Muscle Dysmorphia in Collegiate Athletes

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Muscle Dysmorphia in Collegiate Athletes

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ABSTRACT

Significance: This study has the potential to provide statistics and information on a subject that desperately needs it. The questions answered by these college athletes will reveal not only whether or not they have characteristics of muscle dysmorphia, but also shed light on some of the possible causes. This information will be valuable in planning strategies to help steer these athletes away from muscle dysmorphia and the harmful mental and physical effects that can result. **Purpose:** The primary purpose of this study is to examine muscle dysmorphia (MD) characteristics in NCAA Division II athletes. A secondary purpose of this study is to determine whether or not other factors such as coaches, positions within certain sports, pressure to keep scholarships or desire to make it to the professional level of athletics are causes of muscle dysmorphia or muscle dysmorphia characteristics. Additional purposes include comparing sports and genders for differences in MD characteristics. Identifying which sports are at risk and why is a crucial step in the process of being proactive and preventing muscle dysmorphia from occurring. **Methodology:** 72 varsity athletes (47 male and 25 female; avg. age =20.18 ± 1.36) were recruited from the University of Central Oklahoma athletic department. Varsity sports that were represented include football, men's basketball, men's wrestling, women's rowing, women's tennis and women's volleyball. Data was collected via the Muscle Dysmorphia Inventory (MDI) . The MDI is a 27-item self-report measure designed for the assessment of behavioral and psychological characteristics associated with MD. Additional questions were also asked about possible causative factors of muscle dysmorphia. **Results:** Tests of between-subjects effects revealed a significant effect for sport on MDI Diet (p = .01) , MDI Supplement (p = .01), MDI Exercise Dependency (p = .01), MDI Physique Symmetry (p = .01), effect of coaches on mass (p

= .01), effect of sport on mass (p = .01), effect of position on mass (p = .01) and effect of professional aspirations on mass (p = .01). There were no significant differences between sports on MDI Pharmacology, MDI Physique Protection, and effect of keeping scholarship on the desire to gain mass. The most noticeable and reoccurring difference on the rest of the subscales was football scoring higher than most of the other sports on most of the subscales. **Conclusions:** The results of the present study suggests that muscle dysmorphia characteristics is present in NCAA collegiate athletes. The subscale that scored the highest with all sports was exercise dependency. This is of great concern because exercise dependency can result in injury both in the weight room and on the court/field. On a positive note, only three subjects (4%), answered to having used a pharmacological aid. The results of the present study support the need for more research to be done on the topic of muscle dysmorphia in all populations (NCAA male and female athletes, professional athletes, male and female high school athletes).

Chapter I

Introduction

Muscle dysmorphia is a preoccupation with the idea that one's body is not sufficiently lean and/or muscular (Choi, Pope, & Olivardia, 2001). It is also called "reverse anorexia" because the primary focus is on becoming overly muscular (Pope, Katherine, & Olivardia, 2000). Precise statistics regarding the prevalence of full-blown muscle dysmorphia are unknown, but millions of athletic men display some of the symptoms associated with muscle dysmorphia (Pope, Katherine, & Olivardia, 2000).

There are many factors that have been identified as causes of muscle dysmorphia. One of these factors is the media. There are increasing pressures on men from the media to be perfect in terms of the masculine ideal. Muscular images of men are used more in television and magazine advertisements than in the past (Leit, Pope, & Gray, 2001). These muscular images have negative effects on body image in males (Leit, Gray, & Pope, 2002).

Many associated disorders and risks of muscle dysmorphia have also been identified. Olivardia, Pope, & Hudson (2000) investigated body image perceptions in male weightlifters by comparing a group with muscle dysmorphia to a control group and found that 100% of the participants with muscle dysmorphia admitted to choosing exercise above other important social obligations or events such as keeping a work-related appointment. Their research also revealed that 58% of the individuals with muscle dysmorphia report a lifetime history of major depressive disorder or bipolar disorder. Men with muscle dysmorphia often suffer from exercise dependence, which is defined as training during times of sickness or injury, even when knowing

that injuries will not heal unless time is taken off from their workout routine (Lantz, Rhea, & Cornelius, 2002). Studies have also shown that more than half of the cases admit to using anabolic steroids (Leit, Pope, & Gray, 2001). According to Yesalis (2005), potential adverse effects of anabolic steroids include baldness, breast shrinkage, acne, prostate changes, clitoral enlargement, aggression, gynecomastia, increased facial/body hair, brittle connective tissue, impotence/sterility, menstrual irregularities, cardiovascular disease, premature hair loss, cerebro-vascular incidents, deepened voice dependency (vocal cord thickening), headaches, hypertension, liver disease, psyche and behavior changes, and short stature (premature growth-plate closure).

Purpose of the Study

The primary purpose of this study is to examine muscle dysmorphia (MD) characteristics in NCAA Division II athletes. A secondary purpose of this study is to determine whether or not other factors such as coaches, positions within certain sports, pressure to keep scholarships or desire to make it to the professional level of athletics are causes of muscle dysmorphia or muscle dysmorphia characteristics. Additional purposes include comparing sports and genders for differences in MD characteristics. Identifying which sports are at risk and why is a crucial step in the process of being proactive and preventing muscle dysmorphia from occurring.

Significance of the Study

This study has the potential to provide statistics and information on a subject that desperately needs it. The questions answered by these college athletes will reveal not only whether or not they have characteristics of muscle dysmorphia, but also shed light on some of the possible causes. This information will be valuable in planning strategies to help steer these

athletes away from muscle dysmorphia and the harmful mental and physical effects that can result.

Hypotheses

Hypotheses of this study include that there will be significant differences between sports for characteristics of muscle dysmorphia, particularly that football will display more characteristics than other sports and that males will display more characteristics than females. Another hypothesis is that males, specifically football players, will respond with higher scores on the additional questions examining pressures from coaches, position, and desires to reach the professional level.

Limitations of the Study

One of the limitations of this study is that the participating athletes will be from a NCAA Division II institution and results may not be able to be generalized to other populations such as the general public, NCAA Division I athletes, professional athletes or athletes younger than college age. Another limitation of this study is that the measure being used is a self-report survey, and participants may not answer questions truthfully.

Delimitations of the Study

The main delimitation of this study is in the participants. For this study the sample will be limited to male and female varsity athletes from the University of Central Oklahoma (a NCAA Division II institution). This study is being limited to NCAA Division II athletes at the University of Central Oklahoma for several reasons. There are few studies done of muscle dysmorphia and of those, very few involve college athletes. The researcher is also interested in investigating possible influencing factors unique to college athletes (coaches, position, sport,

scholarships, and professional aspirations). The selected population is also one that is easily available to the primary researcher. The sample consists of athletes from the University of Central Oklahoma. The sample was purposive, and also a convenient sample for the researcher.

CHAPTER II

Literature Review

Introduction

In society today, body image has been, and continues to be, a growing concern. A vast amount of knowledge exists on body image issues in women, especially as it relates to body image and related eating disorders (anorexia nervosa and bulimia). However, body image is also a concern in males, but research on the topic is lacking. Of the research that has been conducted, most of it is very generalized, with little on the topic of muscle dysmorphia, which looks a multitude of factors related to body image. The research on body image in men has produced valuable information, but muscle dysmorphia takes into account many sub scales and concerns of body image that more generalized studies do not. Also, what little research has been done on muscle dysmorphia has been done on college aged men or men of various age ranges. Even fewer studies have investigated muscle dysmorphia in college athletes. The research that does exist on body image and muscle dysmorphia supports the need for further research into the topic.

This literature review will first identify research studies that have directly looked at muscle dysmorphia. These studies will be divided by those that used collegiate athletes as samples, those that used college aged males (non-athletes) as samples, and those that used males of various age ranges as samples. This literature review will then identify research studies that have looked at body image in males on a more general basis. The purpose of this literature review is to justify the need for this study by citing studies that have identified the need for continued research into muscle dysmorphia and to show a lack of current literature on the topic of muscle dysmorphia in collegiate athletes.

Muscle Dysmorhpia in Collegiate Athletes

The amount of current research on muscle dysmorphia (either using the Muscle Dysmorphia Index or a combination of several different surveys) is lacking. In reviewing current literature, only two studies were found that investigated muscle dysmorphia in collegiate athletes.

Muller, Dennis, Schnieder, & Joyner (2004) conducted a study with a sample of 106 male, college aged athletes from various varsity teams and sport clubs. The participants were divided into 3 groups, weightlifters/ body builders (LBB), contact sports athletes (CS), and non contact sports athletes (NCS). The participants completed two surveys which asked questions concerning steroid use, nutritional supplement use and frequency, exercise regimen frequency, intensity and duration, concerns about body symmetry, physique protection factors and concerns about body size or weight, obsessive compulsive disorder, physical appearance, and perfectionism. The data revealed significant differences between LBB athletes and athletes in the CS or NCS groups. Lifting for power, lifting to increase size and using mirrors to check body size were reported more frequently performed by the LBB group, followed by the CS athletes and the NCS athletes. These differences were significant between each of the three groups. The LBB athletes were significantly more likely to consume dietary supplements than the CS athletes but were not significantly different than the NCS athletes. The LBB group also reported checking their weight with a scale significantly more often than the NCS athletes, while the CS group was not significantly different from the LBB group. The NCS athletes reported significantly more frequently use of baggy clothes to hide perceived physical defects than either the LBB or CS athletes. There were no reported differences between any of the groups for the frequency of

taking steroids or worrying about losing weight. LBB athletes also identified more perfectionist traits within their personalities.

Arroyo, González-de-Suso, Sanchez, Ansotegui, & Rocandio, (2008) conducted a study with a sample of 28 males from the academy of a professional soccer team and 28 male volunteers from a university. The control group consisted of university students participating in a study designed to assess their nutritional status. The control group engaged in recreational sport activities such as swimming or soccer that were not part of any competitive sport training. Participants completed a questionnaire that included basic information, along with items addressing self reported weight and height and ideal weight. To assess ideal weight participants were asked, "Ideally, how much would you like to weigh?" Each participant also took the somatomorphic matrix test. For each participant, five measurements were obtained: his actual body fat and muscularity, his perception of what he thought his fat and muscularity were, the level of fat and muscularity that he ideally wished to have, his judgment of the level of fat and muscularity of an average man of his age in his society, and his judgment of the level of fat and muscularity of the male body that women would prefer. The self-reported and ideal data revealed that 21.4% of players and 17.9% of control participants had a desire to weight more than they presently did. There was no significant difference between groups in the desire for weight gain or weight loss. Significant differences were observed between self-reported and current weight in the control group ($p < .01$) while the difference in the players' group was not significant ($p > .05$). The soccer players had a significantly higher Fat Free Mass Index (FFMI) ($p < .001$) than the control group while the control group had a higher body fat percentage ($p < .001$). No differences were found in the perceived image in body fat percentage ($p > .05$) between groups.

Other than average image (with the soccer players perceiving smaller body size than the controls), there were also no differences in all the measurements of the perceived image in the FFMI. Breaking the players down by position (defenders, midfielders, and forwards), the body compositions were similar. Differences in perceived FFMI were observed between ideal and average image in the soccer players' group ($p < .001$) and between ideal and attractive image in the control group ($p < .001$). Soccer players perceived the average image with significantly lower FFMI than their current, actual, ideal, or attractive image ($p < .001$). Both the soccer players and the control group perceived the ideal, average, and attractive images with significantly higher body fat percentage than their actual image. However, these differences were higher in players ($p < .001$). 78.5% of players and 82.2% of controls were dissatisfied with their body image in respect to their muscularity. While not statistically significant, more soccer players than control participants showed severe dissatisfaction, and in the control group more individuals showed a slight dissatisfaction with their FFMI. There were no differences in dissatisfaction observed for body fat percentage between groups.

Both studies had very interesting findings. Muller et al. (2004) compared different sports and found significant differences. It was shown that weightlifters/ body builders (LBB) were more likely to lift for power, lift to increase size, more frequently use mirrors to check body size, more likely to consume dietary supplements, reported checking their weight with a scale significantly more often, and identified more perfectionist traits within their personalities than one or both of the other groups. The NCS athletes reported significantly more frequently use of baggy clothes to hide perceived physical defects than either the LBB or CS athletes. There were no reported differences between any of the groups for the frequency of taking steroids or

worrying about losing weight. Arroyo et al. (2008) evaluated body composition and body image (perception and satisfaction) in a group of young soccer players and compared the data to a control group. The results revealed that many of the areas of comparison as it relates to areas of muscle dysmorphia were not very different. While the soccer players had a higher FFMI than the control group and the control group had a higher body fat percentage than the soccer players, there were no differences between groups in the perceived image in body fat percentage. Regarding body-image dissatisfaction, 78.5% of players and 82.2% of controls were dissatisfied with their muscularity. While these results were not statistically significant, more soccer players than control participants showed severe dissatisfaction, and in the control group more individuals showed a slight dissatisfaction with their FFMI. An examination of the self-reported and ideal data indicated that 21.4% of players and 17.9% of control participants desired a higher weight. Like the difference in body-image dissatisfaction, these results were non-significant. The finding that more of the control group was dissatisfied with their muscularity goes against the assumption of this proposed study that athletes may be influenced by more factors than males in the general public. However, the soccer players, while displaying a lower percentage, showed more severe dissatisfaction. Also, while not statistically significant, a great percentage of soccer players expressed a desire for a higher weight.

Muscle Dysmorhpia in Competitive Body Builders

A few studies on muscle dysmorphia have involved the use of body builders as the sample population.

Lantz, Rhea, & Cornelius (2002) conducted a study with a sample consisting of 68 elite-level power lifters (63 men; five women) and 100 elite-level bodybuilders (79 men; 21 women).

All were competing in or training for a national championship meet and represented all weight classes. All of the participants filled out the Muscle Dysmorphia Index (MDI), which is a 40-item self-report measure designed for the assessment of behavioral and psychological characteristics associated with MD. Statistical analysis revealed a significant difference between bodybuilders and power lifters ($p < 0.05$). A univariate analysis of variance revealed that bodybuilders were significantly more likely to report body size–symmetry ($p < 0.001$), physique protection ($p < 0.001$), dietary behavior ($p < 0.001$), and pharmacological use ($p < 0.001$) than were power lifters. 14% of participants had an extreme concern with size and symmetry (nine percent were bodybuilders; five percent were power lifters). 21% of the bodybuilders were highly concerned with dietary manipulation, although 71% of bodybuilders and 65% of power lifters used nutritional supplements to enhance performance.

Hitzeroth, Wessels, Zungu-Dirwayi, Oosthuizen, & Stein (2001) conducted a study with a sample of 24 males and four females participating in an amateur body-building competition. All participants underwent a structured diagnostic interview undertaken by a psychiatry resident. The interview consisted of details about body-building activities (age at which body building began, number of years of body building, frequency and duration of training sessions, use of supplements/substances), prior medical and psychiatric consultations, a diagnostic module for body dysmorphic disorder (BDD), questions addressing the research criteria for muscle dysmorphia proposed by Pope et al., and demographic data. Fifteen of the 28 participants met the proposed diagnostic criteria for muscle dysmorphia (met criteria one and three for muscle dysmorphia, and frequently also met several others). There were no differences in body-building activities such as frequency and duration of training sessions. Participants with muscle

dysmorphia had more frequently sought prior medical consultation, with a range of different complaints, than those without muscle dysmorphia. Participants with muscle dysmorphia were also significantly more likely to meet diagnostic criteria for BDD on grounds other than muscle concerns. When muscle dysmorphia participants were divided into groups with and without BDD, there were no significant differences in of the variables (demographic data, body-building activities, use of nutritional or other substances, history of medical or psychiatric consultations).

Of the 28 participants studied by Hitzeroth et al. (2001), 15 (53.6%) met the proposed diagnostic criteria for muscle dysmorphia. While there were no significant differences in demographic data of participants with and without muscle dysmorphia, the authors did not specify what questions were asked. While there were no differences in body-building activities such as frequency and duration of training sessions, participants with muscle dysmorphia had more frequently sought prior medical consultation, with a range of different complaints. Participants with muscle dysmorphia were also significantly more likely to meet diagnostic criteria for body dysmorphic disorder (BDD). When muscle dysmorphia participants were divided into groups with and without BDD, however, there were no significant differences in demographic data, in body-building activities, in use of nutritional or other substances, or in history of medical or psychiatric consultations. While this study fails to identify differences between those diagnosed with muscle dysmorphia and those without, it is still important. Even though the sample size was small, over half met diagnostic criteria for muscle dysmorphia. While the exact causes and specifics were not identified, participants with muscle dysmorphia had more frequently sought prior medical consultation. These two facts support the fact that muscle dysmorphia is a topic that needs to be examined more in depth. Lantz et al. (2002) found

that bodybuilders were significantly more likely to report body size–symmetry, physique protection, dietary behavior, and pharmacological use than were power lifters. Approximately 14% of the study participants had an extreme concern with size and symmetry: of these, 9% were bodybuilders, and 5% were power lifters. The cutoff scores also reflected that 21% of the bodybuilders were highly concerned with dietary manipulation, although the majority of bodybuilders (71%) and power lifters (65%) used nutritional supplements to enhance performance. Not only did this study find differences between body builders and power lifters, with body builder exhibiting more characteristics of muscle dysmorphia characteristics, but it also revealed a high percentage of nutritional supplement use by both populations. This study also supports the continued need to compare different sports.

Muscle Dysmorhpia in College-Aged Men(Non-athletes)

Unlike the populations of athletes and body builders, there is an abundance of current research on muscle dysmorphia in college age men that are not athletes.

Leit, Gray, & Pope (2002) conducted a study with a sample of 82 undergraduate males. The participants were divided into two groups and told that they would be viewing a series of 30 slides that they would later be asked to remember. Each group viewed 30 slides of advertisements from magazines or clothing catalogues. The advertisements in the control group contained either no human images or human images that did not focus on the body. Ten of the slides in the experimental group were neutral and 20 featured ideal images of the male body. Body image perception was measured using the Somatomorphic Matrix. Participants were asked to select the figure that they believe best represents their current body shape, their ideal body shape, the average body shape of men their age, and the body shape most desired by women.

Each man's current body shape was compared to three of his perceptions on the Somatomorphic Matrix: ideal body shape, his estimate of the average body shape of men his age, and the body shape he judged most desired by women. The experimental group displayed a significantly greater discrepancy between current and ideal FFMI than did the control group, t (80) = 2.54, p < .05, and between current FFMI and their estimate of the average man's FFMI, t (80) = 1.98, p = .05. No significant differences were found between groups on the discrepancy between current FFMI and their estimate of the FFMI most desired by women, t (80) =.43, p = ns.

Grieve, Jackson, Reece, Marklin, Delaney, (2008) conducted a study with 134 college-aged men. Participants completed a demographics survey the Social Physique Anxiety Scale (SPAS), the Reasons for Exercise Inventory (REI),the Muscle Dysmorphia Diagnostic Inventory (MDDI) and the Rosenberg Self-Esteem Scale (RSES). All participants completed demographics, the SPAS, and the REI. The data presented here was drawn from two separate but similar studies, so approximately half of the sample (N = 82) also completed the RSES, but not the MDDI. The remaining participants (N = 51) completed the MDDI, but not the RSES. Individuals in the high social physique anxiety group reported significantly higher (p < .001) levels of social physique anxiety than individuals in the low social physique anxiety group. Individuals high in SPA reported higher Scores on the Self-Presentation subscale of the REI (Cohen's d = 0.47), but not the other two subscales. Individuals high in SPA also reported higher scores on the MDDI (Cohen's d = 1.01) and lower scores on the RSES (Cohen's d = 0.70). It also indicated that men with higher levels of SPA would report higher levels of muscle dysmorphia symptoms and that men with higher levels of SPA would report lower levels of self-esteem.

Olson, Esco, & Williford (2009) conducted a study with a sample of a group of 60 college-aged male physical education majors Overall, the sample reported that they preferred a larger, more muscular physique reflective of male images that are currently seen and popular in the mainstream media (sub-group of 21 participants desired a larger, more muscular lower body). The questionnaire package consisted of the Eating Disorder Inventory, Body Dissatisfaction sub-scale (EDI-BD), the Muscle Appearance Satisfaction Scale (MASS), and body silhouette drawings. The mean scores for the EDI-BD and MASS were below cut-scores that are generally indicative of an "increased risk" for a body image disturbance and/or eating disorder. Eleven participants scored above the 90th percentile on the EDI-BD. The mean score for these participants was significantly higher in direction of "increased risk" for a body image and/or eating disorder compared to the overall group mean ($p <$. 05). Their mean MASS score was also significantly different (in the direction of more physique dissatisfaction) from the group mean (p < .05). Participants exhibited a preference for an upper body that was approximately one full rating/size larger in muscularity yet, the mean change in desired fatness was just -0.2 and 0.0 for the upper and lower body. 76% (n = 46) desired an upper body that was one or more sizes larger in muscularity compared to their current size. The mean EDI-BD and MASS scores for this sub-group were not significantly different from the group mean. For the lower body, the mean desired change in muscularity was just over half of a full size increase. Twenty of the participants (35%) desired a lower body one or more sizes larger in muscle compared to their current size.. The ANOVA results showed that these values were significantly different from the group mean ($p <$. 05). A significant correlation r = -0.54, (p < .05) was also found between the EDI-BD and MASS.

Leit et al. (2002) clearly demonstrated that the media has a significant impact on how men view and feel about their bodies. Olsen et al. (2009) also found that their sample preferred a larger, more muscular physique reflective of male images that currently abound the mainstream media. However, this is one of the only causative factors that have been evaluated. This may be satisfactory when applying to the research to the general public, but there may be other factors that contribute to how collegiate athletes view and feel about there bodies, including coaches, sport played, positions within certain sports, pressure to keep scholarships or desire to make it to the professional level of athletics. Grieve et al. (2008) determined that individuals in the high social physique anxiety group reported higher score of the Self-Presentation subscale of the REI, which means they were more likely to exercise for non health related purposes. This could possibly lead to overtraining. The authors also found that men with higher levels of SPA would report higher levels of muscle dysmorphia symptoms and those men with higher levels of SPA would report lower levels of self-esteem. This information lists many of the adverse mental and physical effect of muscle dysmorphia, therefore supporting the need for more research to be done on the topic.

Muscle Dysmorhpia in the General Public

There are also a few studies on muscle dysmorphia that involve samples that are not collegiate athletes or college aged.

Kuennen & Waldron (2007) conducted a study with a sample of 49 males with an age range from 20 to 59 years ($M = 28.27$, $SD = 8.35$). Participants completed questionnaires on muscle dysmorphia, self-esteem, perfectionism and narcissism. Additional measurements also included percent body fat (using skinfolds), height, and weight. Fat free mass index (FFMI) was

calculated from skinfold measurements. FFMIs less than 25 were indicative of non-steroid use, while FFMIs greater than 25 were indicative of steroid use. The self esteem questionnaire displayed a significant negative correlation with the size and symmetry (r = -.42, p < .05), and the physique protection (r = -.39, p < .05). The perfectionism questionnaire displayed a significant positive correlation (r = .35, p < .01) with the exercise dependence subscale of the Muscle Dysmorphia Index (MDI). The size and symmetry subscale showed that participants with FFMIs under 25 had significantly higher scores than participants with FFMIs over 25 (p < .02). A negative relationship was revealed between self-esteem and the size and symmetry and physique protection of the MDI. A direct relationship was shown between perfectionism and the exercise dependence subscale of the MDI. Also, participants did not exhibit increased incidences of muscle dysmorphia while using steroids. Individuals with FFMIs below 25 scored significantly higher on this subscale than individuals with values greater than 25.

Cafri, Berg & Thompson (2006) conducted a study with a sample of 269 boys ranging in age from 13 to 18 (M = 14.64, SD = 1.03). Participants responded to the following surveys: Pubertal Development Scale, Media Influence Scale for Adolescent Boys,Teasing about muscularity, Negative Affect Scale, Rosenberg Self-Esteem Inventory, Drive for Muscularity Scale (Body Image Subscale), Muscle Appearance Satisfaction Scale (MASS), Participation in power sports, Substance use, and Dieting to Gain Weight Subscale of the Body-Change Inventory. Out of 266 participants, seven (2.6%) reported lifetime use of steroids and 4 of 265 (1.5%) reported current use. Twelve of 264 (4.5%) reported lifetime use of pro-hormones and 10 of 262 (3.8%) reported current use. Sixteen of 264 (6%) reported lifetime use of ephedrine, and 10 of 264 (3.8%) reported current use. Twenty six participants (9.8%) had used steroids,

ephedrine, pro-hormones, or a combination of the three. There were statistically significant correlations between drug use and participation in power sports. Correlations between MD symptoms and the predictors revealed statistically significant relations with media, negative affect, participation in football specifically, teasing, participation in power sports, and body dissatisfaction, with medium to large effect sizes (with a large effect for media, $r = .59$). For the correlations between dieting to gain weight and the independent variables, the statistically significant correlations were with body dissatisfaction, teasing, negative affect, and self-esteem, with small to medium effect sizes.

Kuennen & Waldron (2007) found that their self esteem questionnaire displayed a significant negative correlation with size and symmetry as well as physique protection. Individuals with muscle dysmorphia tend to have lowering of self-esteem and are more likely to hide perceived defects in their bodies. While physique protection may not be of great concern, low self esteem is, as it can lead to the development of other muscle dysmorphia characteristics. The authors also found that characteristics of perfectionism displayed a significant positive correlation with the exercise dependence. As stated earlier, exercise dependence can lead to over training, sickness, and injury.

The research of Cafri et al. (2006) provides valuable information on supplement use associated with muscle dysmorphia. Of their sample, 266 participants (2.6%) reported lifetime use of steroids and 4 of 265 (1.5%) reported current use. Additionally, 12 of 264 (4.5%) reported lifetime use of pro-hormones and 10 of 262 (3.8%) reported current use. For ephedrine, 16 of 264 (6%) reported lifetime use, and 10 of 264 (3.8%) reported current use. 26 participants (9.8%) had used steroids, ephedrine, pro-hormones, or a combination. The authors' findings also support

previous research identifying the media as a contributing factor of muscle dysmorphia. The finding also support the need to further examine the influences associated with specific sports. With respect to drug use, the statistically significant correlations were with power sports participation, MD symptoms, and media influence. Examination of the correlations between MD symptoms and the predictors revealed statistically significant relations with media, negative affect, participation in football specifically, teasing, participation in power sports, and body dissatisfaction.

Body Image in the General Public

While very few studies have addressed muscle dysmorphia, there are many that investigate body image on a more generic level. While many studies used college aged males or various age ranges, no literature was found with college athletes as the sample**.**

Ahmed, Olsen, & Pituch (2002) conducted a study with a sample of 49 college women (mean age = 20 years). Participants participated in strength training classes twice a week for 50 minutes over the course of 12 weeks. Participants were given the choice of programs with the goals of strength development, muscular endurance or muscular toning. A qualitative questionnaire was developed to ask participants to reflect on changes in their overall health and body image as well as their attitude toward perceived physical changes as a result of the program. Average changes in weight, circumferences, and percentage of fat were not statistically significant. On average, strength gains were all positive. Four of the strength gain measurements were statistically significant. Of the 41 participants who completed the questionnaire, 97.5% indicated that they felt healthier and more fit after the strength training. Fifty one percent of the participants also indicated that perceptions of their body image improved after the training class.

Also, 85.3% of the participants indicated an improved attitude toward their physical selves. Twenty four percent of the participants reported neutral or negative responses about their body or body image after the training.

Watkins, Christie, & Chally (2008) conducted a study with a sample of 188 male students (mean age = 26.15 years;*SD* = 7.07). BMI ranged from 16.72 to 54.52 (mean BMI = 25.38;SD = 4.45). A revised version of a self-report survey developed by the Notre Dame Counseling Center was used to examine the prevalence of eating, weight, and body image attitudes and behaviors in a college student sample. A Body Image Scale was used assess the cognitive and affective dimensions of body image and determine potential differences among four BMI groups. The sample was divided into four BMI categories: underweight (< 20), normal weight (20 to 24.99), overweight (25 to 29.99), and obese (≥ 30). Overweight men scored significantly higher on the affective Weight/Shape Concern subscale than did underweight, normal-weight, and obese men. Underweight, overweight, and obese men indicated significantly greater body dissatisfaction than did normal-weight men. Significant differences were found in regard to total body image ($p < .001$), weight or shape concern ($p < .001$), and body dissatisfaction ($p < .001$). BMI was significantly correlated with negative body image. Overweight and obese participants reported significantly higher levels of negative body image than did normal- and underweight participants. Overweight participants reported significantly higher weight and shape concerns than did underweight, normal-weight, and obese participants. In regard to body dissatisfaction, underweight, overweight, and obese participants reported significantly higher levels of body dissatisfaction than that reported by normal-weight participants.

Merriman, Brahler, Dinan, & Finzer (2008) conducted a study with a sample of 101 college students (52 female, 49 male). All participants completed the University of Dayton Eating Assessment and History Form and the Eating/Body Concerns Checklist (UDEA), a screening instrument used for college students seeking assistance with eating disorders. There was a statistically significant difference in the number of body image concerns that were selected between the five different levels of motivation to resolve these concerns ($p < 0.019$). Both males and females paired an increased motivation to resolve their concerns with an increased number of body image concerns. There was a significant gender difference with respect to motivation to resolve body image concerns and the actual number of body image concerns selected ($p < 0.007$). When compared to male students, female students selected more body image concerns for any given level of motivation to resolve the concerns. There was no significant difference in number of eating concerns selected between the genders ($p < 0.127$) or in the number of eating concerns selected between the five different levels of motivation to resolve these concerns ($p < 0.302$). There was not a statistically significant interaction between gender and motivation level regarding eating ($p < .303$) or body image concerns ($p = .699$). However, statistically significant differences did exist in weight fluctuation (in pounds) between males and females ($p < 0.009$) and in weight fluctuation between the different motivation levels ($p < 0.037$). In regard to weight fluctuation, there was not a significant interaction between gender and motivation level.

Swami, Furnham, Amin, Chaudhri, Joshi, Jundi, Miller, Mirza-Begum, Begum, Sheth, & Tovee (2008) conducted a study with a sample of 130 British university undergraduates (75 women, 55 men). Participants rated grayscale images of 50 consenting real women in a front

view. Of the 50 images, ten were drawn from each of the following five BMI categories: emaciated (< 15 kg/m²), underweight (15–18.5 kg/m²), normal (18.5–24.9 kg/m²), overweight (25.0–29.9 kg/m²) and obese (> 30 kg/m²). The range of BMI values was 11.6– 41.2 kg/m². Participants were asked to record ratings of each image using one of three separate negative descriptors: gets teased, lonely, and lazy. Participants used a Likert-type scale to rate each image. The scale ranged from one (very unlikely to get teased, not at all lonely, not at all lazy) to nine (very likely to get teased, very lonely, very lazy). Very high correlations were found between male and female ratings for each descriptor. This suggests that participants were ranking the images in the same way (gets teased, $r = .98$, $p < .001$; lonely, $r = .97$, $p < .001$; lazy, $r = .99$, $p < .001$). Intraclass reliabilities and intraclass variations were calculated and showed a very high degree of agreement among the observers' ratings for each variable (gets teased, male = .97, female = .98; lonely, male = .97, female = .96; lazy, male = .95, female = .97). Reliability was very high and consistent across both gender groups, according to these findings. Amalgamating the male and female observers did not significantly change the intraclass reliability measures (gets teased = .97; lonely = .97; lazy = .96).

Swami, Furnham, Amin, Chaudhri, Joshi, Jundi, Miller, Mirza-Begum, Begum, Sheth, & Tovee (2008) conducted a study with a sample of 80 British university undergraduates (40 men, 40 women). The mean age of the male participants was 25.75 years ($SD = 8.22$ years), 21.75 years ($SD = 5.34$ years) for females. Participants we asked to rate grayscale images of 50 real men in a front view. High correlations were found between male and female ratings for each descriptor (gets teased, $r = .90$, $p < .001$; lonely, $r = .95$, $p < .001$; lazy, $r = .92$, $p < .001$). A high degree of agreement among the observers' ratings for each variable as also discovered (gets

teased, male = 0.95, female = 0.96; lonely, male = 0.97, female = 0.97; lazy, male = 0.96, female = 0.94). This suggests that the reliability was very high and consistent for both gender groups. Amalgamating the male and female observers did not significantly change the intraclass reliability measures (gets teased = 0.95; lonely = 0.97; lazy = 0.95). A multiple polynomial regression was used to model the contributions of BMI and waist-to-chest (WCR) ratio to participants' ratings. The total variance explained by this model for the relation between WCR and the three descriptors was 47.1% for gets teased, 49.1% for lonely, and 36.2% for lazy. This suggests that WCR was an important component of ratings for all descriptors. The total variance explained by the relation between BMI and ratings was 30.8% for gets teased, 32.6% for lonely, and 50.9% for lazy. This finding suggests that along with WCR, BMI is also an important component of ratings. Ratings of laziness were better predicted by BMI than WCR, suggesting that overall body weight may have been more important for participants when rating with this descriptor. Participants judged men with higher WCRs more negatively for all descriptors. In addition, participants judged overweight men more negatively (lazier, lonelier, and teased more often) than average-weight men.

Ousley, Cordero, & White (2008) conducted a study with a sample of 272 college students (70% female and 30% male; average age of 20.9 years). A modified version of the Weight Management Questionnaire (WMQ) was used. The survey yields frequency data for individual eating disorder symptoms (eg,laxative use), body image concerns (eg, fear of becoming fat), and eating disorder categories (eg, bulimia nervosa). A significantly lower percentage of men with an eating disorder reported feeling fat than did women with an eating disorder. Men with an eating disorder also indicated that they were significantly less fearful

about gaining weight and becoming fat or heavy. No significant gender differences were found between how males and females responded to questions on concern about weight and shape or fear of becoming flabby or untoned. A greater percentage of eating-disordered men (compared with no-diagnosis men) reported that they always, often, or frequently felt fat and were very or moderately fearful of becoming flabby or untoned.

Kyrejto, Mosewich, Kowalski, Mack & Crocker (2008) conducted a study with a sample of 71 men (age M = 20.2 yrs, SD = 3.1 yrs) and 126 women (age M = 19.6 yrs, SD = 3.2 yrs). The following questionnaires were completed by all participants: the original Drive for Muscularity Attitudes Questionnaire (DMAQ), a modified DMAQ with a focus on muscle tone, a Visual Analogue Scale, open-ended responses for cognitive and behavioral correlates, and the self-presentation measures of Fear of Negative Evaluation, Public Self Consciousness, and Social Physique Anxiety Scale. The DMAQ and mDMAQ were significantly related (r = .80 for both men and women; $p < .05$). The four "bulk" items on the DMAQ were significantly related to the four "tone" items on the mDMAQ (r = .55, $p < .05$). Men reported higher values than women on the DMAQ; ANOVA analysis showed a significant gender difference on the DMAQ ($p < .01$). The test of gender difference on the mDMAQ (i.e., the DMAQ with a focus on tone as opposed to bulk) was not significant: $F(1, 190)$ =.03. 74.6% of men and 73.0% of women reported physical activity in their open-ended responses (e.g., "I work out"; "I pump iron"). Diet, cognitive problem solving, leisure activity, and social support were other predominant cognitions and behaviors. 33.8% of men and 26.2% of women reported diet (e.g., "I eat healthy"; "I take protein supplements") and 32.4% of men and 28.6% of women reported cognitive problem solving (e.g., "I set goals to reach"; "I think about the positive outcomes of exercise"). Leisure

activity was reported by 21.1% of men and 23.8% of women reported leisure activity (e.g., "I watch T.V."; "I watch sports") and 18.3% of men and 23.0% of women reported social support (e.g., "I make exercise a social activity"; "I'm friends with physically active people"). Total number of cognitions and behaviors was significantly correlated with the DFM scales for women ($p < .05$). This relationship was not significant for men ($r = .02$ to .11, n.s.). The cognitions and behaviors associated with DFM were rated as effective ($M = 3.79$, $SD = .99$). It was possible for each participant to report multiple correlates in the open-ended portion of the questionnaire, so correlates were also examined in terms of total number of instances in which they were reported. No significant gender difference in the number of reported correlates was found, with men reporting a total of 212 correlates (an average of 3.00 correlates, $SD = 1.72$) and women reporting a total of 383 correlates (an average of 3.03 correlates, $SD = 1.77$). The most common reported correlate for men and women was physical activity, which encompassed 43.4% of the total responses for men and 50.% for women. There were no significant gender differences on sample or total responses for any of the correlates.

Leone & Fetro (2007) conducted a study with a sample of 12 men. Specific inclusion criteria outlined in a prescreening survey was used to select participants. Demographic information, knowledge, and behaviors were assessed. Attitudes were assessed with the Drive for Muscularity Scale, a 15-item, self-report, survey. Body image satisfaction was assessed using the Body Image Questionnaire. Mean scores by group for the DMS yielded an overall score of 3.23 ± 0.58 (range 1-5) for group I (younger precluders) and 4.83 ± 0.15 for group II (older precluders). This scale measures a person's perception of their body image, with lower scores suggesting higher levels of dissatisfaction. The Body Image Questionnaire (BIQ), yielded scores

of 4.6 ± 1.9 for group I and 2.4 ± 1.6 for group II (based on 15 questions). When asked to respond to the question, "Why do people choose to utilize androgenic-anabolic steroids?" both groups had several common responses. Responses from the younger group included citing side effects, getting caught, morality, having been educated on AAS dangers, and monetary reasons. Responses from he older group included stigma, fear of needles, lack of awareness, decreased concern with body image, and the belief it was not masculine to be body image conscious when they were growing up as primary reasons for not using AASs. Body image was much less of a concern for the older group. Concern for body image was maintained with age but, but for different reasons with regard to health. Participants in both groups noted increasing trends in society, such as the media, as what defines an ideal male body. Both groups agreed that chemical means are most always necessary for men to attain such standards. Participants responses revealed differences as to how the media influences older vs. younger participants. Younger participants felt the need to look a certain way, and older participants felt it would be nice to look more like ideal males in the media. Need was emphasized much less in the older participants.

Ahmed et al. (2002) investigated whether participants' perception of body image indicated any change in satisfaction after 12 weeks of strength training in college aged women. Their findings revealed that average changes in weight, percentage of fat, circumference changes were quite small were not statistically significant and only four of the strength gains were statistically significant. However, 97.5% (out of 41) indicated that they felt healthier and more fit after the strength training. In addition, 51.2% of the participants indicated that perceptions of their body image improved after the training class. Also, 85.3% of the participants indicated an improved attitude toward their physical selves. Finally, 24.3% of the participants reported neutral

or negative responses about their body or body image after the training. While these finding have very little to do with muscle dysmorphia in men, they do establish that there is a relationship between exercise and body image, which is a crucial component of muscle dysmorphia.

Watkins et al. (2008) established that underweight, overweight, and obese men indicated significantly greater body dissatisfaction than did normal-weight men. The authors also found that BMI was significantly correlated with negative body image. The authors also established that in regard to body dissatisfaction, underweight, overweight, and obese participants reported significantly higher levels of body dissatisfaction than that reported by normal-weight participants. While the main finding of this study is a negative correlation between BMI and body image, it also reports that, along with overweight and obese participants, underweight participants reported significantly higher levels of body dissatisfaction than that reported by normal-weight participants. This is also supportive of further research into muscle dysmorphia because underweight individuals with high level of body dissatisfaction are at risk of developing muscle dysmorphia.

The most important finding by Merriman et al. (2008), as it related to muscle dysmorphia is that male college and university students are less likely to seek help for their disordered eating, weight control, and binge eating, which undoubtedly supports the need to further study muscle dysmorphia in college males.

Swami et al. (2008) examined the stigmatization of the female body and found that BMI is a very strong predictor appearance ratings, with images with higher BMI's receiving high ratings: 83.2% for gets teased, 81.5% for lonely, and 96.3% for lazy. Swami et al. (2008) also

examined examined the stigmatization of the male body and found that participants judged overweight men more negatively (lazier, lonelier, and teased more often) than average-weight men. These finding are important because they explain part of the reasons why those with body image issues may also have self esteem issues.

Research by Ousley et al. (2008) revealed that a significantly lower percentage of men with an eating disorder reported feeling fat than did women with an eating disorder. The authors also determined that men with an eating disorder indicated that they were significantly less fearful about gaining weight and becoming fat or heavy. A greater percentage of eating-disordered men (compared with no-diagnosis men) reported that they always, often, or frequently felt fat and were very or moderately fearful of becoming flabby or untoned. While this study investigated men with eating disorders related to anorexia or bulimia, it does support the fact that men can indeed suffer from eating disorders.

Research by Kyrejto et al. (2008) supports the relevance of drive for muscularity (DFM) to both men and women and the need to better understand a broad range of cognitive and behavioral correlates of DFM. These finding support the further need to study muscle dysmorphia in men and also provides support to study muscle dysmorphia in women as well.

While Leone & Fetro (2007) identified why men of two age categories have chosen not to use androgenic-anabolic steroids, their research also revealed other valuable information. They determined that body image was much less of a concern for the older group and that age appears to be a strong factor. This supports the need to study muscle dysmorphia in college age males. Participants in both groups also confirmed previous research by noting increasing trends in society (i.e., media) in terms of what defines an ideal male body and agreeing that for men to

attain such standards, chemical means are most always necessary. Differences existed as to how the media influences older vs. younger participants. Younger participants felt the need to look a certain way, whereas older participants felt it would be nice to look more like ideal images in the media, but need was emphasized much less. This also supports age as a factor and supports the need to study muscle dysmorphia in college age males.

Body Image in the Men

O'Kane, Graig, & Sutherland (2008) conducted a study with a sample of 36 men (between the ages of 25 and 64 years). Participants participated in a focus group discussing the the attitudes of rural men to matters of health and body image. Before age 25 ('education and preparation for work years'), men are more likely to move and may not have developed a routine of regular eating and exercise habits. After the age of 64, men have generally retired, which influences changes in lifestyle choices. While there were not any specific related questions, attitudes of the men towards health and body image emerged from the focus groups. There was no attempt to quantify the information. Instead, mix of direct quotes and a summary of the discussions were analyzed and followed by overall discussion. In one of the focus groups, the men explored some of their approaches to eating. They concluded that women were more conscientious about meal preparation because they were more conscious of their appearance. The question that was then asked was that if appearances was not a motivating factor to think about health, then what was. At one of the other focus groups, some of the men did not worry if 'Joe Blow' got sick, because they considered themselves 'bullet-proof', until something unfortunate happened directly to them. The men also discussed their memories of when they were younger and were able to eat and drink alcohol as much as they liked. Their reasoning behind this was

that: " you're absolutely 'bullet-proof' in your twenties." Many of the men believed that men and women have very different approaches to health issues, stating that most men will put off going to the doctor for a check-up and ignore problems, whereas their wives were more inclined to have routine have health checks.

McDonagh, Morrison, McGuire (2008) conducted a study with a sample of 136 men (17 to 34 years old; $M = 21.38$, $SD = 3.85$). Respondents were given a questionnaire packet containing the following measures: Body Esteem Scale, the Drive for Muscularity Attitudes Questionnaire (DMAQ), The Male Body Image Self-Consciousness (M-BISC), Self-rated bodily attractiveness, Sex Anxiety Inventory (SA), the Sexual Esteem Scale (SES) and Sexual experience. Scores on the M-BISC ranged from 17 to 70 ($M = 35.89$, $SD = 12.12$). The average score revealed fairly low levels of body image self-consciousness during physical intimacy in the participants. Results of Pearson's correlation coefficients indicated that higher levels of body image self consciousness during physical intimacy were associated with being less likely to have: 1) engaged in vaginal intercourse, $r = -.24$, $p < .01$; 2) performed oral sex on another person, $r = -.28$, $p < .001$; or 3) received oral sex from another person, $r = .27$, $p < .01$. There was no statistically significant correlation between scores on the M-BISC and whether participants had engaged in anal intercourse, the number of times they had engaged in vaginal intercourse over the past four weeks, or their dating status.

Anderson, Foster, McGuigan, Seebach, & Porcari (2004) conducted a study with a sample of 28 (aged 18–40 years). A panel of three men and three women of similar age to the participants were also recruited to objectively rate the physical appearance of the participants. The participants were randomly assigned to one of three training groups: a cardiovascular group,

a strength group, and a control group. Participants were photographed from four angles while wearing swim briefs. Physical tests as well as objective and subjective appearance ratings were measured before and after a six-week training session. The appearance ratings were completed using an analog scale developed by the authors. The far left side of the scale was labeled ‘‘very unattractive,’’ and the far right side of the scale was labeled ‘‘very attractive.’’ Participants were asked to place a mark on the scale showing how they perceived their own physical attractiveness. The panel members were also asked to rate the appearance of the participants pre- and post exercise. No change in objective measures were noticed pre- and post training among groups. There was no significant difference in VO_2 max, percent fat, total lean tissue, percent limb fat, percent trunk fat, lean trunk tissue, or lean limb tissue, or sum of skin fold measurements. While there was no significant interaction effect, shoulder girth increased. This increase in shoulder girth caused a significant difference in the shoulder-to waist ratio with an interaction effect. There were no significant differences in the pre- vs. posttest measures in self-rated appearance scores. While there was no significant interaction effect, the panel did show a significant change in pre- vs. posttest appearance ratings. There was a statistically significant difference between the subject-rated appearance scores and the panel-rated appearance scores, with the participants rating themselves higher than the panel. A comparison between the men and women of the panel showed that the men of the panel rated the participants significantly higher than the women.

O’Kane et al. (2008) used focus groups to gather information on eating and health habits of men. The main finding of this study as it relates to muscle dysmorphia is that participants admitted to practicing unhealthy habits or not practicing healthy habits because they felt ‘bullet-proof.” The other significant fact was that many participants pointed to cultural traditions as one

of the cause of unhealthy habits such drinking to excess. This is important because it further supports how culture and media can contribute to unhealthy practices such as muscle dysmorphia.

McDonagh et al. (2008) revealed that poor body image can have a significant effect on physical intimacy. This is important because it identifies another negative self esteem issue related to body image.

Anderson et al. (2004) investigated the effect of a short-term exercise program on subjective physical appearance ratings. There was no significant difference in percent fat, total lean tissue, percent limb fat, percent trunk fat, lean trunk tissue, or lean limb tissue. There were also no significant differences in the pre- vs. posttest measures in self-rated appearance scores. While the combined panel showed a significant change in pre- vs. posttest appearance ratings, no significant interaction effect was observed. A comparison of the subject-rated appearance scores and the panel-rated appearance scores revealed a statistically significant difference. The participants rated themselves higher than the panel. The importance of this study is that the men rated themselves differently than the panel. In this case it was higher, but it shows that men may have different opinions of themselves that differ from reality, such as thinking of themselves as not lean or muscular enough.

Summary

The current literature on muscle dysmorphia, and lack thereof, supports the need for more research on the topic. Few studies have been, and the ones that have, provide substantial information that needs to be explored further. Muller et al. (2004) compared different sports and found significant differences. These finding of differences between sports supports the need for

more comparisons. While this study revealed differences, it did so by grouping the sports into categories, and not by specific sport. More detailed information might be discovered if comparisons were done sport by sports, instead of lumping them into generic categories. However, Arroyo et al. (2008) evaluated body composition and body image (perception and satisfaction) in a group of young soccer players and compared the data to a control group, and the difference, however, these differences were non significant. Leit et al. (2002) clearly demonstrated that the media has a significant impact on how men view and feel about their bodies. Olsen et al. (2009) also found that their sample preferred a larger, more muscular physique reflective of male images that currently abound the mainstream media. However, this is one of the only causative factors that have been evaluated. This may be satisfactory when applying to the research to the general public, but there may be other factors that contribute to how collegiate athletes view and feel about there bodies, including coaches, sport played, positions within certain sports, pressure to keep scholarships or desire to make it to the professional level of athletics. The research of Cafri et al. (2006) provides valuable information on supplement use associated with muscle dysmorphia. Of their sample, 266 participants (2.6%) reported lifetime use of steroids and 4 of 265 (1.5%) reported current use. Additionally, 12 of 264 (4.5%) reported lifetime use of pro-hormones and 10 of 262 (3.8%) reported current use. For ephedrine, 16 of 264 (6%) reported lifetime use, and 10 of 264 (3.8%) reported current use. Twenty six participants (9.8%) had used steroids, ephedrine, pro-hormones, or a combination. The authors' findings also support previous research identifying the media as a contributing factor of muscle dysmorphia. The finding also support the need to further examine the influences associated with specific sports. With respect to drug use, the statistically significant correlations

were with power sports participation, MD symptoms, and media influence. Examination of the correlations between MD symptoms and the predictors revealed statistically significant relations with media, negative affect, participation in football specifically, teasing, participation in power sports, and body dissatisfaction.

CHAPTER III

Methodology

Participants

Seventy two varsity athletes (47 male and 25 female; avg. age = 20.18 ± 1.36) were recruited from the University of Central Oklahoma athletic department. Varsity sports that were represented include football, men's basketball, men's wrestling, women's rowing, women's tennis and women's volleyball. Descriptive statistics can be found in Table 1.

Table 1

Descriptive statistics by individual sports and total group.

Sports	*n*	BMI (kg/m^2)		Age (years)	
		M	*SD*	*M*	*SD*
Football	23	29.59	4.14	20.00	.95
Wrestling	14	24.60	3.28	20.42	1.60
Volleyball	8	22.48	1.83	20.14	1.34
Tennis	8	22.21	3.16	18.85	1.67
Rowing	9	23.85	3.32	20.44	1.01
Basketball	10	23.77	1.09	21.11	1.36
Total	72	25.47	4.28	20.18	1.36

*Note.*There was one participant from tennis and one from football that did not respond to BMI information. BMI = body mass index.

Data Collection

Each participant completed a written informed consent form before data was collected (Appendix B). Data was collected via the Muscle Dysmorphia Inventory (MDI) (Appendix A). The MDI was developed by Lantz, Rhea, & Cornelius (2002). The MDI is a 27-item self-report measure designed for the assessment of behavioral and psychological characteristics associated with MD. The MDI contains six subscales: body size–symmetry (e.g., I feel satisfied with the

shape of my body); physique protection (e.g., I wear bulky clothing to hide my physique from others); exercise dependence (e.g., I maintain a strict workout schedule); supplement use (e.g., before a workout I consume energy drinks); dietary behavior (e.g., I regulate my caloric intake to maximize muscle development); and pharmacological use (e.g., I use steroids to increase my size and definition). Of the six subscales, five use a six-point Likert scale of ‘‘always’’, ‘‘usually’’, ‘‘often,’’ ‘‘sometimes’’, ‘‘rarely’’, or ‘‘never.’’ Responses for each item of the five subscales are scored from one to six, with a score of six assigned to the responses farthest in the ‘‘symptomatic’’ direction and a score of one for the responses farthest in the ‘‘asymptomatic’’ direction. Subscale scores are computed by summing all the item scores for that particular subscale. A higher score per subscale translates into a higher risk of the characteristics associated with MD.The pharmacological use subscale requires respondents to indicate how often they use various pharmacological aids (2 or more times daily = 6, once daily = 5, 2–6 times weekly = 4, 1–3 times monthly = 3, less than once a month = 2, never = 1) (Lantz, Rhea, & Cornelius, 2002).

Additional questions were also asked about possible causative factors of muscle dysmorphia including the effect of coaches on desire to add mass, effect of sport on the desire to add mass, effect of sport position on the desire to add mass, effect of keeping scholarship on the desire to add mass and the effect of professional aspirations on the desire to add mass.

Data Analysis

A multivariate test was conducted to determine if there was any difference on MDI subscales by sport. Pillai’s Trace indicated significant effect for sport and post hoc tests were performed to identify significant differences. T-tests were conducted to compare differences

between football linemen and skill positions. T-tests were also conducted to determine differences between males and females.

CHAPTER IV

Results

Multivariate Test

Pillai's Trace indicated significant effect for sport, F (55, 300) = 2.46, $p < .01$, partial eta squared = .31, observed power = 1.00.

Tests of between-subjects effects revealed a significant effect for sport on MDI Diet , MDI Supplement, MDI Exercise Dependency, MDI Physique Symmetry, effect of coaches on mass, effect of sport on mass, effect of position on mass and effect of professional aspirations on mass.

There was a significant effect for sport on MDI Diet, F (5, 66) = 4.133, $p < .01$, partial eta squared = .238, observed power = .941. There was a significant effect for sport on MDI Supplement, F (5, 66) = 6.406, $p < .01$, partial eta squared = .327, observed power = .995. There was a significant effect for sport on MDI Exercise Dependency, F (5, 66) = 18.459, $p < .01$, partial eta squared = .583, observed power = 1.00. There was a significant effect for sport on MDI Physique Symmetry, F (5, 66) = 12.295, $p < .01$, partial eta squared = .482, observed power = 1.00. There was a significant effect for sport on Sport Mass, F (5, 66) = 7.501, $p < .01$, partial eta squared = .362, observed power = .999. There was a significant effect for sport on Pro Mass, F (5, 66) = 8.763, $p < .01$, partial eta squared = .399, observed power = 1.00. There was a significant effect for sport on Coach Mass, F (5, 66) = 9.229, $p < .01$, partial eta squared = .411, observed power = 1.00.

There were no significant differences between sports on MDI Pharmacology, MDI Physique Protection, and effect of keeping scholarship on the desire to gain mass. The most

noticeable and reoccurring difference on the rest of the subscales was football scoring higher than most of the other sports on most of the subscales. Football scored significantly higher than every other sport (volleyball, wrestling, rowing, tennis and basketball) on MDI Physical Symmetry, effect of position on the desire to gain mass, effect of coaches on the desire to gain mass, and effect of professional aspirations on mass. For the effect of sport on the desire to gain mass subscale, football scored significantly higher than every sport (volleyball, wrestling, tennis and basketball) with the exception of rowing. There were significant differences between sports on most of the MDI subscales. On the MDI diet subscale, both football and wrestling were significantly higher than men's basketball. For MDI Supplement, men's football was significantly higher than volleyball, wrestling, and women's rowing. Men's basketball was also significantly higher than volleyball. For MDI Exercise Dependency, football was significantly higher than volleyball, basketball, and rowing. Wrestling was significantly higher than volleyball, and basketball. Surprisingly, rowing scored significantly higher than basketball, as did tennis.

Table 2

Means of muscle dysmorphia inventory (MDI) subscales by individual sports, and total group.

Subscale	FB	WR	VB	Ten	Row	BB	Tot
Nutrition Factors							
Diet*	17.21	17.28	12.37	12.12	12.44	10.80	14.63
Supplementation*	13.08	9.21	4.62	8.75	7.88	10.20	9.86
Pharmacology	3.12	3.14	3.00	3.00	3.33	3.90	3.23
Physique development factors							
Exercise dependence*	20.39	17.42	13.00	16.87	16.44	9.60	16.61
Body size*	20.91	14.57	8.50	8.75	14.88	11.60	14.90
Physique protection	13.08	11.28	8.37	10.25	10.77	11.70	11.41

*Note.*FB=football; WR=wrestling; VB=volleyball; Ten=tennis; Row=rowing; BB=basketball; *Statistically significant differences at the 0.05 level.

Post Hoc Test-MDI Diet

Results for MDI Diet can be found in figure 1. There was a significant difference ($p = .034$) between wrestling ($M = 17.28$; $SD = 4.73$) and men's basketball ($M = 10.800$; $SD = 2.78$). There was a significant difference ($p = .017$) between football ($M = 17.21$; $SD = 6.33$) and men's basketball ($M = 10.800$; $SD = 2.78$).

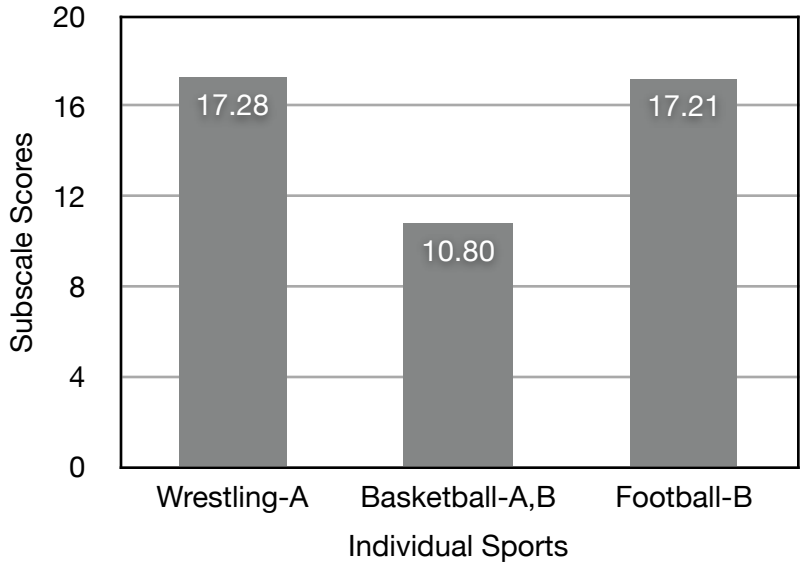

Figure 1. Significance for MDI Diet. Matching letters indicate a significant difference between sports. There were significant differences between wrestling (*A*) and men's basketball (*A*); football (*B*) and men's basketball (*B*).

Post Hoc Test-MDI Supplement

Results for MDI Supplement can be found in Figure 2. There was a significant difference ($p <$ .000) between volleyball ($M = 4.62$; $SD = 1.06$) and men's football ($M = 13.08$; $SD = 5.60$). There was also a significant difference ($p =$ .049) between volleyball ($M = 4.62$; $SD = 1.06$) and men's basketball ($M = 10.20$; $SD = 2.29$). There was almost a significant difference ($p =$ .060) between football ($M = 13.08$; $SD = 5.60$) and wrestling ($M = 9.21$; $SD = 3.21$). There was a significant difference ($p =$ .018) between football ($M = 13.08$; $SD = 5.60$) and women's rowing ($M = 7.88$; $SD = 3.25$).

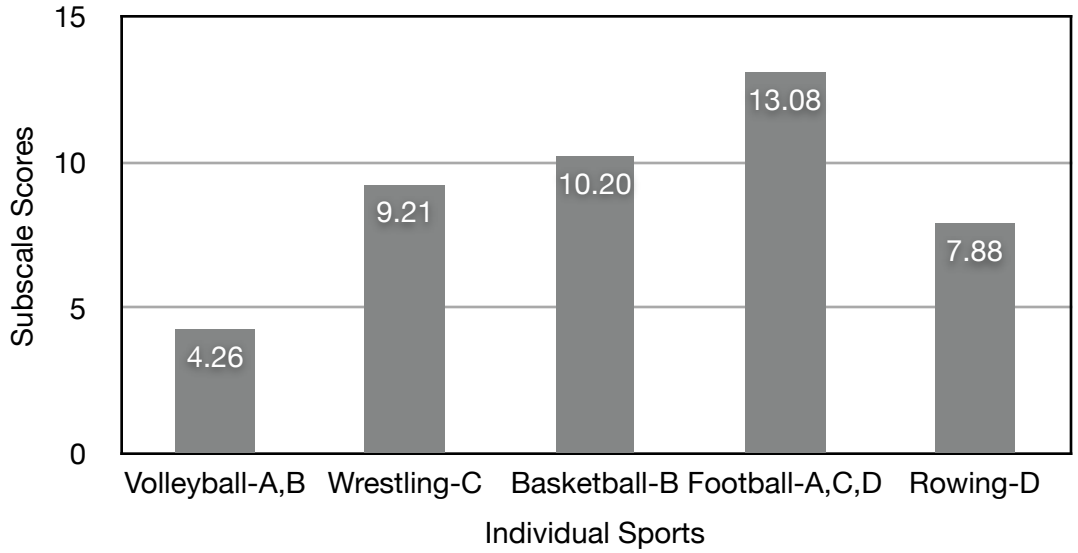

Figure 2. Significance for MDI Supplement. Matching letters indicate a significant difference between sports. There were significant differences between volleyball (*A*) and football (*A*); volleyball (*B*) and men's basketball (*B*); football (*C*) and wrestling (*C*); football (*D*) and women's rowing (*D*).

Post Hoc Test-MDI Physique Protection

There were not any significant differences between sports on MDI physique protection.

Post Hoc Test-MDI Exercise Dependency

Results for MDI Exercise Dependency can be found in Figure 3. There was a significant difference ($p = .029$) between volleyball ($M = 13.00$; $SD = 3.62$) and wrestling ($M = 17.42$; $SD = 3.15$). There was also a significant difference ($p < .000$) between volleyball ($M = 13.00$; $SD = 3.62$) and football ($M = 20.39$; $SD = 3.62$). There was a significant difference ($p < .000$) between wrestling ($M = 17.42$; $SD = 3.15$) and basketball ($M = 9.60$; $SD = 2.11$). There was a significant difference ($p = .028$) between rowing ($M = 16.44$; $SD = 3.43$) and football ($M = 20.39$; $SD = 3.62$). There was a significant difference ($p < .000$) between basketball ($M = 9.60$; $SD = 2.11$) and football ($M = 20.39$; $SD = 3.62$). There was a significant difference ($p < .000$) between basketball ($M = 9.60$; $SD = 2.11$) and rowing ($M = 16.44$; $SD = 3.43$). There was a

significant difference ($p < .000$) between basketball ($M = 9.60$; $SD = 2.11$) and tennis ($M = 16.87$; $SD = 1.80$).

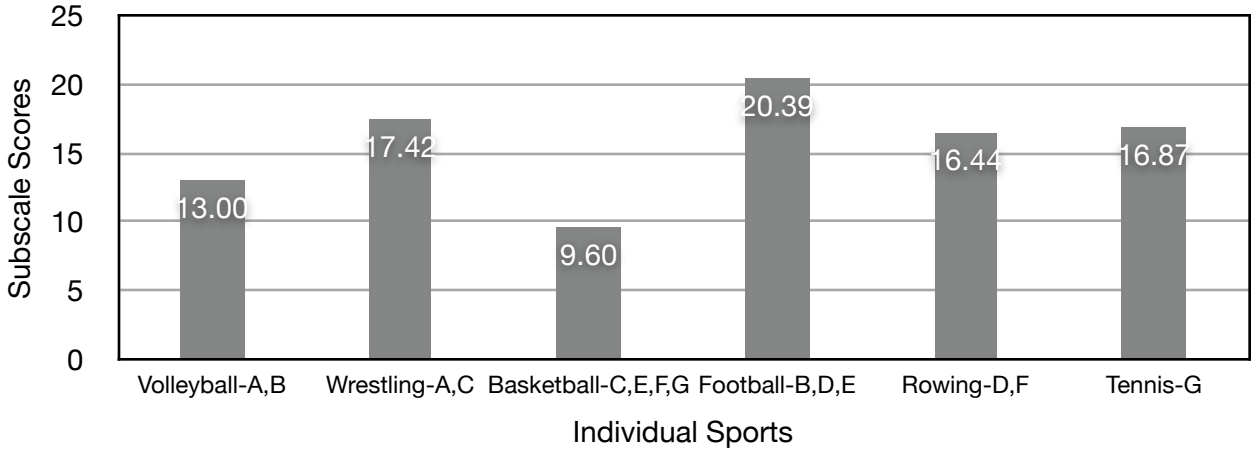

Figure 3. Significance for MDI Exercise Dependency. Matching letters indicate a significant difference between sports. There were a significant differences between volleyball (*A*) and wrestling (*A*); volleyball (*B*) and football (*B*); wrestling (*C*) and basketball (*C*); rowing (*D*) and football (*D*); basketball (*E*) and football (*E*); basketball (*F*) and rowing (*F*); basketball (*G*) and tennis (*G*).

Post Hoc Test-MDI Physical Symmetry

Results for MDI Physical Symmetry can be found in Figure 4. There was a significant difference ($p < .000$) between football ($M = 20.91$; $SD = 6.66$) and volleyball ($M = 8.50$; $SD = 3.66$). There was a significant difference ($p = .006$) between football ($M = 20.91$; $SD = 6.66$) and wrestling ($M = 14.57$; $SD = 5.33$). There was a significant difference ($p = .039$) between football ($M = 20.91$; $SD = 6.66$) and rowing ($M = 14.88$; $SD = 3.78$). There was a significant difference ($p < .000$) between football ($M = 20.91$; $SD = 6.66$) and tennis ($M = 8.75$; $SD = 2.60$). There was a significant difference ($p < .000$) between football ($M = 20.91$; $SD = 6.66$) and basketball ($M = 11.60$; $SD = 3.09$).

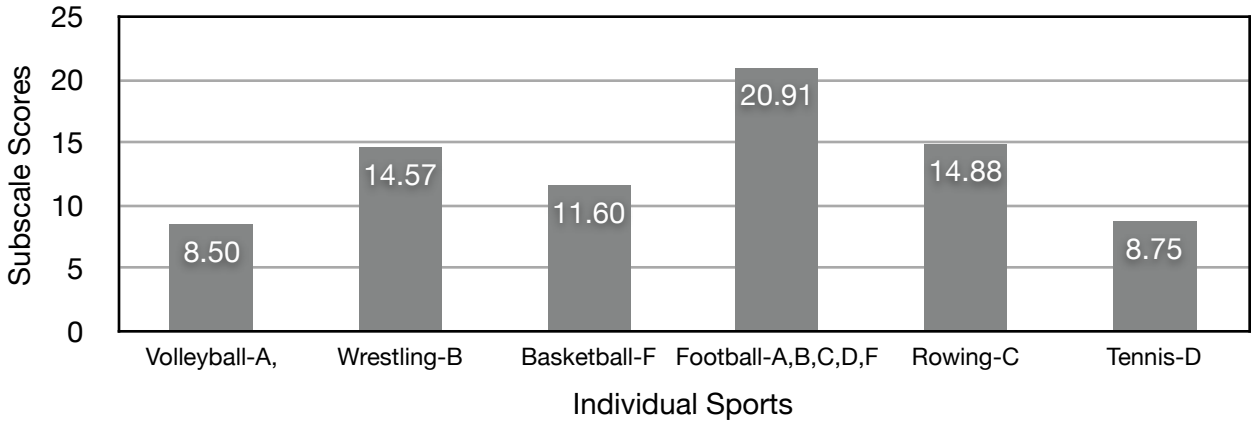

Figure 4. Significance for MDI Physical Symmetry. Matching letters indicate a significant difference between sports. There were a significant differences between football (*A*) and volleyball (*A*); football (*B*) and wrestling (*B*); football (*C*) and rowing (*C*); football (*D*) and tennis (*D*); football (*F)* and basketball (*F*).

Post Hoc Test-MDI Pharmacology

There were not any significant differences between sports on MDI Pharmacology.

Mean scores (reported by individual sports and total group) for the effect subscales can be found in Table 3. There was a significant effect for sport on every subscale except the effect of scholarship on the desire to add mass. Similar to the MDI subscales, football was higher than every other sport on every subscale.

Table 3

Means of effect subscales by individual sports and total group.

Subscale	FB	WR	VB	Ten	Row	BB	Tot
Sport*	4.48	2.71	2.25	2.13	3.67	1.80	3.15
Position*	4.74	2.43	2.00	2.00	3.44	1.90	3.12
Coaches*	4.39	2.14	1.75	1.50	2.67	1.80	2.76
Scholarship	3.26	2.07	2.00	2.00	3.44	1.90	2.58
Pro. Aspirations*	4.39	2.36	1.75	2.38	2.33	2.10	2.90

*Note.*FB=football; WR=wrestling; VB=volleyball; Ten=tennis; Row=rowing; BB=basketball;
* Statistically significant differences at the 0.05 level.

Post Hoc Test- Effect of Sport on Mass

Results for the effect of sport on the desire to add mass can be found in Table 5. There was a significant difference ($p = .005$) between football ($M = 4.48$; $SD = 1.83$) and volleyball ($M = 2.25$; $SD = 1.035$). There was a significant difference ($p = .008$) between football ($M = 4.48$; $SD = 1.83$) and wrestling ($M = 2.71$; $SD = 1.38$). There was a significant difference ($p = .002$) between football ($M = 4.48$; $SD = 1.83$) and tennis ($M = 2.13$; $SD = 1.35$). There was a significant difference ($p < .000$) between football ($M = 4.48$; $SD = 1.83$) and basketball ($M = 1.80$; $SD = .919$).

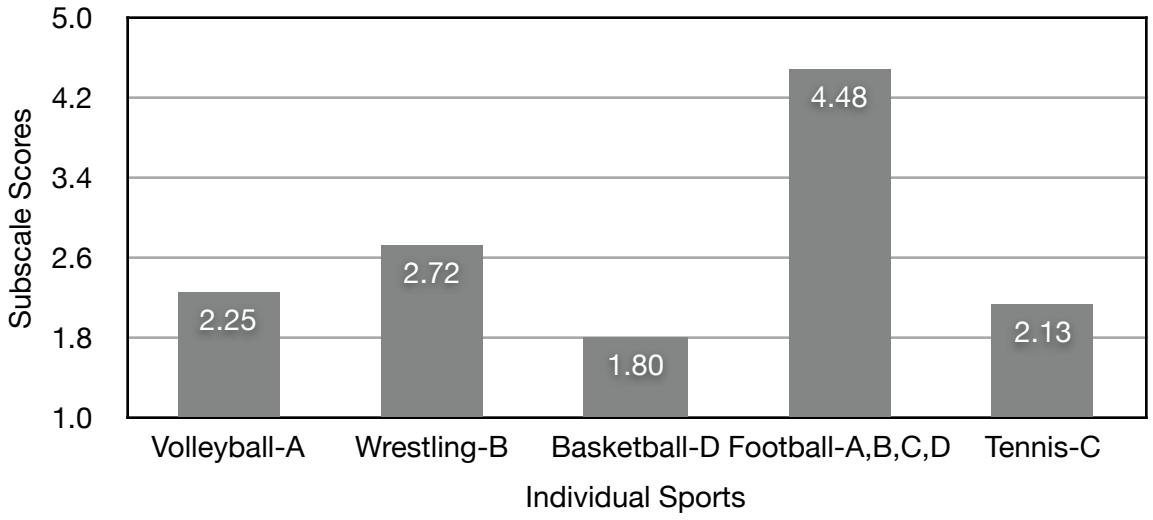

Figure 5. Significance for the effect of sport on the desire to add mass. Matching letters indicate a significant difference between sports. There were a significant differences between football (*A*) and volleyball (*A*); football (*B*) and wrestling (*B*); football (*C*) and tennis (*C*); football (*D*) and basketball (*D*).

Post Hoc Test-Effect of Position on Mass

Results for the effect of position on the desire to add mass can be found in Figure 6. There was a significant difference ($p = .001$) between football ($M = 4.74$; $SD = 1.771$) and volleyball ($M = 2.00$; $SD = 1.195$). There was a significant difference ($p < .000$) between football ($M = 4.74$; $SD = 1.771$) and wrestling ($M = 2.43$; $SD = 1.604$). There was a significant difference ($p = .001$) between football ($M = 4.74$; $SD = 1.771$) and tennis ($M = 2.00$; $SD = 1.512$). There was a significant difference ($p = .001$) between football ($M = 4.74$; $SD = 1.771$) and basketball ($M = 1.90$; $SD = .994$).

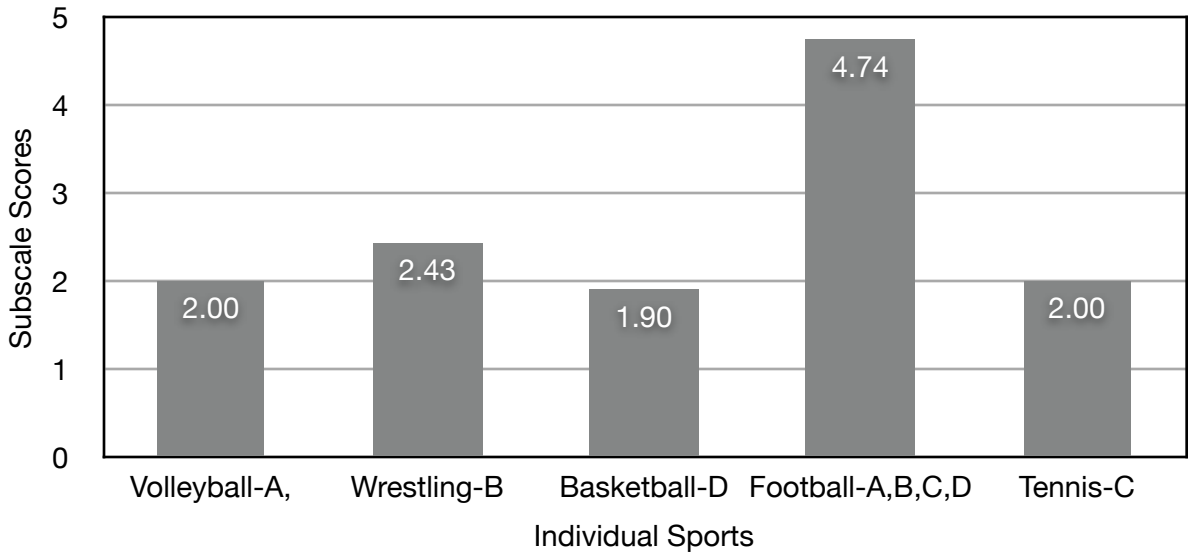

Figure 6. Significance for the effect of position on the desire to add mass. Matching letters indicate a significant difference between sports. There were significant differences between football (*A*) and volleyball (*A*); football (*B*) and wrestling (*B*); football (*C*) and tennis (*C*); football (*D)* and basketball (*D*).

Post Hoc Test-Effect of Coaches on Mass

Results for the effect of coaches on the desire to add mass can be found in Figure 7. There was a significant difference ($p < .000$) between football ($M = 4.39$; $SD = 1.751$) and volleyball ($M = 1.75$; $SD = 1.165$). There was a significant difference ($p < .000$) between

football (*M* = 4.39; *SD* = 1.751) and wrestling (*M* = 2.14; *SD* = 1.292). There was a significant difference (*p* = .039) between football (*M* = 4.39; *SD* = 1.751) and rowing (*M* = 2.67; *SD* = 1.581). There was a significant difference (*p* < .000) between football (*M* = 4.39; *SD* = 1.751) and tennis (*M* = 1.50; *SD* = 1.069). There was a significant difference (*p* = .039) between football (*M* = 4.39; *SD* = 1.751) and basketball (*M* = 1.80; *SD* = 1.135).

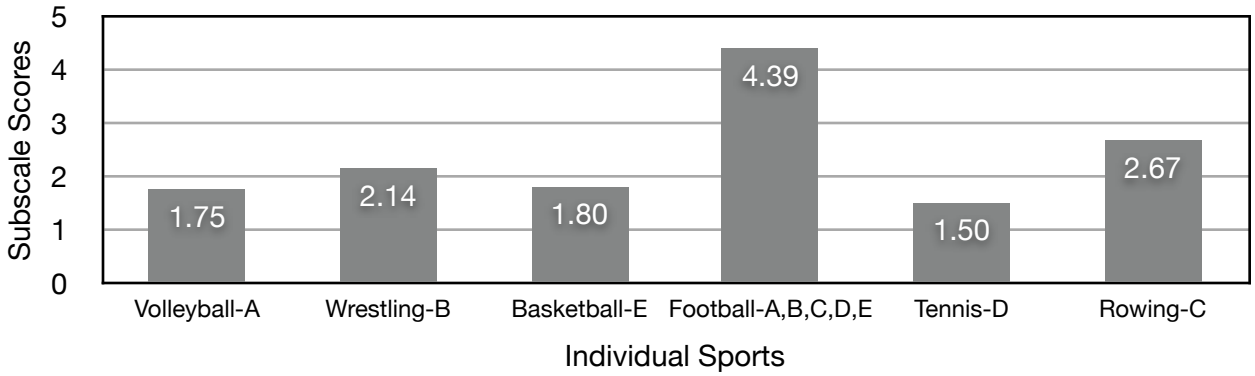

Figure 7. Significance for the effect of coaches on the desire to add mass. Matching letters indicate a significant difference between sports. There were significant differences between football (*A*) and volleyball (*A*); football (*B*) and wrestling (*B*); football (*C*) and rowing (*C*); football (*D)* and tennis (*D*); football (*E*) and basketball (*E*).

Post Hoc Test-Effect of Keeping Scholarship on Mass

There were not any significant differences between sports on the effect of keeping scholarship on mass.

Post Hoc Test- Effect of Professional Aspirations on Mass

Results for the effect of professional aspirations on the desire to add mass can be found in Figure 8. There was a significant difference (*p* = .003) between football (*M* = 4.39; *SD* = 2.017) and volleyball (*M* = 1.75; *SD* = 1.488). There was a significant difference (*p* = .008) between football *(M* = 4.39; *SD* = 2.017) and wrestling (*M* = 2.07; *SD* = 1.385). There was a significant difference (*p* = .029) between football (*M* = 4.39; *SD* = 2.017) and rowing (*M* = 2.33; *SD* =

1.118). There was a significant difference (p = .048) between football (M = 4.39; SD = 2.017) and tennis (M = 2.38; SD = 1.506). There was a significant difference (p = .007) between football (M = 4.39; SD = 2.017) and basketball (M = 2.10; SD = 1.595).

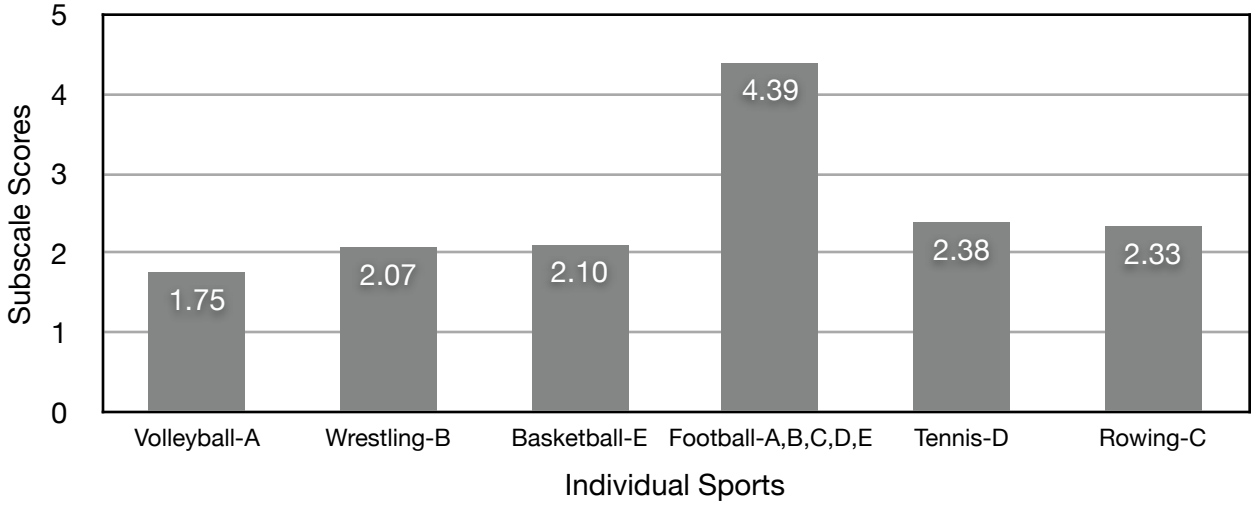

Figure 8. Significance for the effect of professional aspirations on the desire to add mass There were significant differences between football (*A*) and volleyball (*A*); football *(B*) and wrestling (*B*); football (*C*) and rowing (*C*); football (*D*) and tennis (*D*); football (*E*) and basketball (*E*).

T Test- Football "Line" vs. "Skill"

Levene's tests indicated that the assumption of homogeniety of variance was met for all dependent variables. Results for t-tests on football position can be found in Table 4. There was a significant effect for position on MDI Pharmacology, t (21) = -1.937, p = .66 and BMI, t (20) = -4.089, p = .01, with "line" significantly higher on both.

Table 4

T-test results comparing football skill and line positions on MDI Pharmacology and BMI.

Sports	*n*	BMI (kg/m^2)		MDI Pharm	
		M	*SD*	*M*	*SD*
Skill	11	26.6	2.69	2.72	.904
Line	12	32.08	3.44	3.5	1.00

*Note.*MDI Pharm=MDI Pharmacology

T-Test-Male vs. Female

Levene's tests indicated that the assumption of homogeniety of variance was not met for some dependent variables. Equal variance not assumed column was referred to for adjustment. Results for t-tests on gender can be found in Table 5. There was a significant effect for gender on BMI, t (64.354) = -4.522, $p < .01$, MDI Physique Symmetry, t (66.828) = -4.590, $p = .01$, effect of professional aspirations on mass, t (66.973) = -2.820, $p = .01$, effect of coaches on the desire to ass mass, t (64.271) = -3.008, $p = .01$, and effect of position on the desire to add mass, t (59.546) = -2.153, $p = .05$. Males scored significantly higher than females on all of the above mentioned MDI subscale and effect questions.

Table 5

T-test results comparing males and females on BMI, effect of professional aspirations on mass, effect of coaches on mass, effect of position on mass and MDI Physique symmetry

Gender	*n*	BMI (kg/m^2)		Pro Mass		Coach Mass		Pos Mass		Phy Sy	
		M	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*
Male	47	26.80	4.32	3.30	2.06	3.17	1.91	3.45	1.998	17.04	6.84
Female	25	22.91	2.83	2.16	1.344	2.00	1.354	2.52	1.584	10.88	4.48

Note. Pro Mass = effect of professional aspirations on the desire to add mass. Coach Mass = effect of coaches on the desire to add mass. Effect of position on the desire to ass mass. Phy Sy = MDI Physique Symmetry.

As noted, there are significant subscale differences found between many of the sports. To help identify who might be at a higher risk of symptoms related to MD, the number and percentage of individuals scoring above a cutoff score for each of the subscales were computed (Table 6 and Table 7). Since each subscale had a high answer of 6, the cutoff scores were based on responses of at least 5 on all the items in a subscale (the lowest concerned score). For example, MDI Diet had 5 items, so someone had to score at least 5 on all 5 items. This would give a cutoff score of 25. Since an individual might use only 1 pharmacological substance, cutoff scores were not calculated for the pharmacological subscale. Instead, the number of individuals scoring at least a 4, 5, or 6 on each item was calculated. Those numbers were summed to obtain a total number of individuals using at least 1 pharmacological aids. This method of calculating cutoff scores was originally done and based off of the research of Lantz, Rhea, & Cornelius (2002). Similar cutoffs were also determined for the effect of sport on mass, effect of position on mass, effect of coaches on mass, effect of keeping scholarship on mass and effect of professional aspirations on mass (Table 8 and Table 9). Since these are singular

questions and not subscales, the cut off point was set at 4, similar to the reasoning of the pharmacological subscale.

Table 6

Number of athletes by sport and total group above a lower-limit cutoff score for MDI subscales

Factor	No. of Sub scale items	Cutoffs	FB	WR	VB	Ten	Row	BB	Tot
Diet	5	25	3	1	0	0	0	0	4
Size	4	20	8	0	0	0	0	0	0
Ex Depend	6	30	15	5	0	1	2	0	23
Phy Pro	4	20	0	0	0	0	0	0	0
Supplement	5	25	4	0	0	0	0	0	4
Pharmacology			1	0	0	0	0	2	3

*Note.*FB=football; WR=wrestling; VB=volleyball; Ten=tennis; Row=rowing; BB=basketball; Diet = MDI Diet; Size = MDI Physique Symmetry; Ex Depend = MDI Exercise Dependency; Phy Pro = MDI Physique Protection; Supplement = MDI Supplement; Pharmacology = MDI Pharmacology

Table 7

Percentage of athletes by sport and total group above a lower-limit cutoff score for MDI subscales

Factor	No. of Sub subscale items	Cutoffs	FB	WR	VB	Ten	Row	BB	Tot
Diet	5	25	13	7	0	0	0	0	5
Size	4	20	34	0	0	0	0	0	11
Ex Depend	6	30	65	35	0	12	22	0	32
Phy Pro	4	20	0	0	0	0	0	0	0
Supplement	5	25	17	0	0	0	0	0	5
Pharmacology			4	0	0	0	0	20	4

*Note.*FB=football; WR=wrestling; VB=volleyball; Ten=tennis; Row=rowing; BB=basketball; Diet = MDI Diet; Size = MDI Physique Symmetry; Ex Depend = MDI Exercise Dependency; Phy Pro = MDI Physique Protection; Supplement = MDI Supplement; Pharmacology = MDI Pharmacology

Table 8

Number of athletes by sport and total group above a lower-limit cutoff score for effect subscales

Factor	Cutoffs	FB	WR	VB	Ten	Row	BB	Tot
Sport	4	17	4	1	1	5	1	29
Position	4	19	4	1	1	4	1	30
Coaches	4	15	2	1	1	4	1	24
Scholarship	4	10	2	2	2	6	1	19
Pro. Aspirations	4	16	3	1	2	1	1	24

*Note.*FB=football; WR=wrestling; VB=volleyball; Ten=tennis; Row=rowing; BB=basketball; Sport = effect of sport on desire to add mass; Position = effect of position on desire to add mass; effect of coaches on desire to add mass; Scholarship = effect of scholarship on desire to add mass; Pro. Aspirations = effect of professional aspirations on desire to add mass.

Table 9

Percentage of athletes by sport and total group above a lower-limit cutoff score for effect subscales

Factor	Cutoffs	FB	WR	VB	Ten	Row	BB	Tot
Sport	4	73	28	12	12	55	10	40
Position	4	82	28	12	12	44	10	41
Coaches	4	65	14	12	12	44	10	33
Scholarship	4	43	14	25	25	66	10	26
Pro. Aspirations	4	69	21	12	25	11	10	33

*Note.*FB=football; WR=wrestling; VB=volleyball; Ten=tennis; Row=rowing; BB=basketball; Sport = effect of sport on desire to add mass; Position = effect of position on desire to add mass; effect of coaches on desire to add mass; Scholarship = effect of scholarship on desire to add mass; Pro. Aspirations = effect of professional aspirations on desire to add mass.

CHAPTER V

Discussion, Conclusions, Practical Applications and Future Recommendations

Discussion

The primary purpose of this study is to examine muscle dysmorphia (MD) characteristics in NCAA Division II athletes. A secondary purpose of this study is to determine whether or not other factors such as coaches, positions within certain sports, pressure to keep scholarships or desire to make it to the professional level of athletics are possible indicators of muscle dysmorphia or muscle dysmorphia characteristics. Additional purposes include comparing sports and genders for differences in MD characteristics. Identifying which sports are at risk and why is a crucial step in the process of being proactive and preventing muscle dysmorphia from occurring.

Hypotheses of this study included that there would be significant differences between sports for characteristics of muscle dysmorphia, particularly that football will display more characteristics than other sports and that males will display more characteristics than females. Another hypothesis was that males, specifically football players, would respond with higher scores on the additional questions examining pressures from coaches, position, and desires to reach the professional level.

There were no significant differences between sports on MDI Pharmacology, MDI Physique Protection, and effect of keeping scholarship on the desire to gain mass. The most noticeable and reoccurring difference on the rest of the subscales was football scoring higher than most of the other sports on most of the subscales. There were significant differences between sports on most of the MDI subscales. On the MDI diet subscale, both football and

wrestling were significantly higher than men's basketball. This is no surprise, as wrestlers are often pre-occupied with their diets to cut or maintain weight while football players have traditionally focused on diet as a means of gaining weight. For MDI Supplement, men's football was significantly higher than volleyball, wrestling, and women's rowing. Men's basketball was also a significant higher than volleyball. For MDI Exercise Dependency, football was significantly higher than volleyball, basketball, and rowing. Wrestling was significantly higher than volleyball, and basketball. Surprisingly, rowing scored significantly higher than basketball, as did tennis.

While there has not been a direct comparison of sports done previously, the results are in agreement with the research of Muller, Dennis, Schnieder, & Joyner (2004). For their research, participants were classified as weightlifters/ body builders (LBB), contact sport athletes (CS), or non-contact sport athletes (NCS). If the present study was to be categorized the same way, the NCS group would include volleyball, rowing, tennis. The CS group would consist of only football. Basketball could be debatable, but due to the non-violent nature as compared to football and wrestling, this researcher would put basketball in the NCS group. While wrestling is a contact sport, it would be hard to place in that category for this comparison because wrestling is a sport where cutting weight is often the focus, whereas the focus of most contact sports is acquiring more lean muscle mass. Based on these grouping, this research supports that of Muller et al. (2004).

The study of Muller et al. (2004) revealed that lifting to increase size and using mirrors to check body size were reported more frequently performed by the LBB group, followed by the CS athletes and the NCS athletes. These two factors are close equivalents of the exercise

dependence and size/symmetry subscales. The results of the present study are similar. Football, the only sport put in the CS group, scored higher on the exercise dependence subscale than volleyball, basketball, and rowing, the NCS group. Football also scored higher than every other sport on the size/symmetry subscale.

Muller et al. (2004) also found that there was no difference in the likelihood to consume dietary supplements between LBB and NCS athletes, but both were more likely than the CS athletes. The present research is different than Muller et al. (2004) in the fact that men's football was significantly higher than volleyball, wrestling, and women's rowing for MDI Supplement.

Another finding of Muller et al. (2004) was that there was no difference in checking weight between the LBB group and the CS group. However, both were significantly more often than the NCS athletes. This variable would be equivalent to the Size/Symmetry Subscale, a subscale in which football outscored all other sports used in this study.

Muller et al. (2004) also reported that NCS athletes reported significantly more frequently use of baggy clothes to hide perceived physical defects than either the LBB or CS athletes. This research cannot support or contradict this finding as there were no significant differences between sports on the MDI physique protect subscale.

The two main groups within football, linemen and skill positions, were also compared for differences. There was a significant difference ($p < .01$) in reported BMI, with line scoring higher. Lineman (M BMI = 32.08, $SD \pm 3.44$) are usually physically larger than skill (M BMI = 26.6, $SD \pm 2.69$) players, so a higher BMI was expected. The only subscale with a significanct difference was MDI Pharmacology, with line scoring higher. It is this researcher's belief that this may be due to the fact that since linemen are expected to be larger than skill players, they would

score higher on this subscale. This measure is hard to judge due to the fact that the sample size for both skill and linemen were small (n = 11 and 12 respectively). This finding on lack of difference by BMI is contradictory to previous research. Watkins, Christie, & Chally (2008) found several differences between men based on BMI classification. They divided a sample into four BMI categories: underweight (< 20), normal weight (20 to 24.99), overweight (25 to 29.99), and obese (≥ 30). Overweight men scored significantly higher ($p < .01$) on the a Weight/Shape Concern subscale than all the others. Underweight, overweight, and obese men indicated significantly greater body dissatisfaction than did normal-weight men. Significant differences were found in regard to total body image ($p < .001$), weight or shape concern ($p < .001$), and body dissatisfaction ($p < .001$). Overweight and obese participants reported significantly higher levels of negative body image than did normal- and underweight participants. Overweight participants reported significantly higher weight and shape concerns than all others. Obese participants reported significantly higher levels of body dissatisfaction than that reported by normal-weight participants. This lack of difference could be due to several possible factors. One cause may be the small sample size of the present study. The football players may also only be concerned about their body weight as it relates to performance instead of esthetic purposes. Lastly, BMI does always reflect accurately for athletes who may have large amounts of muscle in relation to body fat.

Another difference between the present study and the current is the prevalence of steroid use. Cafri, Berg & Thompson (2006), reported that 26 of the teenage athlete participants (9.8%) had used steroids, ephedrine, pro-hormones, or a combination of the three. This study reported only had three participants (4%) score on or the above the cutoff for the MDI Pharmacological

subscale. This difference may be due to the fact that the student athletes in this study may be hesitant to use illegal substances because they are subject to random drug testing. Student athletes may also be hesitant to respond honestly to the question, in fear of losing their position on their respective team.

Males and females were also compared to see if any gender based differences existed. Males had a significantly higher ($p < .01$) BMI. This is typical and was expected. Males scored higher on MDI Physique Symmetry, effect of professional aspirations on the desire to gain mass, effect of coaches on the desire to gain mass and effect of position on the desire to gain mass.This supports the research of Olsen et al. (2009), who found that their sample (college-aged male physical education majors) preferred a larger, more muscular physique. This also supports the finding of Arroyo et al. (2008), who found that 78.5% of males from an academy of a professional soccer team were dissatisfied with their body image in respect to their muscularity and 21.4% desired a higher weight. The result on position mass was expected as well. This is due to the fact that football has many different positions, each with a different average body weight. This position difference does not exist in the women sports involved in this study. The result for effect of professional aspirations on mass comes at no surprise. For most of the women sports in this study (tennis, volleyball and rowing) only tennis has mainstream professional competition (volleyball and rowing are both Olympic sports, and there is also a professional sand volleyball circuit). Body mass is not seen as a benefit or necessary trait to separate oneself from the other competitors in professional tennis. On the other hand, football is quite the opposite. Body mass is also a valued trait in recruiting players for these leagues. The difference on the effect of coaching on the desire to gain mass is more difficult to explain. Football coaches often encourage increase

in body mass for the reasons mentioned above. Being bigger and stronger is viewed as valuable in football. Why women's sport coaches do not feel the same way has yet to be studied or explained.

The lack of difference on gender of other variables supports the result of Kyrejto et al. (2008). The only significant difference was that men reported higher values than women on the Drive for Muscularity Attitudes Questionnaire (DMAQ). Several other variables were very similar between genders. 74.6% of men and 73.0% of women reported physical activity in their open-ended responses (e.g., "I work out"; "I pump iron"). 33.8% of men and 26.2% of women reported diet (e.g., "I eat healthy"; "I take protein supplements"). Men had slightly higher percentages, but these were not significant.

Football had the highest number and percentage on every MDI subscale for cutoff numbers. The subscale with the highest rate of subjects scoring on or above the cutoff scores was exercise dependency, with 32%. This is of great concern because exercise dependency often results in overtraining and injury. This finding supports the finding of Lantz, Rhea, & Cornelius, (2002), who concluded that men with muscle dysmorphia often suffer from exercise dependence, which is defined as training during times of sickness or injury, even when knowing that injuries will not heal unless time is taken off from their workout routine. Football also had the highest number and percentage on every effect subscale. The subscale with the highest rate of participants scoring on or above the cutoff scores was position, with 41%. It is interesting to note that only one of the effect subscales (scholarship = 26%) had less than 1/3 of total participants below the cutoff. Effect of sport on desire to gain mass had 40% on or above the cutoff, effect of position on the desire to gain mass 41% on or above the cutoff, effect of coaches had 33% on or

above the cutoff and effect of professional aspirations has 33% on or above the cutoff. This suggests that these extra influences that are unique to the collegiate athlete do indeed have an effect on muscle dysmorphia.

Conclusions

The primary purpose of this study was to examine muscle dysmorphia (MD) characteristics in NCAA Division II athletes. Additional purpose included determining whether or not factors unique to the college athlete are causes of muscle dysmorphia or muscle dysmorphia characteristics and to compare sports and genders for differences in MD characteristics. Identifying sports that may be at a greater risk is a crucial step in the process of being proactive and preventing muscle dysmorphia from occurring.

The results of the present study confirmed all of the hypotheses of this study, which included that there would be significant differences between sports for characteristics of muscle dysmorphia and the effect of factors unique to the college athlete. The results also confirmed the hypothesis that males would score higher than females on MDI subscales and effect factors and that football would score higher than a majority of the other sports on MDI subscales and effect factors.

There were significant differences between sports on every MDI subscale except MDI Pharmacology and MDI Physique Protection. There were also significant differences between sports on every effect question except the effect of keeping scholarship on the desire to gain mass. The most noticeable and reoccurring difference was football scoring higher than most of the other sports on most of the MDI subscales. Football also had the highest number and percentage on every effect question. Only one of the effect questions, effect of keeping

scholarship on the desire to add mass, had less than 1/3 (26%) of total participants below the cutoff. Effect of sport on desire to gain mass had 40% on or above the cutoff, effect of position on the desire to gain mass 41% on or above the cutoff, effect of coaches had 33% on or above the cutoff and effect of professional aspirations has 33% on or above the cutoff.

The results of the present study suggests that muscle dysmorphia characteristics are present in NCAA Division II collegiate athletes. The subscale that scored the highest with all sports was exercise dependency. This is of great concern because exercise dependency can result in injury both in the weight room and on the court/field. On a positive note, only three subjects (4%), answered to having used a pharmacological aid. The results of the present study support the need for more research to be done on the topic of muscle dysmorphia in all populations (NCAA male and female athletes, professional athletes, male and female high school athletes).

Recommendations for Future Studies

While this study produced significant results to contribute to the current literature on muscle dysmorphia, there is still more beneficial information to be discovered. For example, information on more sports would be helpful. This study only examined six different sports. Since muscle dysmorphia is more common in males, an effort should be made to recruit participants from more male sports (this study only has participants from three male sports). However, females should still be studied as well. It would also be interesting to compare males and females from the same sports (men's golf/women's golf; baseball/softball; men's basketball/ women's basketball; men's soccer/women's soccer, etc.). Doing so may shed light on why gender differences may or may not exist on various subscales. Since it is still unclear why there are or aren't differences between sports and genders on subscales, it is suggested that more open

ended, qualitative research be done on muscle dysmorphia as well. With steroid use becoming more common in high school age students, it would be beneficial to conducted research on that population as well. It is also recommended that studies be done on NCAA Division I athletes and professional athletes.

Practical Applications

This research suggests that college athletes are indeed at a risk of developing muscle dysmorphia and its characteristics. It also shows that football players may be at greater risk and it appears that factors such as sports, position, coaches, keeping scholarships, and professional aspirations can have an effect on the development of muscle dysmorphia. This information may be very valuable in helping sport coaches, strength and conditioning coaches, and athletic trainers to identify warning signs and characteristics of muscle dysmorphia. Identifying warning signs and characteristics early may help in preventing muscle dysmorphia from developing. Coaches might even want to consider giving a form of the MDI, or ask questions similar to those on the MDI, to gauge the presence of muscle dysmorphia in their athletes. Coaches need to be educated on the topic of muscle dysmorphia in order for thus information to truly be applicable. It is the opinion of this researcher, that education of head coaches might best be done by the strength and conditioning staff. While there are situations in sports where additional mass is beneficial for performance and even necessary for safety, precaution should be taken when encouraging players to gain weight. Instruction should be given on proper and safe strategies to gain weight as well as a realistic time table. Coaches should also refrain from calling smaller athletes “tiny”, “skinny”, or similar names, as this may trigger some of the hazardous characteristics of muscle dysmorphia.

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APPENDIX A

UNIVERSITY OF CENTRAL OKLAHOMA

INFORMED CONSENT FORM

Research Project Title: Muscle Dysmorphia in Collegiate Athletes

Researcher (s): Faculty Mentor: Dr. Gregory Farnell

A. **Purpose of this research:**

The main purpose of this study is to examine the presence of muscle dysmorphia (MD) characteristics in NCAA Division II athletes. A secondary purpose of this study is to determine whether or not other factors such as coaches, certain sports, positions within certain sports, pressure to keep scholarships or desire to make it to the professional level of athletics are cause of muscle dysmorphia or its characteristics. Muscle dysmorphia is a preoccupation with the idea that one's body is not sufficiently lean and/or muscular. Many associated disorders and risks of muscle dysmorphia have also been identified. Men with muscle dysmorphia often suffer from exercise dependence, which is defined as training during times of sickness or injury, even when knowing that injuries will not heal unless time is taken off from their workout routine. Studies have also shown that more than half of the cases admit to using anabolic steroids.

B. **Procedures/treatments involved:**

Data will be collected via the Muscle Dysmorphia Inventory (MDI). The MDI is a 40-item self-report measure designed for the assessment of behavioral and psychological characteristics associated with MD. The MDI will also be modified with extra subscales regarding other possible causative factors of muscle dysmorphia such as coaches, certain sports, positions within certain sports, pressure to keep scholarships or desire to make it to the professional level of athletics are cause of muscle dysmorphia or it's characteristics. A demographic questionnaire will identify age, gender, ethic background, sport the athlete plays and position within sport (if applicable). The questionnaires will be distributed and collected at the end of a sports practice session or team meeting. No coaches for the sports teams will be present during this time.

C. Expected length of participation:

10-15 minutes

D. **Potential benefits:**

There are no obvious benefits for the participant. However, potential benefits for allied health professionals include increased knowledge on the presence on causes muscle dysmorphia in collegiate athletes, an area currently lacking significant amounts knowledge.

E. **Potential risks or discomforts:**

Participants will be asked potentially sensitive questions over body size–symmetry (e.g., I feel satisfied with the shape of my body); physique protection (e.g., I wear bulky clothing to hide my physique from others); exercise dependence (e.g., I maintain a strict workout schedule); supplement use (e.g., before a workout I consume energy drinks); dietary behavior (I regulate my caloric intake to maximize muscle development); and pharmacological use. These questions are necessary to ask in order to

evaluate muscle dysmorphia and are commonly used in similar research studies. Participants have the right to refuse to answer any questions.

F. Medical/mental health contact information (if required):

The UCO student counseling center is located on the fourth floor of the Nigh University Center in suite 402. The hours are 8am-5pm and they can be reached at 405-974-2215

G. **Contact information for researchers and UCO IRB:**

Dr. Gregory Farnell: gfarnell@uco.edu, 974-5304

Dr. Jill A. Devenport
Chair, UCO Institutional Review Board
ADM 216, Office of Research & Grants
Campus Box 159 Edmond, OK 73034
405-974-5479 phone; 405-974-2526; 405-974-3825 fax

H. **Explanation of confidentiality and privacy:**

No identifying information will be asked of participants. Also, with the exception of aggregate results, responses will be not be shard with anyone outside of the research team.

I. **Assurance of voluntary participation:**

Participants have the choice to refuse to fill out any of the questionnaires without consequence. Participants also have the right to refuse to answer any questions or stop the questionnaire at any time without consequence.

AFFIRMATION BY RESEARCH SUBJECT

I hereby voluntarily agree to participate in the above listed research project and further understand the above listed explanations and descriptions of the research project. I also understand that there is no penalty for refusal to participate, and that I am free to withdraw my consent and participation in this project at any time without penalty. I acknowledge that I am at least 18 years old. I have read and fully understand this Informed Consent Form. I sign it freely and voluntarily. I acknowledge that a copy of this Informed Consent Form has been given to me to keep.

Research Subject's Name: _____

Signature: _____ Date _____

APPENDIX B

MDI

INSTRUCTIONS

This scale measures a variety of attitudes, feelings, and behaviors. Read each item (1-32) carefully and then indicate the degree to which the item is characteristic or true of you by circling the appropriate number corresponding to each statement. There are no right or wrong answers so please respond as honestly as possible. The anonymity of your responses is guaranteed.

	Never	Rarely	Sometimes	Often	Usually	Always
1. I regulate my caloric intake to maximize muscle development.	1	2	3	4	5	6
2. Before a workout, I consume energy supplements.	1	2	3	4	5	6
3. I maintain a strict workout schedule.	1	2	3	4	5	6
4. I monitor my diet closely to limit my fat intake.	1	2	3	4	5	6
5. I wear bulky clothing to hide my muscular physique from others.	1	2	3	4	5	6
6. I am concerned with losing muscle mass.	1	2	3	4	5	6
7. I use supplements to help me recuperate from strenuous workouts.	1	2	3	4	5	6
8. I control the intake of proteins, carbohydrates, and fats to maximize my muscular development.	1	2	3	4	5	6
9. I use supplements to increase my lifting performance.	1	2	3	4	5	6
10. My workouts are designed to develop the maximum amount of muscle mass.	1	2	3	4	5	6
11. I am preoccupied that I look small.	1	2	3	4	5	6
12. I use nutritional supplements to help me train through injuries.	1	2	3	4	5	6
13. It bothers me to miss a scheduled workout.	1	2	3	4	5	6
14. I prefer to work out when no one else can see me.	1	2	3	4	5	6
15. Developing large muscle mass is important to me.	1	2	3	4	5	6
16. My diet is regimented to the point that I eat the same foods several days in a row.	1	2	3	4	5	6
17. I will benefit from having large muscles.	1	2	3	4	5	6

17. I have a hard time taking a scheduled day off from training.	1	2	3	4	5	6
18. I avoid foods high in sodium.	1	2	3	4	5	6
19. I am preoccupied with a desire to be larger.	1	2	3	4	5	6
20. I avoid situations where other weightlifters may see my muscle development.	1	2	3	4	5	6
21. I wear clothes that help conceal the size of my physique.	1	2	3	4	5	6
22. It is important that other weight trainers see how muscular I am.	1	2	3	4	5	6
23. I would rather keep others from seeing my level of muscle development.	1	2	3	4	5	6
24. I use steroids.	1	2	3	4	5	6
25. I use laxatives.	1	2	3	4	5	6
26. I use diuretics.	1	2	3	4	5	6
28. Do you feel pressure from your sport to gain muscle mass?	1	2	3	4	5	6
29. Do you feel pressure from the position you play to gain muscle mass?	1	2	3	4	5	6
30. Do you feel pressure from any of your coaches to gain muscle mass?	1	2	3	4	5	6
31. Do you feel like you need to gain muscle mass to keep your athletic scholarship or spot on your team?	1	2	3	4	5	6
32. Are you tempted to gain muscle mass in order to make it to the next level of your sport (i.e. NFL, NBA, MLB, Olympics)?	1	2	3	4	5	6

Height _____

Weight _____

Age _____