No. If yes, Explain here.

2. Is this project part of a grant? ☐ Yes or ☐ No. If yes, provide the following information:
Title of the Grant Proposal
Name of the Funding Agency
Dates of the Project Period

3. Does your project involve the debriefing of those who participated? ☐ Yes or ☐ No
If yes, explain the debriefing process here.

4. If your project involves a questionnaire interview, ensure that it meets the requirements of Appendix _ in
Draft, April 7, 2005
Project Director's Certification
Program Involving HUMAN SUBJECTS

The proposed investigation involves the use of human subjects and I am submitting the complete application form and project description to the Institutional Review Board for Research Involving Human Subjects.

I understand that Institutional Review Board (IRB) approval is required before beginning any research and/or data collection involving human subjects. If the Board grants approval of this application, I agree to:

1. Abide by any conditions or changes in the project required by the Board.
2. Report to the Board any change in the research plan that affects the method of using human subjects before such change is instituted.
3. Report to the Board any problems that arise in connection with the use of human subjects.
4. Seek advice of the Board whenever I believe such advice is necessary or would be helpful.
5. Secure the informed, written consent of all human subjects participating in the project.
6. Cooperate with the Board in its effort to provide a continuing review after investigations have been initiated.

I have reviewed the Federal and State regulations concerning the use of human subjects in research and training programs and the guidelines. I agree to abide by the regulations and guidelines aforementioned and will adhere to policies and procedures described in my application. I understand that changes to the research must be approved by the IRB before they are implemented.

Professional Research

Project Director's Signature

Student or Class Research

Student Researcher's Signature

Supervising Faculty Member's Signature if required

Department Chairperson's Signature

ACTION OF REVIEW BOARD (IRB use only)

The Institutional Review Board for Research Involving Human Subjects has reviewed this application to ascertain whether or not the proposed project:

1. provides adequate safeguards of the rights and welfare of human subjects involved in the investigations;
2. uses appropriate methods to obtain informed, written consent;
3. indicates that the potential benefits of the investigation substantially outweigh the risk involved;
4. provides adequate debriefing of human participants;
5. provides adequate follow-up services to participants who may have incurred physical, mental, or emotional harm.

☑ Approved  ☐ Disapproved

Chairperson, Institutional Review Board

Date: 17-70-2005

Draft, April 7, 2005
APPENDIX C4
COVER LETTER TO ATHLETIC TRAINER
January 30, 2006

Dear Athletic Trainer,

My name is Latonia Allen and I am a graduate student at California University of Pennsylvania. As part of my graduation requirement, I am to construct a thesis. My thesis topic is the “Prevalence of Disordered Eating and Menstrual Dysfunction in Female Collegiate Athletes.” For my study I would like to focus on three colleges, two in West Virginia and one in Maryland, since I competed in volleyball in the WVIAC for four years during my undergraduate career. The schools I have chosen to use are Alderson-Broaddus College, Wheeling Jesuit University, and Frostburg State University.

I am writing to ask for your assistance. The athletes need to know that this is voluntary and is not mandatory to complete. What I am asking of you to is find a time when you can meet with all the female athletes. Not just the ones that are involved in their season at the time, but all female athletes involved in any sport throughout the school year. I ask that the only person to be in the room when the athletes are completing the forms is you. I will mail you a packet, which will include two documents. The first document is the informed consent form, which will need to be filled out prior to the completion of the questionnaire. It describes exactly what I my intentions are for this study and that their name and personal information will be kept confidential. Second, the Eating Behaviors and Menstrual History Questionnaire will need to be distributed. Please ask the athletes to fill out the questionnaire to the best of their ability and to answer the questions honestly. I then ask for you to put all the documents in the pre-postaged envelope and return them to me.

I truly appreciate your assistance and kindness. If you have any concerns or questions, please feel free to contact me through email all2930@cup.edu or phone at 724-317-8593.

Sincerely,

Latonia Allen
REFERENCES
REFERENCES


ABSTRACT

Title: PREVALENCE OF DISORDERED EATING AND MENSTRUAL DYSFUNCTION IN FEMALE COLLEGIATE ATHLETES

Researcher: Latonia S. Allen

Advisor: Dr. Carol Biddington

Date: May 2006

Research Type: Master’s Thesis

Purpose: The purpose of this study was to determine a prevalence of disordered eating and menstrual dysfunction.

Problem: The prevalence of disordered eating and menstrual dysfunction in female athletes is not declining. Certain predictors must be discovered in attempt to eliminate the severity of these disorders.

Method: A descriptive type of research was conducted. Ninety-seven female athlete from Alderson Broaddus College, Wheeling Jesuit University, and Frostburg State University, who participated in basketball, volleyball, track, cross country, softball, and soccer, volunteered. The instrument used was the Eating Behaviors and Menstrual History Questionnaire.

Findings: Age at menarche is a predictor of disordered eating. Athletes with a history of being perceived to have an eating disorder have significantly higher eating disorders than athletes without a history. Athletes with higher BMI experienced an earlier age at menarche. Cross-country athletes have lower BMI than softball athletes.
Conclusion: Disordered eating and menstrual dysfunction are prevalent in the collegiate setting among all sports.