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Objective Measurement and Insight Assessment of Muscle Dysmorphia

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Muscle dysmorphia is a relatively new psychological disorder primarily affecting men. The main diagnostic criterion is an obsession with the idea that the body is not sufficiently lean or muscular when compared to others. As a muscular physique is so important to their self-worth, individuals with muscle dysmorphia may have little insight into how their behaviors are affecting their lives and may be less likely to seek psychological treatment. The purpose of this study was to measure factors related to exercise and muscle dysmorphia and examine their relationship to insight and recognition of criteria for muscle dysmorphia. Participants (N = 85) completed a series of questionnaires to assess the independent variables and were then administered two questionnaires designed to assess insight to any criteria of muscle dysmorphia participants might be experiencing as well as their recognition of criteria in a case vignette. A series of multiple regression analyses were conducted using feeling of obligatory exercise, exercise motivation, reasons for exercise, athletic identity, and symptoms of muscle dysmorphia as predictor variables for awareness of diagnostic criteria of muscle dysmorphia and self-reported symptoms of muscle dysmorphia. Results indicated that participants with higher athletic identity and greater symptoms of muscle dysmorphia had a higher insight into their own dysmorphia than participants with low athletic identity and fewer symptoms of muscle dysmorphia. At the same time, individuals with more symptoms of muscle dysmorphia had a lower recognition of muscle dysmorphia in others than those with fewer symptoms.

Historically, psychological research addressing body image concerns has focused predominately on women, as dissatisfaction with the body was primarily seen in women (Brownell & Rodin, 1994). The rationale behind this was that their bodies were seen as the major form of social capital for women (Crandall, 1994). However, more recent research (Grieve, Wann, Henson, & Ford, 2006) indicates that men, too, have begun to be dissatisfied with their bodies. While women generally want to lose weight and be thinner (Thompson & Stice, 2001), men desire to either lose weight or gain weight, with a focus on increased muscularity rather than adiposity (Ridgeway & Tylka, 2005). The focus on increasing muscularity can lead to pathological behaviors; the syndrome that results from these pathological behaviors has been termed *muscle dysmorphia* (Pope, Gruber, Choi, Olivardia, & Phillips, 1997).

In the most recent version of the *Diagnostic and Statistical Manual of Mental Disorders* (*DSM5*; American Psychological Association, 2013), muscle dysmorphia is listed as a subtype of body dysmorphic disorder. The key symptom of muscle dysmorphia is that an individual believes that his or her body is not as muscular as he or she wishes it would be, even though the individual is usually more muscular than the majority of the population (Olivardia, 2001). Obsessions with muscularity lead individuals to frequently miss social or occupational functions because they are overly committed to their exercise routines. Whereas a woman with an eating disorder will generally be seen compulsively exercising to improve her lower body, a man with muscle dysmorphia may exercise just as frequently, but focus on his upper body muscles instead (Thompson & Stice, 2001; Ridgeway & Tylka, 2005).

Despite obsessive commitments to exercise, individuals with muscle dysmorphia have varying degrees of insight into their preoccupation with their body size. A study by Olivardia, Pope, and Hudson (2000), revealed that of the 24 male weightlifters that met three of the specific criteria for muscle dysmorphia, 10 (42%) participants reported "excellent" or "good" insight into recognizing that their impressions of their body size

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was mistaken; 12 (50%) of participants reported "fair" or "poor" insight. The remaining two participants (8%) lacked any insight and refused to accept that they were not "small" (Olivardia, Pope, & Hudson, 2000).

Additionally, individuals with muscle dysmorphia feel intense anxiety when their bodies are exposed in public and go to extreme lengths to avoid such situations (APA, 2013). Even though they are distressed by others seeing their bodies, individuals with muscle dysmorphia frequently check their appearance in the mirror to look for any changes in physique. Finally, individuals with muscle dysmorphia have strict diets comprised of high protein and low amounts of carbohydrates and fats. They often use performance-enhancing substances, such as anabolic-androgenic steroids, despite the risk to their health (Olivardia, 2001; Grieve, Truba, & Bowersox, 2009).

One of the greatest concerns regarding muscle dysmorphia is that even though individuals may be concerned about the effects their behavior has on their lives, the fear of becoming less muscular is greater (Olivardia, 2001). Even when individuals do seek out treatment, it is often for depression, anxiety, eating or steroid abuse, rather than issues surrounding muscle dysmorphia. In the previously mentioned study by Olivardia, Pope, and Hudson (2000), a clinical interview revealed that of the 24 participants, 29% had a history of an eating disorder, 58% reported a history of a mood disorder, and 29% had a lifelong history of an anxiety disorder (Olivardia et al., 2000).

Despite these findings, little research has been done to assess what factors contribute to an individual seeking treatment other than receiving encouragement from others. There are some barriers to therapy for individuals with muscle dysmorphia (Grieve et al., 2009). Individuals with muscle dysmorphia find the symptoms ego-syntonic: that is, the symptoms do not cause distress. In fact, working out and dieting to increase muscle mass decreases the anxiety that they experience because they believe they are too small. Individuals with muscle dysmorphia do not consider therapy necessary for improving their lives, and they skip sessions with their therapists because the sessions conflict with their scheduled gym times, using this as a form of self-medication (Olivardia et al., 2000).

Currently, the only information regarding prevalence of muscle dysmorphia is limited to specific populations (Olivardia, 2001). Studies have proposed that 5% to 10% of weightlifters and 9% of men diagnosed with body dysmorphic disorder have muscle dysmorphia (Cafri et al., 2005; Olivardia, 2001). This is most likely an underestimate of the true prevalence rate as it is difficult to provide an estimate of the population. Many men do not see the symptoms of muscle dysmorphia as indicating a problem—in fact, they view the symptoms as eliminating a problem (see Olivardia, 2001)—so they do not present for treatment. The mean age of onset for symptoms is 19.4 years (Olivardia et al., 2000), which means that it generally begins in college as young men begin to adopt the social ideal body image. As muscle dysmorphia is associated with anabolic steroid use (Olivardia, 2001), it is important to note that the rate of anabolic steroid use in young men is similar to the rate of bulimia nervosa in young women (Schooler & Ward, 2006); that is, approximately 2 million males of all ages in the United States have used anabolic steroids at some point in their lives (Pope, Phillips, & Olivardia, 2000).

Grieve (2007) proposed a conceptual model for the etiology of muscle dysmorphia that included four categories of variables, each with contributing factors: socioenvironmental, emotional, psychological, and physiological. While limited research has been done in all of these areas (see Grieve, 2007), socioenvironmental factors have been shown to be the most influential in individuals who develop muscle dysmorphia. These factors convey muscular ideals through an individual's social environment, such as family, peers, athletics, and mass media. Mass media has been regarded as the most influential of all pressures (Grieve, 2007). Mass media, predominately in Western societies, promotes individuals with physiques that are generally impossible to attain without the use of anabolic steroids (Baghurst & Kissinger, 2009). The Western social ideal male body includes a muscular build, with a broad chest and thin waist; this is often considered a "V" shape (Ridgeway & Tylka, 2005).

Studies have shown that media presentations of the male body (i.e., magazine models, action toys, and celebrities) influence body image ideals through contrast effects (Grieve, 2007). Even though social comparison theory has been shown to help others by increasing self-esteem through contrasting with others considered to be of lower status (Dijkstra, Gibbons, & Buunk, 2010), the opposite effect has been shown to result from

contrasting with individuals with a perceived higher status. In the case of muscle dysmorphia, comparing oneself to overly muscular individuals can decrease self-esteem. Exposure to muscular male models in the media has been associated with lower levels of body satisfaction and self-esteem (Leit, Gray, & Pope, 2002). As these messages have previously led females to adopt exercise and dietary strategies to attain thinness, it is reasonable to guess that they can equally lead males to engage in similar strategies to gain and improve muscular physiques (Cafri et al., 2005).

Men with body image concerns can overutilize exercise; in fact, this excessive exercise can become "addictive" and sometimes is referred to as anorexia athleticism (Strother, Lemberg, Stanford, & Turberville, 2012). In addition to exercising in order to improve muscularity, several other motivations have been identified as factors in determining why individuals complete exercise, how often they exercise, and how long they exercise. Self-Determination Theory (SDT; Deci & Ryan, 1985) has been suggested as a means of exploring motivations in order to gain a greater understanding of the motives underlying exercising (Duncan, Hall, Wilson, & Jenny, 2010). SDT proposes that motivations for exercising can be broken down into two categories: intrinsic motivations and extrinsic motivations. Intrinsic motivations are focused on personal interests, with specific motivations being enjoyment, improving abilities, or social affiliation. On the other hand, extrinsic motivations are concerned with achievement or recognition, and include weight loss or appearance (Markland & Ingledew, 1997).

Further research into motivations for exercise has found that there are differences in motivation based on gender. In a study conducted by Kilpatrick, Hebert, and Bartholomew (2005), male and female college students were administered the Exercise Motivations Inventory-2 (EMI-2; Markland & Ingledew, 1997) to distinguish differences in extrinsic and intrinsic motivations between genders; the EMI-2 is comprised of various subscales, each reflecting a different motivation regarding why people think they should exercise. An analysis of the results revealed that men rated the motives of competition, challenge, social recognition, and strength and endurance higher than women; weight management was the only motive that women rated higher than men. Given that the motivations rated highest by men are frequently seen in individuals exhibiting criteria of muscle dysmorphia, as well as the sample being comprised of college students that have been primarily used in previous studies, there is a greater need for understanding of exercise and individual motivations (Kilpatrick et al., 2005).

Exercising should be distinguished from sport and athletic participation. Although both are classified as forms of physical activity, there are benefits and motivations related to athletic involvement beyond the physiological aspects of just exercising (Kilpatrick, Bartholomew, & Riemer, 2003). Exercise has normally been defined as participating in physical activity to gain or maintain fitness; on the other hand, sport is defined as engaging in physical activity for recreational purposes. Individuals participating in sport derive benefits such as higher self-esteem, more positive body image, greater social development, and greater social status than non-participating individuals (Cafri et al., 2005). Furthermore, individuals participating in athletics often develop skills that carry over into their personal lives, such as abstaining from alcohol and illicit drugs, accepting and overcoming failures and difficult situations, as well as having a wider range of educational and career opportunities.

Kilpatrick, Hebert, and Bartholomew (2005) examined the differences in exercise behaviors and motivation for exercise between engaging in exercise and engaging in sports. Results indicated that participants engaged in exercise more frequently and at a higher intensity than they engaged in sports, but there were no significant differences in ratings of duration or adherence to activity. Additionally, analyses revealed a mix of intrinsic and extrinsic motivations for each form of physical activity; participants rated appearance, strength and endurance, stress management, health pressures, ill-health avoidance, and positive health motives higher when they engaged in exercise, but rated affiliation, challenge, competition, enjoyment, and social recognition motivations higher when participating in sport (Kilpatrick et al., 2005).

Sport participation also carries associated risks. The most salient set of risks for the present study involve body image issues. Athletes participating in sports such as bodybuilding and football, where greater muscle mass and body size are valued are at risk for developing steroid abuse or muscle dysmorphia (Grieve, 2007).

On the contrary, sports with weight restrictions, such as wrestling, boxing, swimming, or gymnastics, inspire participants to avoid gaining weight in an effort to stay lean; as a result, these individuals have a high risk of developing eating disorders or abuse of diuretics and laxatives (Cafri et al., 2005; Murray, Rieger, Karlov, & Touyz, 2013).

Athletic identity is defined as the degree to which an individual considers him- or herself an athlete (Chen, Snyder, & Magner, 2010). Athletic identity has been found to correlate with: athletic appearance; the importance of exercise, sport, and physical activity; perceptions of competence; and encouragement from others to be an athlete. Benefits associated with higher levels of athletic identity include an improved sense of self, perceived improved social life, and higher levels of confidence. A strong athletic identity can also improve athletic performance by providing an individual with a more focused approach to training. Finally, individuals who strongly identify themselves as athletes exercise more frequently and engage in more exercise behaviors than those with lower athletic identities.

In a study by Chen, Snyder and Magner (2010), athletic identity, commitment to sports, and sports participation were examined in relation to possible benefits on personal and social life. A sample comprised of 163 student-athletes and 112 non-athlete students were administered a series of questionnaires to assess the previously mentioned factors. An analysis of the results showed that student athletes reported that their athletic involvement had improved their overall health, development, and meeting new friends. Interestingly, the researchers noted that athletes who were involved in team sports (i.e., football, basketball, volleyball, etc.), rated personal role, personal attributes, core benefits, social relationship, and special behaviors higher than athletes involved with more individual sports (i.e., track and field, tennis, etc.); the athletes involved with the individualized sports reported placing a greater importance of sports in their lives and expectations of others higher than team sport athletes (Chen, Snyder, & Magner, 2010).

However, there are also costs that arise with the adoption of a stronger athletic identity. Individuals with a strong athletic identity run the risk of neglecting areas of their life unrelated to athletics, such as work or friendships outside of sport. Also, because they often lack other sources of self-worth, individuals with a high sense of athletic identity are more vulnerable to depression when faced with role-disrupting life events (Brewer, 1993). For example, after sustaining an injury, individuals with a high degree of athletic identity are likely to interpret it as inhibiting their ability to exercise or participate in competitions; this in turn decreases mood and self-esteem (Brewer, Van Raalte, & Linder, 1993).

Present Study

The purpose of the current study was to examine patterns of and motivations for participants' exercising and their awareness for any personal evidence of muscle dysmorphia. We predicted that participants score on the exercise and MD questionnaires will be negatively related to personal insight of diagnostic criteria for muscle dysmorphia in themselves. We also predicted that participants score on the exercise and MD questionnaires will be positively related to identification of diagnostic criteria via a case vignette. The independent variables were chosen to assess the degree of factors related to exercise, importance of exercise, and typical behaviors of muscle dysmorphia in participants. These variables were considered important to assess in relation to muscle dysmorphia because the majority of studies have not examined frequency of exercise in participants, considered alternative motivations for exercise aside from improving musculature, or have used samples comprised of professional athletes without assessing the importance that their participation in athletics is to their self-concept.

Method

Participants

Participants were 85 men all over the age of 18 who were recruited via two methods. Approximately one-third (27 participants; 31.8%) were students attending university; participants were recruited through the Department of Psychology's online participant pool and were awarded course credit for their participation. The remainder of the participants (58, 68.2%) were recruited through the Amazon Mechanical Turk website and were awarded a monetary payment upon completion; these participants were awarded either $0.20 (initially) or $0.50 (later) for their participation.

The average age of participants was 32.73 (*SD* = 13.42), with ages ranging from 18 to 65. Participants were comprised of 8 (9.3%) high school graduates, 13 (15.1%) freshmen in college, 9 (10.5%) sophomores, 6 (7.0%) juniors, 19 (22.1%) seniors, 13 (15.1%) graduate students, and 17 (19.8%) college graduates. Participants included 58 (68.2%) Caucasians, 17 (20.0%) Asians, 5 (5.9%) African Americans, 2 (2.4%) American Indian/Alaskan Natives, 2 (2.4%) participants who did not indicate their race/ethnicity, and 1 (1.2%) Hispanic (see Table 1).

Body mass index (BMI) was calculated for participants by using their reported height and weight. The mean height of participants was 70.24 inches (*SD* = 3.51), with heights ranging from 60 to 76 inches. The mean weight of participants was 184.47 pounds (*SD* = 45.26), ranging from 70 to 310 pounds. The mean BMI of participants was 26.17 (*SD* = 5.73), ranging from 11.30 to 44.09; this average falls outside the range of what is considered a healthy BMI (18.5 to 24.9) into the overweight range (25 to 29.9).

Of the 85 participants, 39 reported currently participating in one or more sports. At least one participant reported engaging in the following sports: baseball, basketball, bowling, boxing, cheerleading, chess, cricket, cross fit, cycling, dance, dodge ball, fishing, football, Frisbee, golf, hiking, hockey, powerlifting, racing, soccer, softball, table tennis, skipping rope, swimming, tae kwon do, tennis/badminton, track/running, volleyball, weightlifting.

Table 1
Demographics of Participants

Characteristic	*n*	%
Gender		
Male	85	100
Age		
11–20	14	16.4
21–30	33	38.9
31–40	14	16.6
41–50	7	8.4
51–60	10	11.9
61–70	4	4.8
N/A	3	3.5
Ethnicity		
Caucasian	58	68.2
Asian	17	20.0
African American	5	5.9
American Indian/Alaskan Native	2	2.4
Other	2	2.4
Hispanic	1	1.2
Education		
High School Graduate	8	9.3
College Freshmen	13	15.1
College Sophomore	9	0.5
College Junior	6	7.0
College Senior	19	22.1
College Graduate	17	19.8
Graduate Student	13	15.1

Materials and Procedure

Demographics. Participants completed a demographic questionnaire that included questions regarding age, race/ethnicity, education level, current sport participation, height, and weight. The response option to the question regarding sport participation was an open response to allow participants to define sport participation in their own manner.

Obligatory Exercise Questionnaire. This measure was used to assess fixation, frequency, and commitment to exercising (OEQ; Pasman & Thompson, 1988). The OEQ is composed of 20 questions designed to gather information on individual attitudes and habits in exercise; responses are on a four-point Likert-type scale, from 1 (Never) to 4 (Always). An example question on the OEQ is "If I miss a planned workout, I attempt to make up for it the next day." The OEQ is scored by summing the responses for each question (reverse scoring two questions). Higher scores indicate a greater sense of obligation to exercise. The OEQ has excellent internal consistency (Cronbach's $\alpha = .96$; Pasman & Thompson, 1988).

Exercise Motivations Inventory – 2. This measure (EMI-2; Markland & Ingledew, 1997) was used to determine overall motivation behind exercise participation. The EMI-2 contains a total of 51 questions that are designed to assess fitness and health-related reasons for exercising among exercisers and non-exercisers; for this study, participants responded to each reason on a scale from 1 (Not at all true for me) to 5 (Very true for me).

A sample motivation for exercising question is "To stay slim." The EMI-2 total score was obtained by summing the scores of all items. In addition, scores for each of the subscales (Stress Management, Revitalisation, Enjoyment, Challenge, Social Recognition, Affiliation, Competition, Health Pressures, Ill-Health Avoidance, Positive Health, Weight Management, Appearance, Strength & Endurance, and Nimbleness) was obtained by summing the items associated with each. The EMI-2 is applicable to exercisers and non-exercisers, and has acceptable internal consistency across subscales, with Cronbach's alpha ranging from .69 to .92 (Markland & Ingledew, 1997).

Reasons for Exercise Inventory. This measure (REI; Silberstein, Striegel-Moore, Timko & Rodin, 1988) assessed how important specific reasons for exercise were for participants. The REI contains a total of 24 reasons for exercising and asks participants to rate how important each reason is, with responses ranging from 1 (Not at All Important) to 7 (Extremely Important). An example reason for exercising on the questionnaire is "To cope with stress, anxiety." The REI has six subscales: Weight Control, Attractiveness, Mood, Fitness, Health Concerns, Enjoyment, and Tone. Each subscale score consisted of the sum of the items associated with the subscale. The REI assesses participants' reasons for exercising in contrast to reasons why they believe they should exercise. Furthermore, the subscales have reported good internal consistency, averaging between .70 and .81 (Crawford & Eklund, 1994).

Athletic Identity Measurement Scale. This measure (AIMS; Brewer & Cornelius, 2001) was used to measure participants' athletic identity. It is made up of three factors: Exclusivity, Social Identity, and Negative Affectivity (Groff & Zabriskie, 2006). The AIMS consists of seven questions with responses ranging from 1 (Strongly Disagree) to 7 (Strongly Agree). The AIMS is scored by summing the scores for each of the subscales. The AIMS has high internal consistency (coefficient alpha = .81; Brewer & Cornelius, 2001) and test-retest reliability ($r = .89$, $p < .01$; Brewer, 1993).

Muscle Dysmorphia Questionnaire. This measure (MDQ; Grieve et al., 2014) was used to measure symptoms of muscle dysmorphia. The MDQ is made up of 34 questions with responses ranging from 1 (Strongly Disagree) to 6 (Strongly Agree). A sample question from this inventory is "I am inclined to continue to work out when I am sick." The MDQ is scored by summing the scores (reverse scoring three items). The MDQ has a high internal consistency (Cronbach's $\alpha = .86$; Grieve et al., 2014).

Symptom Insight Assessment. The SIA was designed by the experimenter by using the criteria for muscle dysmorphia (Olivardia, 2001) as a guideline. Participants were instructed to rate to what degree they believed they exhibited each of the criteria for muscle dysmorphia. Participants rated each criterion on a scale from 1 (Not at all true for me) to 6 (Very true for me). This measure was used to assess participant knowledge and awareness of any personal symptoms of muscle dysmorphia.

Criteria Awareness Assessment. Participants read a vignette describing an individual who exhibited each of the criteria of muscle dysmorphia; they were then asked to rate how much they believed the patient described met the criteria for muscle dysmorphia on a scale from 1 (Not at all true for Jim) to 6 (Very true for Jim). Both this measure and the vignette were designed by the experimenter by using the criteria for muscle dysmorphia (Olivardia, 2001) and a case history reported in a previous study (Mosley, 2009) as a guide. This measure was used to assess identification of the symptoms of muscle dysmorphia.

Procedure

Prior to study commencement, Institutional Review Board approval was obtained. In-person participants were given an informed consent document that indicated that completing the survey implied consent; on-line participants were given the same document with a link that indicated consent and took participants to the actual survey. After agreeing to participate, participants completed the demographics questionnaire. Participants then completed the OEQ, the EMI-2, the REI, the AIMS, and the MDQ in this order.

After completing the above questionnaires, participants were asked to rate themselves on each of the diagnostic criteria for muscle dysmorphia. Participants read the vignette and indicated to what extent they believed the individual in the vignette met each of the diagnostic criteria for muscle dysmorphia. Upon completing the study, participants were debriefed about the aim of the study, the purpose of each questionnaire, the hypotheses, and contact information for any

questions regarding their participation; participants were then guided to the final page and instructed to close the browser window. Amazon Mechanical Turk participants were provided a code at the end of the survey and were paid when they used that code in the recruitment website. The mean amount of time that it took participants to complete the study was 23.87 minutes (SD = 28.09), with times ranging from 7 to 172 minutes.

In order to ensure that participants from Amazon Mechanical Turk were paying attention to item content, five manipulation check questions were spread throughout the survey to ensure that participants were reading the items. Although participants were excluded from the data set if they missed even one manipulation check question, the Amazon Mechanical Turk participants were only denied payment if they missed more than three manipulation check questions.

Results

Preliminary Analyses

The items from each of the questionnaires were summed to create a total score for each scale (see Table 2 for means and standard deviation). Cronbach's alpha was calculated for each of the scales to determine internal consistency; each scale was shown to have high internal consistency, with coefficients ranging from .81 to .96. Pearson product-moment correlation coefficients were conducted to assess the relationship between each of the variables; results were varied with the two strongest correlations between the EMI-2 and the REI (r = .84, p < .001) and between the MDQ and SIA (r = .870, p < .001) (see Table 3 for full results).

Hypothesis Testing

A multiple regression analysis was conducted to predict scores on the symptom insight and criteria awareness from scores on the OEQ, EMI-2, REI, AIMS, and MDQ. Hypothesis 1 proposed that high scores on the OEQ, EMI-2, REI, AIMS, and MDQ would be associated with low scores on the SIA. The overall model was significant, F (5, 79) = 57.19, p < .005, R^2 = .78; however, only the AIMS (t = 3.064, p = .003) and MDQ (t = 13.864, p = .000) were statistically significant predictors of symptom identification in participants.

Hypothesis 2 proposed that high scores on the OEQ, EMI-2, REI, AIMS, and MDQ would be associated with high scores on the CAA. The overall model was significant F (5, 79) = 3.88, p < .005, R^2 = .20, but in this analysis, only the MDQ was a significant predictor of criteria awareness for muscle dysmorphia in the presented case vignette (t = -2.280, p = .025). See Table 4 for the full results.

To determine if sports participation was a factor in participants' responses, a second, separate set of regression analyses were run where participants were split into one of two groups based on whether they answered 'Yes' or 'No' to participating in sports; 39 participants reported that they currently participated in sports, while 46 participants denied current sports participation. Results were similar to the total sample analysis for the SIA for both groups; overall, the independent

Table 2
Descriptive Statistics for Each of the Measures Used in the Study

Variable	*M*	*SD*	Range	Alpha (α)
OEQ	45.95	10.52	26–76	.89
EMI-2	159.74	37.06	69–242	.96
REI	112.54	25.55	39–168	.92
AIMS	20.73	12.10	7–49	.94
MDQ	94.13	26.77	47–147	.92
SIA	14.44	6.64	6–30	.83
CAA	30.40	5.27	15–36	.81

Note. The above statistics were obtained for the following measures: Obligatory Exercise Questionnaire (OEQ); Exercise Motivations Inventory – 2nd edition (EMI-2); Reasons for Exercise Inventory (REI); Athletic Identity Measurement Scale (AIMS); Muscle Dysmorphic Questionnaire (MDQ); Symptom Insight Assessment (SIA); Criteria Awareness Assessment (CAA).

variables statistically significantly predicted scores, but only the AIMS and MDQ were statistically significant predictors; sport participation group: F (5, 33) = 19.25, $p < .005$, $R^2 = .75$; no sports participation group: F (5, 40) = 33.68, $p < .005$, $R^2 = .81$. However, neither groups' scores on the independent variables were statistically significant in predicting CAA scores; sport participation group: F (5, 33) = 1.90, $p > .05$, $R^2 = .22$; no sport group: F (5, 40) = 1.36, $p > .05$, $R^2 = .15$. See Tables 5 and 6 for full results.

Discussion

Muscle dysmorphia is a fairly new clinical diagnosis that is primarily shown in adolescent and adult males. The primary symptom is that an individual believes that he or she is not sufficiently lean or muscular, even though the individual may already be overly muscular (Pope et al., 1997). These symptoms and beliefs are often derived from individuals comparing themselves to others they encounter or a desire to conform to specific body types promoted by mass media (Baghurst & Kissinger, 2009; Grieve, 2007). To compensate, individuals engage in behaviors to increase muscularity that include frequent weightlifting and strict eating behaviors, often taking away time from social or occupational activities (American Psychiatric Association, 2013; Olivardia, 2001). As the compulsion to attain a certain body shape becomes central to their self-concept, individuals with muscle dysmorphia may be unwilling to admit that their behaviors are negatively affecting their lives and may be unwilling to seek treatment because it would take away from their time exercising (Grieve, Truba, & Bowersox, 2009; Olivardia, Pope, & Hudson, 2000).

Table 3
Correlations Among Variables

Variable		OEQ	EMI	REI	AIMS	MDQ	SIA	CAA
	Pearson Correlation	1	.663**	.547**	.610**	.542**	.452**	-.272*
OEQ	Sig. (2-tailed)		.000	.000	.000	.000	.000	.012
	N	85	85	85	85	85	85	85
	Pearson Correlation	.663**	1	.840**	.680**	.443**	.375**	-.199
EMI-2	Sig. (2-tailed)	.000		.000	.000	.000	.000	.068
	N	85	85	85	85	85	85	85
	Pearson Correlation	.547**	.840**	1	.502**	.405**	.330**	-.055
REI	Sig. (2-tailed)	.000	.000		.000	.000	.002	.618
	N	85	85	85	85	85	85	85
	Pearson Correlation	.610**	.680**	.502**	1	.397**	.450**	-.317**
AIMS	Sig. (2-tailed)	.000	.000	.000		.000	.000	.003
	N	85	85	85	85	85	85	85
	Pearson Correlation	.542**	.443**	.405**	.397**	1	.870**	-.335**
MDQ	Sig. (2-tailed)	.000	.000	.000	.000		.000	.002
	N	85	85	85	85	85	85	85
	Pearson Correlation	.452**	.375**	.330**	.450**	.870**	1	-.325**
SIA	Sig. (2-tailed)	.000	.000	.002	.000	.000		.002
	N	85	85	85	85	85	85	85
	Pearson Correlation	-.272*	-.199	-.055	-.317**	-.335**	-.325**	1
CAA	Sig. (2-tailed)	.012	.068	.618	.003	.002	.002	
	N	85	85	85	85	85	85	85**

*Correlation is significant at the 0.05 level (2-tailed); **Correlation is significant at the 0.01 level (2-tailed).

The purpose of the current study was to assess participant insight to the diagnostic criteria that they might have and to determine whether they recognize diagnostic criteria in a case vignette. The predictor variables used were obligation to exercise (OEQ), motivations and reasons for exercise (EMI-2 and REI, respectively), athletic identity (AIMS), and symptoms of muscle dysmorphia (MDQ). It was hypothesized that individuals with high scores for each of the predictor variables would have a low insight score, but would have a high score on recognizing symptoms in the vignette.

The first hypothesis was that individuals with high obligation, motivation, and reason for exercise, athletic identity, and muscle dysmorphia behavior would report low symptom insight and recognition. An analysis of the results indicated a statistically significant increase in symptom insight as athletic identity and muscle dysmorphia behavior increased. Of the six criteria listed, the ones that participants rated the highest were: (1) You are hung-up on the idea that your body is not sufficiently lean or muscular; (2) You avoid situations where your body is exposed to others, or endure such situations with distress or anxiety; and (3) You have feelings about the inadequacy about your body size and musculature that causes distress and impairment in your social, occupational, or other important areas of functioning.

These results are somewhat similar to Olivardia, Pope, and Hudson (2000). Of the 24 men with muscle dysmorphia interviewed, less than half had accurate insight that their body perception was distorted. This lack of insight could be due to the nature of muscle dysmorphia symptoms. The symptoms are egosyntonic; that is, excessive weight lifting relieves anxiety that people have about their bodies so the symptoms

Table 4
Regression Examining Predictor Variables for Symptom Insight Assessment and Criteria Awareness Assessment, Overall

	SIA				CAA			
Variable	*B*	*SE B*	β	*p*	*B*	*SE B*	β	*p*
OEQ	-.059	.049	-.093	.237	-.028	.075	-.055	.713
EMI-2	-.020	.021	-.111	.356	-.026	.033	-.186	.421
REI	.000	.026	.002	.987	.074	.039	.358	.062
AIMS	.128	.042	.232	.003	-.098	.064	-.226	.126
MDQ	.217	.016	.876	.000	-.055	.024	-.277	.025

Note. The above statistics were obtained for the following measures: Obligatory Exercise Questionnaire (OEQ); Exercise Motivations Inventory – 2nd edition (EMI-2); Reasons for Exercise Inventory (REI); Athletic Identity Measurement Scale (AIMS); Muscle Dysmorphia Questionnaire (MDQ); Symptom Insight Assessment (SIA); Criteria Awareness Assessment (CAA).

Table 5
Regression Examining Predictor Variables for Symptom Insight Assessment and Criteria Awareness Assessment, Sport Participants (n = 39)

	SIA				CAA			
Variable	*B*	*SE B*	β	*p*	*B*	*SE B*	β	*p*
OEQ	-.136	.084	-.230	.116	-.087	.122	-.177	.481
EMI-2	-.003	.045	-.013	.946	-.099	.065	-.506	.137
REI	-.035	.053	-.105	.513	.125	.076	.455	.110
AIMS	.177	.085	.269	.045	.051	.123	.093	.681
MDQ	.227	.026	.919	.000	-.046	.038	-.222	.243

Note. The above statistics were obtained for the following measures: Obligatory Exercise Questionnaire (OEQ); Exercise Motivations Inventory – 2nd edition (EMI-2); Reasons for Exercise Inventory (REI); Athletic Identity Measurement Scale (AIMS); Muscle Dysmorphia Questionnaire (MDQ); Symptom Insight Assessment (SIA); Criteria Awareness Assessment (CAA).

Table 6
Regression Examining Predictor Variables for Symptom Insight Assessment and Criteria Awareness Assessment, No Sport Group (n = 46)

	SIA				CAA			
Variable	*B*	*SE B*	β	*p*	*B*	*SE B*	β	*p*
OEQ	.042	.069	.052	.543	.127	.104	.219	.229
EMI-2	-.035	.023	-.211	.130	.009	.035	.072	.803
REI	.018	.028	.081	.524	.030	.042	.190	.478
AIMS	.120	.057	.169	.042	-.052	.087	-.103	.549
MDQ	.208	.020	.855	.000	-.054	.030	-.309	.079

Note. The above statistics were obtained for the following measures: Obligatory Exercise Questionnaire (OEQ); Exercise Motivations Inventory – 2nd edition (EMI-2); Reasons for Exercise Inventory (REI); Athletic Identity Measurement Scale (AIMS); Muscle Dysmorphia Questionnaire (MDQ); Symptom Insight Assessment (SIA); Criteria Awareness Assessment (CAA).

are seen in a positive light (Grieve, 2007; Grieve et al., 2009). Therefore, many times people who exhibit the symptoms do not see them as problematic.

The second hypothesis proposed that, after reading the vignette of an individual exhibiting symptoms of muscle dysmorphia, participants with high obligatory exercise, motivation and reason to exercise, athletic identity, and muscle dysmorphia behavior would have high recognition of symptoms in the described individual. Analyses showed a significant decrease in recognizing symptoms in the vignette as participants' behaviors of muscle dysmorphia (MDQ) increased.

These results show some relation to the concept of identification in social comparison theory. As noted by Dijkstra et al. (2010), when an individual identifies with a comparison target, those who view the target as doing worse off themselves, make downward comparisons between themselves and the target, provoking feelings of anxiety or fear (Dijkstra et al., 2010). In this study, it is likely that participants saw something of themselves in the description in the vignette and reported low symptomology as a means of defending their own self-image.

In addition, the relationship between insight and athletic identity can be attributed to the behaviors associated with athletic involvement. Participation in athletics already requires a significant time commitment. Athletes generally obtain and maintain a particular body shape through exercise and diet as part of this participation (Brewer, Van Raalte, & Linder, 1993). Therefore, it is possible that individuals with high levels of athletic identity recognize the criteria for muscle dysmorphia because of the experience of being an athlete rather than because of experiencing mental illness.

These results also hold clinical implications. The results suggest that the MDQ and SIA may be beneficial in a treatment setting to measure the specific behaviors of muscle dysmorphia and patient insight about the preoccupation with improving body image. Taking this one further step, a readiness to change survey could also be administered to patients to determine how willing they are to change their behavior, what therapy might be most effective, and possible treatment outcome. Thus, insight into problem behaviors can be used as a motivational tool, such as within motivational interviewing (Miller & Rollnick, 2013).

There are several limitations to the results of this study. First, even though the SIA and CAA are based on the established criteria for muscle dysmorphia (American Psychiatric Association, 2013; Olivardia, 2001), they were specifically designed for this study, and therefore may have questionable validity. Additionally, the vignette was also written for this study and was not tested in advance; therefore, it is possible that the vignette does not sufficiently or accurately describe the criteria for muscle dysmorphia. Second, there is the possibility that because participants were allowed to complete the survey outside of a research environment for their own convenience, some participants may have misunderstood the questions. Third, the SIA and CAA were administered at the end of the study; even though there is a decreased likelihood of this affecting

the CAA, administering the SIA at the beginning of the study could have made it less likely to be influenced by response bias.

Future research should focus on assessing differences in muscle dysmorphia symptoms and behaviors based on ethnicity, sport, and gender. Including measures of self-esteem, depression, or anxiety could also be useful in a treatment setting to determine patient overall mood state and gain a greater understanding of psychological well-being for individuals with muscle dysmorphia.

In conclusion, individuals have difficulty recognizing symptoms of muscle dysmorphia in others. However, those with a strong athletic identity or high rates of behaviors appear to have greater insight to any possible symptoms that they themselves might be experiencing, which may be useful in treatment.

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