

A Comparative Study of Disordered Eating and
Muscle Building Behavior in Individual vs. Team Sports
in High School Athletes

Alex Martocci
Briarcliff Manor High School

Abstract

The purpose of this study was to examine the effect of gender and sport (individual versus team) on measures of body image disturbance, eating pathology, and attitudes towards extreme weight control behavior.

During physical education classes, 92 athletes and non-athletes at a suburban high school were given an anonymous survey that included the Muscle Dysmorphic Disorder Inventory (MDDI), the Eating Disorder Examination Questionnaire (EDE-Q), and an additional 7 questions about extreme dieting/muscle building behaviors. There were 67 females and 25 males; ages ranged from 14 to 18 with a mean of 15.67. The mean BMI among all participants was 21.23 ($SD = 3.40$).

The effects of gender and sport type (individual versus group) and their interaction were examined using ANCOVA to control the effects of age. Females scored significantly higher than males on the shape concern subscale of the EDE-Q, $F(1) = .443$, $p = 0.013$. Females reported significantly more dietary restraint, $F(1) = 8.568$, $p = 0.004$. Participants in individual sports scored significantly higher on the MDDI's "drive for size" subscale than those in group sports, $F(3) = 5.959$, $p = 0.001$. There was a significant interaction of gender x sport on the use of fasting, $F(1) = 4.084$, $p = 0.009$.

Results showed that females participating in individual sports were more likely to engage in fasting. It was also found that those participating in team sports had a stronger desire to become more muscular. Females showed greater concern about their body shape than did males. These results can be used to help improve target prevention for athletes and create sport specific modules for prevention programs based on specific risk.

I. Review of Literature

Athletes experience a great deal of pressure to maintain a certain weight, shape, and/or level of fitness. The source of this pressure can be from coaches, peers, or even the athletes themselves. Scoffier 2012 found that within a collegiate sample of athletes, the difficulty of goals set by coaches for their athletes was positively correlated with the amount of disordered eating and muscle building behaviors demonstrated by the athletes. Athletes participating in aesthetically/leanness-oriented sports (such as cross country, gymnastics, dance, etc.) have been shown to have significantly lower self-worth and significantly higher numbers of disordered eating behaviors than non-participating controls (Monthuy-Blanc 2012). Females have been shown to be more likely to experience both clinical and subclinical disordered eating behaviors, as it has been approximated that about 0.5% of the US female population have eating disorders (Committee 2003). However, Robinson & Ferraro 2010 showed that while non-athletes have higher body dissatisfaction, athletes demonstrate significantly higher levels of disordered eating and muscle building behaviors.

Females, athletes in particular, have become more susceptible to disordered eating behaviors in recent years. The age at which females display the onsets of eating disorders and/or disordered eating behaviors has lowered, with females as young as six years old showing symptoms of these problematic behaviors (Stein & Reichert 1990). In a multi-racial sample of high school athletes, Pernick & Nichols et al. 2006 found that despite the low number of patients with clinical eating disorders, the rate of subclinical disordered eating was as high as 62% among the population. In the study at hand, subclinical disordered eating was assessed as well as disordered eating.

Despite their non-clinical classification, disordered eating behaviors as opposed to full-fledged eating disorders still bear many risks and consequences. Many females with disordered eating behaviors experience amenorrhea and other types of menstrual dysfunction (Committee 2003). Disordered eating behaviors have also been shown to reduce the amount of bone stored (Pernick & Nichols 2006). Furthermore, disordered eating behaviors may lead to a risk of loss of overall bone mass (Andersen & Woodward 1995). The effects on those experiencing clinical eating disordered behavior are more extreme; side effects can include kidney failure, infertility, electrolyte imbalance, pancytopenia, hair loss/growth of lanugo hair, and delayed gastric emptying (Rome & Ammerman 2003). For these reasons, subclinical disordered eating should be targeted and prevented as early as possible.

While females have been shown to be more likely to have disordered eating behaviors, males are more susceptible to disordered muscle building behaviors and muscle dysmorphia. Although there has been little research done on the age at which men begin to experience insecurities about their bodies and muscle dysmorphic behaviors, Farland & Kaminski in 2009 found high levels of depression, anxiety, and emotional sensitivity to be predicting factors of muscle dysmorphia. The effects of subclinical versus clinical muscle dysmorphia are difficult to measure, as the disorder is not yet listed in the DSM-IV. Informally known as the “Adonis complex,” muscle dysmorphia is a facet of body dysmorphic disorder that is characterized by a strong drive for muscularity that often inhibits social functioning. Sufferers are typically unable to see that they are already very muscular; similarly, anorexia nervosa sufferers are unable to see that they are excessively thin (Pope & Gruber et al. 1997). However, McFarland & Kaminski 2009 found that high levels of depression, interpersonal sensitivity, and anxiety were correlated with body image concerns in males. In the same study, interpersonal sensitivity and depression

were strong predicting factors of full-blown muscle dysmorphia. Although the disorder has not been listed in the DSM-IV, Niewoudt & Shi et al. 2012 found that the disorder will most likely be listed in the DSM-V either as an eating disorder not otherwise specified, a subcategory of body dysmorphic disorder, a new disorder, or as a provisional diagnosis needing further research. Athletes are more susceptible to this disorder or subclinical forms of it due to the pressure they experience to increase their physical abilities.

Hildebrandt & Shiovitz et al. 2008 found that when in social situations, men and women both employ the tactic of body deception; males tend to exaggerate how muscular they are, while females exaggerate how thin they are. However, Paxton & Schutz et al. 1999 found that disordered eating behaviors and extreme weight loss behaviors were similar among girls within the same clique/peer group. This finding could substantiate the hypothesis that team sport participants are less likely to demonstrate disordered eating behaviors. This is also why the survey in our study was anonymous; the assumption was that if anonymity was guaranteed, participants would not feel inclined to deceive.

Two hypotheses were proposed for the current study. The first hypothesis was that participants in individual sports, such as track and cross country, would find disordered eating/muscle building behaviors safer and more effective than participants in group sports. The second hypothesis was that participants in individual sports would be more likely to participate in disordered eating/muscle building behaviors.

II. Methods

Setting

This research was conducted partially inside the gymnasium and partially inside the science research classroom of a suburban high school of high socioeconomic status. The overall student population in the high school was small, consisting of no more than 600 students total. The subjects involved included the researcher and the physical education teacher/science research teachers. The researcher administered surveys to students seated on rows of bleachers on one side of the room in the gymnasium; in the science research classroom, surveys were administered to students sitting at computers around the perimeter of the room.

Participants

The experimental group consisted of 92 participants (67 females and 25 males of 14-18 years). There were 81 participants of Caucasian descent, 10 participants of Asian descent, and 1 participant of Native American descent. All participants under 18 completed a parental consent form. The sports represented in the study were soccer, volleyball, cross country, track and field, swimming and diving, lacrosse, basketball, bowling, football, baseball, softball, field hockey, and cheerleading.

Recruitment

To recruit participants, the study was explained in detail in each physical education and science research class. The researcher described the purpose vaguely in saying that the study examined the relationship between body image in athletes. Additionally, the purpose and risks were explained thoroughly on the parental consent forms and parents were given a link that

allowed them to view the survey online. Students were explicitly instructed, both verbally and on the consent form, not to view the survey online prior to completing it. The benefits to the school and community as a whole were explained on the form as well. Students were informed that they could potentially win a \$100 American Express gift card by participating.

Benefits

Potential benefits to participants included gaining insight into their relationship with food and body image and increasing awareness of the prevalence of extreme dieting/muscle building behaviors. The benefit to the participating school was that they would become more aware of the eating and body image problems that existed within its student body population. An intervention within the school may take place regarding participation in sports and extreme dieting behaviors. These results may work toward improving the students' and student athletes' attitudes toward healthy eating behaviors and body image as well as improve awareness of disordered eating and muscle building behavior.

Risks

This study imposed minimal risks upon its participants. However, risks were still present, including potential feelings of negative body image, emotional distress, and stress. Participants were made fully aware that the school's social workers were available at any point in the day if assistance were to be needed. Each participant was given the option to stop at any time. The researcher explicitly stated that participants' grades in their physical education/science research classes would not be affected based on whether they participated or their answers to the survey. The survey was anonymous.

Institutional Review Board

Permission was obtained from the high school's Institutional Review Board for this research to be conducted. Science research teachers as well as physical education teachers granted permission for the researcher to use classroom time and space for the study to be administered.

Procedure

A parental consent was administered on day 1. Risks and benefits were explained, as well as eligibility to win a \$100 American Express gift card. On day 2, a survey was administered to participants who returned the parental consent forms. The survey aimed to identify disordered eating behavior, extreme dieting and muscle-building behaviors, muscle dysmorphia behaviors, and acceptance/attitudes toward extreme weight loss and muscle building behaviors.

To assess extreme muscle building and muscle dysmorphia behaviors, the MDDI (Muscle Dysmorphic Disorder Inventory) was used. In the version used in this particular study, two subscales were used: drive for size (DFS) and functional impairment (FI). There were 12 questions on this section of the survey. Each question was answered using a 1-5 Likert scale to indicate how frequently participants experienced sentiments expressed in the questions, with 1 indicating "never" and 5 indicating "always."

Participants were also asked to check off the extreme dieting behaviors that they had participated in within the past year. Behaviors included restricting calories, counting calories, use of supplements for weight/muscle control, fad diets, vigorous exercise, fasting, self-induced expulsion of food from the body, and an "other" option in which participants were encouraged to

list what type of behavior this indicated. Sample responses included “eating healthy,” “keeping a food log,” “pre-shower workouts at night,” and “over-thinking everything I eat.”

Attitudes toward disordered eating and muscle building behaviors were assessed using seven two-part questions. Each question listed a specific weight/muscle control behavior. Behaviors included restricting calories, counting calories, use of supplements such as HGH/diet pills/powder/etc. (legal or non-legal), fad diets such as detoxes/cleanses/juice fasts/etc., vigorous exercise for 2+ hours, not eating for 8+ hours for non-religious purposes, and self-induced expulsion of food/calories from the body including self-induced vomiting/laxative use/enema use/etc. Below the behavior listed in each question, participants were asked to rate the validity of two statements: “this method is safe,” and “this method is effective in controlling weight/shape/performance.” Each behavior was rated on a 1-5 Likert scale, with 1 meaning “I strongly disagree” and 5 meaning “I strongly agree.”

5. Vigorous exercise for 2+ hours

This method is safe	1 ---- 2 ---- 3 ---- 4 ---- 5
This method is effective in controlling weight/shape/performance	1 ---- 2 ---- 3 ---- 4 ---- 5

Figure 1.1, a sample of one of the questions used to assess attitudes toward disordered eating and muscle building behaviors.

The EDE-Q (Eating Disorder Examination Questionnaire) was used to identify extreme dieting behaviors and attitudes. The EDE-Q was designed as a self-report version of the EDE. It has 29 questions that measure four subscales of disordered eating: dietary restraint, shape concern, weight concern, and eating concern. The EDE-Q uses a 0-6 Likert scale that measures the frequency that participants experienced characteristic behaviors of each of the four subscale

categories in the past four weeks. 0 indicated “not at all” and 6 indicated “always.” Dangerous eating behaviors such as binge eating, diuretic use, and laxative use are assessed using the 0-6 Likert scale as well.

III. Results

Participants ranged in age from 14 to 18 years. The mean age was 15.67 years. The average BMI was 21.23 (SD=3.40). 65.34 inches was the mean height (SD=4.28). The average female height was 63.81 inches (SD=3.44), while the average male height was 69.46 inches (SD=3.58). The mean weight for females was 122.12 lbs., while the mean weight for males was 158.44 lbs. Means for BMI were 21.1 for females and 23.1 for males, both of which are within the normal range.

Females received significantly higher scores on the EDE-Q than males received, $F(1)=7.876$, ($P=0.006$). Females also received higher scores on several subscales of the EDE-Q. Female scores were greater on the shape concern subscale, $F(1)=0.443$, ($p=0.013$) the weight concern subscale, $F(1)=4.566$, ($p=0.036$), and the restraint subscale on the EDE-Q, $F(1)=8.586$, ($p=0.004$). Age had an effect on the shape concern subscale score of the EDE-Q, $F(1)=4.086$, $P=0.047$), as well as the eating concern subscale score, $F(1)=4.986$, ($p=0.028$).

Participants in individual sports felt that self-induced expulsion of food was more effective than participants in group sports found them, $F(3)=3.915$, ($p=0.012$.) Participants in individual sports also found fasting more effective than did participants in group sports, $F(3)=6.220$, ($p=0.001$). Individual sport participants also reported that counting calories and restricting calories were effective, $F(3)=3.165$, ($p=0.029$) and $F(3)=3.125$, ($p=0.030$), respectively. Caucasian participants reported feeling that fad diets were safer than members of

other races reported, $F(2)=3.101$, ($p=0.050$). When using ANCOVA to control the effects of age, there was a significant interaction between gender and sport in terms of how effective participants found the use of restricting calories, $F(3)=3.097$, ($p=0.031$).

More females than males reported that they had fasted, $F(1)=10.426$, ($p=0.002$). There was a significant interaction between gender and sport type on the use of fasting, $F(1)=4.084$, ($p=0.009$). Only males reported to have used performance-enhancing supplements, $F(1)=14.911$, ($p=0.000$). Significantly more group sport participants reported use of performance-enhancing supplements, $F(3)=5.978$, ($p=0.001$). Age also had an effect on reported use of supplements, $F(1)=3.863$, ($p=0.53$). There was an interaction between sex and sport type that affected the reported use of supplements, $F(3)=5.545$, ($p=0.002$).

Age had an effect on reported use of restricting calories, $F(1)=6.213$, ($p=0.015$). The number of females who reported counting calories was nearly significant, $F(1)=3.871$, ($p=0.053$). Participants in individual sports received significantly higher scores on the “drive for size” subscale on the MDDI, $F(3)=5.959$, ($p=0.001$). Similarly, males received significantly higher scores on the “drive for size” subscale than females received, $F(3)=1.250$, ($p=0.046$). Participants in individual sports received higher overall scores on the MDDI than participants in groups sports received, $F(3)=3.507$, ($p=0.019$).

IV. Discussion

Females reported being significantly more concerned with their shape and weight than males did. They also reported higher levels of subclinical disordered eating (restraint in particular). This supports the finding in Klinkby-Stoving & Andries 2011 that females are much more likely to suffer from disordered eating and eating disorders.

Participants in individual sports reported to find of several of the extreme dieting and muscle building behaviors, such as fasting, restricting calories, and self-induced expulsion of food effective while participants in team sports did not. This finding partially proved hypothesis 1, as participants in individual sports were more likely to accept disordered eating behaviors but not necessarily muscle building behaviors. Females in particular were more likely to find the disordered eating behaviors effective. Hypothesis 1 was proven to be partially true. Participants in individual sports were more likely to find fasting, self-induced expulsion of food, counting calories, and restricting calories effective than were participants in team sports and non-athletic controls. However, it was found that neither type of athlete was more likely to find any of the problematic behaviors safe than were non-athletic controls.

Participants in team sports were found to be more likely to use substances such as steroids and other performance-enhancing supplements. It should be noted that the only participants that reported use of performance-enhancing substances were males. Regardless, this disproves hypotheses two. Male participants in team sports were found to be more likely to participate in extreme muscle building behaviors, partially further disproving hypothesis two. However, female participants in individual sports were found to be likely to fast. These results support the findings of previous research. Monthuy-Blanc et al. 2012 found that females involved in sports that focused on aesthetics and leanness, such as track and cross country, reported lower self-esteem and higher rates of disordered eating behaviors. These results also partially proved hypothesis two.

Hypothesis two was proven to be false in that male participants in team sports were very likely to use performance-enhancing supplements; however, hypothesis two was also proven to be true in that female participants in individual sports were more likely to fast and restrict their

food intake. Although there has not been previous research conducted regarding the difference in eating behaviors of individual versus team sport players, it has been proven that team sport participants have generally healthier eating habits than non-athletic individuals (Croll & Neumark-Sztainer et al. 2006). Our research supported this finding in that there were no significant findings regarding team sport participants utilizing disordered eating habits.

These findings are very significant. The data shows that despite athletes' awareness that the behaviors they are engaging in are harmful, athletes still continue to utilize these behaviors in order to control their shape and weight and gain a competitive edge. Unlike other research, this study has shown that athletes are engaging in such behaviors at a very young age. Should these behaviors progress, the future may hold many negative health consequences for these individuals. The number of individual sport athletes participating in extreme dieting and muscle building behaviors was striking. The number of individuals using performance-enhancing substances, although small, was also significant for the population. (Performance-enhancing substance use was only found among team sport athletes.)

Age was strongly correlated with disordered behavior. These results showed that older participants were more likely to both accept and participate in disordered behaviors. This may predict that younger participants will engage in disordered behavior as they get older. These findings should warrant an intervention within the school's athletic population as to prevent the development and progression of disordered behaviors among the school population.

V. Limitations and Future Research

Despite the number of significant findings, there were several methodological limitations of this study. The original population size was 110 participants, but many participants left

surveys incomplete or gave invalid data, leaving the final population size at 92. The population demographics consisted predominantly of female participants, which may have skewed the results to magnify the significance of the impact of gender on several variables. The sample also consisted mostly of Caucasian individuals, which may have produced results incongruous to those produced in previous research. The version of the Muscle Dysmorphic Disorder Inventory (MDDI) that was used omitted the thirteenth question, rendering the researchers unable to analyze the “appearance intolerance” subscale of the survey. There was not a very strong incentive for participation, as the likelihood of winning the gift card was relatively low and extra credit could not be offered in exchange for participation in the study.

The aforementioned limitations emphasize the necessity of future research, as disordered eating and muscle building behaviors can have severe, long-term, negative physical and psychological consequences that should be prevented as early as possible. Further research also may help to confirm the study’s findings. Future research with a larger, more racially diverse population with an even female to male ratio may help to corroborate and further the results obtained in this study. Future research may also incorporate high schools within neighborhoods of different socioeconomic statuses as to analyze whether the high numbers of disordered behaviors and high rates of acceptance of them was due to the relatively high socioeconomic status of the participants.

VI. Acknowledgements

I would like to thank Dr. Tom Hildebrandt at Mount Sinai School of Medicine for giving me all of his scientific guidance, helping me develop this project, analyzing my data, and vastly expanding my interest in science.

I would also like to thank Sydney Shope and Adrienne Flores at Mount Sinai School of Medicine for answering countless questions, analyzing my data, and for helping to write my abstract and final paper.

VII. References

Andersen AE, Woodward PJ, LaFrance N. Bone mineral density of eating disorder subgroups. *Int J Eat Disord* 1995;18:335-42.

Committee on Adolescence. (2003). Identifying and treating eating disorders. *Pediatrics: Official Journal of the American Academy of Pediatrics*, 111(1), 204-211.

Croll, J., Neumark-Sztainer, D., Story, M., Wall, M., Perry, C., & Harnack, L. (2006). Adolescents involved in weight-related and power teamsports have better eating patterns and nutrient intakes than non-sport-involved adolescents. *106(5)*, 709-717.

Hildebrandt, T. Shiovitz R, Alfano L, Greif R. (2008). Defining body deception and its role in peer based social comparison theories of body dissatisfaction. *Body Image*, 5, 299-306.

Franko, D. (2001). Rethinking prevention efforts in eating disorders. *Cognitive and behavioral practice*, 8, 265-70.

Klinkby-Støvning , R., Andries, A., Brixen, K., Bilenberg, N., & Hørder, K. (2011). Gender differences in outcome of eating disorders: A retrospective cohort study. *Psychiatry Research*, 186(2-3), 362–366.

McFarland, M., & Kaminski, P. (2009). Men, muscles, and mood: The relationship between self-concept, dysphoria, and body image disturbances. *Eating Behaviors*, 10(1), 68-70.

Monthuy-Blanc, J., Maïano C, Morin AJ, & Stephan Y. (2012). Physical self-concept and disturbed eating attitudes and behaviors in French athlete and non-athlete adolescent girls: Direct and indirect relations. *Body Image*, 9, 373-380.

Nieuwoudt, J., & Shi, Z. (2012). Muscle dysmorphia: Current research and potential classification as a disorder. *Psychology of Sport and Exercise*, 13, 569-577.

Paxton, S., & Schutz, H. (1999). Friendship clique and peer influences on body image concerns, dietary restraint, extreme weight-loss behaviors, and binge eating in adolescent girls. *Journal of Abnormal Psychology, 108*(2), 255-266.

Pernick, Y., Nichols, J., Rauh, M., Kern, M. Ji, M., Lawson, M., & Wilfley, D. , Nichols, J., Rauh, M., Kern, M. Ji, M., Lawson, M., & Wilfley, D. (2006). Disordered eating among a multi-racial/ethnic sample of female high-school athletes. *Journal of adolescent health, 38*, 689-95.

Pinto, A., & Phillips, KA. (2005). Social anxiety in body dysmorphic disorder. *Body Image, 2*, 401-405.

Pope, H., Gruber, A., Choi, P., Olivardia, R., & Phillips, K. (1997). Muscle dysmorphia: An underrecognized form of body dysmorphic disorder. *Psychosomatics, 38*(6), 548-557.

Robinson, K. & Ferraro, F. (2010). The relationship between types of female athletic participation and female body type. *The Journal of Psychology: Interdisciplinary and Applied, 138*(2), 115-128.

Rome, E. & Ammerman S. (2003). Medical complications of eating disorders: an update. *Journal of Adolescent Health, 33*, 418-26.

Rome ES. Eating disorders. *Obstet Gynecol Clin North Am* 2003;30:353-77, vii.
Stein DM, Reichert P. Extreme dieting behaviors in early adolescence. *J Early Adolesc* 1990;10:108-121.

Scoffier, S., Gernigon C., & d'Arripe-Longuevillea F. (2012). Effects of achievement goals on self-regulation of eating attitudes among elite female athletes: An experimental study. *Psychology of Sport and Exercise, 13*, 201-207.

Van den Berg, P., Mond, J., Eisenberg, M., Ackard, D., & Neumark-Sztainer, D. (2010). The link between body dissatisfaction and self-esteem in adolescents: Similarities across gender, age, weight status, race/ethnicity, and socioeconomic status. *Journal of Adolescent Health, 47*(3), 290–296.