



ORIGINAL ARTICLE

Muscle Dysmorphia and Eating Disorders: Comparison on Self-Esteem and Personality Traits

Christopher Rodrigue, Isabelle Labrecque, Olivier Turcotte and Catherine Bégin*

School of Psychology, Laval University, Quebec City, Quebec, Canada



*Corresponding author: Catherine Bégin, School of Psychology, Laval University, 2325 Allée des Bibliothèques, G1V 0A6, Quebec City, Quebec, Canada, Tel: 001-418-656-2131 #12997, Fax: 001-418-656-3646

Abstract

Even though muscle dysmorphia (MD) is classified as a body dysmorphic disorder, it shares similarities with eating disorders (ED). The aim of the present study was to explore similarities between men with MD, women with ED, and a control group of men with body related preoccupations, regarding self-esteem, body esteem, and personality traits. Analyses revealed that clinical groups reported lower body esteem, more perfectionism and narcissism than the control group; only the ED group showed a significantly lower self-esteem than the control group. Also, men with MD showed higher self-esteem and body-esteem, as well as a higher level of narcissistic grandiosity than women with ED. Even though, we cannot exclude that gender differences could partly explain these findings, the present results suggested that a preserved self-esteem and a heightened narcissistic grandiosity tend to characterize MD.

Keywords

Muscle dysmorphia, Eating disorders, Self-esteem, Personality, Narcissism

Introduction

In today's society, men are facing important social pressures to reach a muscular and lean body [1-3]. They are increasingly exposed to an ideal body (more unveiled and muscular than before) through several media [4-6]. According to a meta-analysis, the male body ideal conveyed by various media (magazines, advertising, toys) has a significant negative impact on males' body satisfaction, self-esteem, and is associated with specific behaviors, such as dieting and excessive exercising [7]. Men present more muscularity-oriented thoughts and behaviors than women due to stereotypical traditional

perceptions of what it means to be a man [8-10].

Men tend to be more often dissatisfied with their body than they used to [11,12]. More precisely, men's preoccupations focus mainly on developing a more muscular body shape, as well as a physical strength. In a non-clinical sample of 343 women and 157 men (mean age = 20 years), McCreary, Saucier and Courtenay [13] found out that although 10% of men and 28% of women are dieting to lose weight, another 17% of men and only 1% of women adopted behaviors to gain weight and develop muscles.

Muscle Dysmorphia

Muscle Dysmorphia (MD) has been introduced to conceptualize an excessive concern about one's own muscularity. It is mainly characterized by an intense drive for muscularity while maintaining a low body fat percentage [11]. MD has been included in the latest edition of the Diagnostic and Statistical Manual of Mental Disorders [14] as a body dysmorphic disorder specification, which is classified as an obsessive-compulsive disorder. However, this field of study has emerged way before that. Indeed, Pope, et al. [15] had previously defined diagnostic criteria for MD. These criteria were developed from studies about MD, case examples and clinical features (Appendix 1). The principal criterion is a preoccupation with the idea that one's body is not sufficiently lean and muscular.

Based on these criteria, Olivardia and colleagues [16] compared a group of 24 men with MD to a control group of 30 men who regularly train in a gym but did

not report any MD symptoms. Results revealed that 50% of the clinical sample reports spending more than five hours a day thinking that they are too small, not muscled enough and that they need to increase their muscularity (Criterion A); in opposition to 40 minutes for men from the control group. Moreover, 54% of the clinical sample reported having little to no control on their training and dieting routine (Criterion B1); and 58% revealed avoiding activities, places and persons in a moderate to severe way, because of the negative perception they have of their own body (Criterion B2).

Similarities between Muscle Dysmorphia and Eating Disorders

Despite MD's belonging to the obsessive-compulsive disorders spectrum, similarities with feeding and eating disorders' (ED's) contribute to the debate pertaining its classification [17-23]. Accordingly, Murray, et al. [21] posit that like anorexia and bulimia nervosa (ED), MD occurs during adolescence and would come from the internalization of social pressures regarding body image (muscularity for men and thinness for women).

Furthermore, few authors have drawn parallels between MD and ED clinical features. Foremost, they are all characterized by high levels of body dissatisfaction and cognitive distortions about body shape; for MD, one's body is never muscular or lean enough, and never skinny enough for ED [16,18,24,25]. Furthermore, dieting and excessive exercising are central features for all these conditions [19,21]. A study comparing 24 men with anorexia nervosa (AN), as diagnose with the DSM-5 criteria, to 21 men suffering of MD as diagnosed with Pope's criteria, and 15 men gym-using controls showed that men with MD and AN reported clinical similarities regarding disturbed body image, disordered eating, as well as excessive exercising [22].

MD and ED also share underlying psychological features. A study from Davis, Karvinen and McCreary [26] showed that neuroticism and perfectionism are significant predictors of both drive for thinness among women and drive for muscularity among men. More recently, Murray and colleagues [23] showed, with a student sample, that components of a transdiagnostic model of ED (mood intolerance, low self-esteem, self-oriented and socially prescribed perfectionism) also predicted MD symptoms. These results are consistent with those obtained by Lamanna, Grieve, Derryberry, Hakman & McClure [27], reporting that body dissatisfaction and low self-esteem are considered as etiological factors of both MD and ED symptoms in men and women. Finally, Davis and Scott-Robertson [28] compared a group of 22 bodybuilders with a group of 46 women with anorexia, on self-esteem and personality. Results showed no significant differences between groups on all variables except for self-esteem and body self-esteem, which were higher for the bodybuilders'

group. Moreover, when compared to normed data, their results showed that both groups were more obsessional, perfectionistic, narcissistic, and reported more physical anhedonia than the general population. Although these results suggest that MD symptoms are associated with determinants that are traditionally linked to ED, very few clinical studies have empirically demonstrated it.

To date, MD symptoms have mainly been assessed with self-reported questionnaires. The present study goes a step further by ensuring that the MD group met the diagnosis criteria proposed by Pope before comparing it to ED group. Consequently, the aim of the present study was to identify a group of men with MD using a semi-structured interview based on Pope's criteria [15], and to compare them with a group of women with ED, and with a control group regarding self-esteem (self-esteem, body self-esteem) and personality traits (perfectionism, obsessive-compulsive personality traits, pathological narcissism). According to this objective, it is expected that both clinical groups would display similar levels of self-esteem and body esteem. They are also expected to display similar levels of perfectionism, obsessive-compulsive traits and narcissism.

Method

Participants

Participants were 63 men and 28 women from 18 to 50-years-old. The group was composed of 31 men between 19 and 36 years ($M = 24$; $SD = 4.5$), who met the significant number of criteria proposed by Pope and his colleagues [15], to be classified as MD. Secondly, a control group was composed of 32 men between 19 and 34-years-old ($M = 23.9$; $SD = 3.8$) concerned by their muscularity (Criterion A according to Pope), but who did not meet significant criteria to be classified as MD. Finally, the third group was composed of 28 women suffering from ED, between 18 to 50 years ($M = 26.4$; $SD = 8$). An experienced psychiatrist diagnosed women from this group, based on DSM-5 criteria for anorexia and bulimia nervosa.

Measures

Sociodemographic questionnaire: General sociodemographic information about age, gender, family situation, citizenship, education and salary were collected through a homemade questionnaire. Other information regarding weight (maximum, minimum and current weight, height, presence of body image concerns and onset of these body image concerns) was also collected with this questionnaire.

Diagnosis Interview for Muscle Dysmorphia (DIMD): MD was evaluated with a semi-structured interview elaborated by our research team, based on the diagnostic criteria proposed by Pope and colleagues [15] as well as by Leone and colleagues [29]. The DIMD

represents a more complete diagnostic tool than the actual self-reported questionnaires, allowing to clarify questions and to ask sub-questions if needed (Appendix 2). The interview contains 13 questions, divided in three distinct categories: exercising, dietary habits, and the social impact of exercising and dietary habits. It has been built to make sure that all the criteria were concisely covered. Moreover, the coding process consists of asking questions to the participant until the experimenters can take a clinical decision on each criterion (does the participant meet the criterion?). As for the evaluation of all mental disorder according to DSM 5, the clinician must be able to document with examples whether the person met the diagnosis criterion. The final decision is bipolar, it means that the experimenter must conclude to a diagnostic of MD (MD group) or not. For the present study, the experimenter completed the rating scale for every male participant to maintain a standardized procedure. A good knowledge about diagnostic features of MD is needed to conduct the interview adequately. In order to ensure that the interview distinguished the two group of male (MD and control group), a Chi-square was conducted on all criteria. Results showed that the two group of participants were significantly different on all the diagnosis criteria (B1(= 41,28, dl = 1, $p < 0.001$), B2(= 5,38, dl = 1, $p < 0.05$), B3(= 23,79, dl = 1, $p < 0.001$) et B4(= 34,90, dl = 1, $p < 0.001$)) excepted the criterion A.

Rosenberg Self-Esteem Scale (RSES): The RSES is the most recognized and widely used measure of self-esteem. It has been designed by Rosenberg [30] to assess positive and negative attitudes towards the self. It is a 10-item questionnaire, answered on a four-point Likert-type scale from *strongly agree* to *strongly disagree*. A higher score indicates a higher level of self-esteem. This questionnaire has shown a very satisfying internal consistency (alphas from 0.70 to 0.90), a very good one-dimensional factorial structure, satisfying construct validity and an acceptable test-retest stability ($r = 0.84$) [31]. In the present study, the RSES's internal consistency was excellent, reaching 0.96.

Body-Esteem Scale (BES): The Body-Esteem Scale [32], a 23-item questionnaire used to assess body satisfaction, is divided in three subscales: Appearance, Weight, and Attribution. Items are answered on a five-point Likert-type scale ranging from *never* (0) to *always* (4). A higher score on each subscale indicated higher body self-esteem and a positive appearance evaluation [33]. An excellent internal consistency ($\alpha = 0.92, 0.81,$ and 0.94) as well as a good temporal stability have been demonstrated for each scale ($\alpha = 0.89, 0.92,$ and 0.83) [32,34,35]. In the present study, internal consistency coefficients for the Appearance subscale ($\alpha = 0.93$) and Weight subscale ($\alpha = 0.91$) were excellent, and poor for the Attribution subscale ($\alpha = 0.47$).

Multidimensional Perfectionism Scale (MPS): The Multidimensional Perfectionism Scale was used

to assess perfectionism [36]. This is a 35-item self-reported questionnaire divided in multiple subscales: Concerns Over Mistakes, Personal Standards, Parental Expectations, Parental Criticism, Doubt About Actions and Organization. Each participant answers the 35 items on 5-point likert scale ranging from *strongly disagree* (1) to *strongly agree* (5). Psychometric properties were evaluated in four studies; internal consistency analysis of all subscales showed that MPS has an acceptable to excellent internal reliability, with Chronbach's alphas ranging from 0.77 to 0.93 [36]. Coefficients for each scale are the following: Concerns Over Mistakes ($\alpha = 0.86$), Personal Standards ($\alpha = 0.85$), Parental Expectations ($\alpha = 0.86$), Parental Criticism ($\alpha = 0.86$), Doubt About Actions ($\alpha = 0.80$) and organization ($\alpha = 0.85$).

Obsessive-Compulsive Personality Scale (OCP): Obsessive-compulsive personality was evaluated with the Obsessive-Compulsive Personality Scale [37,38], a 41-item, true-false self-reported questionnaire, composed of six subscales (Emotional Constriction, Organization, Parsimony, Perseverance, Inflexibility and High Superego). A higher total score on this questionnaire indicates stronger obsessive-compulsive personality traits. An acceptable internal consistency was reported (alphas = 0.71) for all subscales [39]. In the present study, the internal consistency coefficient was also acceptable ($\alpha = 0.74$).

Pathological Narcissism Inventory (PNI): The Pathological Narcissism Inventory [40], a 52-item self-report questionnaire, was used to assess multidimensional pathological narcissism. The questions are answered on a 6-point Likert-type scale ranging from 1 (not at all like me) to 6 (very much like me). The PNI aims to assess narcissistic grandiosity (Exploitativeness, Grandiose Fantasy, Self-Sacrificing/Self-Enhancement, Entitlement Rage), and narcissistic vulnerability (Contingent Self-Esteem, Devaluing, Hiding the Self) [41]. The PNI has shown internal consistency coefficients ranging from acceptable to excellent for every subscale of the narcissistic grandiosity and the narcissistic vulnerability ($\alpha = 0.78$ to 0.93), and for the total score ($\alpha = 0.95$) [42]. The internal consistency for the present study was also excellent ($\alpha = 0.93$).

Procedure

Men were recruited through advertisements in 28 gyms in the Quebec Metropolitan area. The heading of the recruitment ad was: «Never muscular enough?». The same ad was sent by email to the whole community of Laval University (students and employees). To take part of the study, men must be preoccupied by their muscularity. Participants were invited to come to the teaching clinic of the School of Psychology at Laval University. After explaining the study, participants read and signed the consent form, approved by the Laval University's Ethics Research Committee. Afterwards,

male participants completed the diagnosis interview to assess MD. To standardize the interviews, two doctoral students in clinical psychology received an appropriate training by a psychologist specialized in psychopathology. Following the interview, participants were left alone to compute the computerized survey.

Groups were formed using Pope's diagnosis criteria [15]: Individuals who met the significant number of criteria were assigned to the clinical group (MD condition) and individuals concerned about their muscularity (Criterion A) but who did not meet other MD's criteria were assigned to the control group (control condition). To validate the coding process, a psychologist specialized in psychopathology offered consultation periods to clarify some difficult aspects of the coding process (ex: Identification of distinctive aspects of men's distress, participants with unclear diagnosis, etc.). Then, both interviewers reviewed each interview to ensure similar diagnostic norms. Furthermore, to establish inter-rater reliability, a doctoral student in clinical psychology has been recruited to act as a blind coder. He listened randomly to 30% of the interviews. Before the coding process, he received the appropriate training to code the interviews, and during it, he received the same consultation opportunities than the initial coders. The inter-rater agreement according to the final decision pertaining to the clinical group or control group was calculated with SPSS 24.0, and was almost perfect ($\kappa = 0.90$).

Women were recruited through the Eating Disorders Unit at Laval University Medical Center in Quebec City, Canada. They had to meet the diagnostic criteria for ED as described in the DSM-5, to be eligible for the study. A psychiatrist conducted a semi-structured interview based on DSM-5 to confirm the diagnostic. Afterwards, if women agreed to participate to the study, they signed an informed consent form and completed the questionnaires.

Data Analysis

Data were analyzed using SPSS 24.0. Participants of the three groups (MD, control group and ED) were com-

pared on all studied variables (self-esteem, body self-esteem, perfectionism, obsessive-compulsive personality traits and narcissism), using ANOVAS, to see if significant differences exist among them. Fisher's LSD tests were used to identify the potential differences between groups. All variables were examined for normality and the presence of outliers. ANOVA's assumptions of homoscedasticity, normality of the dependent variable, and independence of observations were all met. No outliers were identified for the present variables.

Results

Analyses of variance revealed significant differences between groups regarding self-esteem ($F_{(2,88)} = 26.18$, $p < 0.001$), body self-esteem related to appearance ($F_{(2,88)} = 22.16$, $p = 0.00$, weight, $F_{(2,88)} = 29.6$, $p < 0.001$), and attribution ($F_{(2,88)} = 3.26$, $p = 0.043$). Results of these analyses are presented in the Table 1. More specifically, only women of the ED group reported a lower self-esteem compared to the control group ($p < 0.001$). However, both MD and ED groups had a significantly lower body self-esteem level related to appearance and weight ($p < 0.05$), than the control group; while there was no difference between the clinical groups (MD and ED) and the control group for the attribution subscale ($p > 0.05$). Also, MD group had significantly higher self-esteem's scores, and body self-esteem's scores related to appearance, weight, and attributions, than the ED group ($p < 0.05$).

Significant differences between groups were also observed in relation with personality traits (perfectionism, obsessive traits, and narcissism). Results revealed significant differences among the three groups according to perfectionism ($F_{(2,87)} = 6.24$, $p = 0.003$), narcissistic vulnerability ($F_{(2,88)} = 4.5$, $p = 0.013$), and narcissistic grandiosity ($F_{(2,88)} = 7.25$, $p = 0.001$), but no significant difference was found for the obsessive-compulsive traits. Specifically, both clinical groups (MD and ED) reported higher levels of perfectionism compared to the control group, and no significant difference were found between the MD and the ED group for the perfectionism's subscales ($p > 0.05$). A similar pattern was ob-

Table 1: Differences between groups on self-esteem and personality measures.

| | Control (n = 32) | MD (n = 31) | ED (n = 28) | ANOVA |
|--------------------|------------------|----------------------------|-----------------------------|-----------------------|
| | Mean (SD) | Mean (SD) | Mean (SD) | |
| Self-esteem | | | | |
| RSES-total | 22.78 (4.23) | 21.23 (5.13) | 14.43 (4.70) ^{a,b} | $F_{(2,88)} = 6.18^*$ |
| BES-appearance | 2.34 (0.59) | 1.97 (0.75) ^a | 1.16 (0.76) ^{a,b} | $F_{(2,88)} = 2.16^*$ |
| BES-weight | 2.50 (0.71) | 2.13 (0.77) ^a | 1.10 (0.67) ^{a,b} | $F_{(2,88)} = 9.63^*$ |
| BES-attribution | 2.18 (0.53) | 2.26 (0.63) | 1.92 (0.41) ^b | $F_{(2,88)} = 3.26^*$ |
| Personality | | | | |
| MPS-total | 75.03 (16.07) | 85.48 (18.35) ^a | 91.56 (20.53) ^a | $F_{(2,88)} = 6.24^*$ |
| OCPS-total | 24.88 (4.16) | 24.90 (5.69) | 22.79 (6.12) | $F_{(2,88)} = 1.50$ |
| PNI-grandiose | 3.40 (0.76) | 3.970 (0.63) ^a | 3.32 (0.73) ^b | $F_{(2,88)} = 7.25^*$ |
| PNI-vulnerable | 2.92 (0.73) | 3.36 (0.62) ^a | 4.44 (0.86) ^a | $F_{(2,88)} = 4.54^*$ |
| PNI-total | 2.13 (0.61) | 3.62 (0.51) ^a | 3.39 (0.65) | $F_{(2,88)} = 4.75^*$ |

* $p < 0.05$; ^aDiffers to Control; ^bDiffers to MD.

served for the narcissistic vulnerability, on which both clinical groups reported higher levels compared to the control group ($p < 0.05$). No significant differences were found between ED and MD groups on the narcissistic vulnerability trait. However, participants from the MD group showed higher levels of narcissistic grandiosity than those from the control group ($p = 0.003$), as well as women from the ED group ($p < 0.01$).

Discussion

The main objective of this study was to enhance our knowledge on MD by comparing a group of men with MD based on a diagnostic interview, to a group of women with an eating disorder (ED), and a control group of men concerned with their muscularity, regarding self-esteem and personality traits.

Comparisons between groups (ED, MD and control) revealed some interesting findings. Similarly, to David and Scott-Robertson [28], the present results suggested that participants with MD as well as those with ED reported similar levels of perfectionism and narcissism and that both groups were more perfectionist and narcissistic (narcissistic vulnerability) than men from the control group. Perfectionism is defined by the pursuit of unrealistic goals despite negative consequences [43], and underlies themes like: concerns with mistakes, personal standards, or doubt about its own behaviors. In this context, it is possible that this personality trait could be a precursor of rigid attitudes and behaviors to reach an ideal body shape. These results support previous findings in which MD and eating disorders were linked to perfectionism [27].

Although participants from the MD and ED groups reported similar global scores on the narcissism scale, the multidimensional nature of the measure allows a finer understanding of this personality trait on MD's clinical features. Results revealed that men from the MD group reported higher levels of narcissistic grandiosity, while both clinical groups reported higher levels of narcissistic vulnerability than the control group. The higher levels of narcissistic vulnerability within women with ED is well supported in literature about ED's diagnostic features [44-46]. Less is known about narcissistic vulnerability among MD. Regarding narcissistic grandiosity, the only significant subscale for MD group is "grandiose fantasy". These results revealed that men with MD differ from women with ED by their marked tendency to have grandiose fantasies around success, admiration and gratitude. Thus, overinvestment of body image in men could become the target of these grandiose fantasies as a way to reach society's idealized models. When their results were compared to normed PNI total scores, men with MD, as well as body builders were more similar to a psychiatric population. They showed even higher levels of grandiose (3.97 vs. 2.47) and vulnerable (3.36 vs. 2.39) narcissism than the psychiatric population [40].

The absence of significant differences regarding obsessive-compulsive personality traits is inconsistent with other studies in which obsessive-compulsive characteristics were significantly related to MD or eating disorders [25,47-50]. The present results may be explained by the OCPS's answer format, which is a true/false measure; it does not allow participants to give a more nuanced and accurate answer. In their study, Davis and Scott-Robertson [28] used a continuous scale on which participants indicate their answer on a 155 millimetres horizontal line and found that bodybuilder men and women with anorexia nervosa showed more obsessive-compulsive personality traits than the general population. Nevertheless, we cannot rule out that the present control group was not typical of the general population and that it could be more similar to MD and ED groups as participants of the control group endorsed body-image concerns (i.e. criterion A of MD). In that sense, the obsessive-compulsive traits may be a common trait for those who endorsed body image preoccupations whether or not they received the full diagnosis. The absence of significant differences regarding the obsessive-compulsive traits may thus be explained by the over homogenized samples.

As expected, body self-esteem related to appearance and weight was lower for the MD group, when compared to the control group. This result was significant since men from both groups were preoccupied with their body image (criterion A of MD). The presence of negative affect regarding appearance and weight, harmful behaviors and functional impairments in men with MD may all influence body self-esteem. This finding suggest that body-esteem appearance and weight could discriminate men who meet the full MD diagnostic criteria and those who did not endorse all the diagnosis criteria but that were still more inclined to meet MD than men from the general population. These results were different from those obtained by David and Scott-Robertson [28], in which the bodybuilder sample had higher levels of body self-esteem, compared to normative data from the general population. However, because they did not assess MD symptoms, their sample of bodybuilders could have included men who did not meet diagnosis of MD but were concerned about their shape and weight. In that sense, they may look alike more as our control group (risky for MD group). The different samples between our study and David and Scott-Roberson's study made it harder to conclude.

Finally, results suggest that men from the MD group and men from the control group had similar levels of self-esteem; whereas men of the MD group reported a better self-esteem than women from the ED group. Accordingly, David and Scott-Robertson [28] have found that bodybuilders had a higher self-esteem than a group of women with anorexia. A possible explanation for the higher self-esteem in MD may come from the fact

that men with MD present significantly higher level of grandiose fantasy than women with ED. These fantasies around success and admiration may inflate self-esteem of men with MD. In fact, if men with MD think about themselves grandiosely, they may explicitly endorse positive items on self-esteem. Moreover, it is possible that men who devoted their time and energy to their muscle development, and who are encouraged by their surroundings, presented a good sense of self. Lastly, in order to explain the higher self-esteem levels reported by the MD group compared to the ED group, we cannot exclude the possibility that both clinical groups were not equivalent in terms of severity or awareness regarding their dysfunctional behaviors. Indeed, women of the ED group were recruited in a specialized unit of eating disorders, at Laval University Medical Center, whereas men of the MD group were recruited in the general population. In that sense, ED women, by requesting help for their eating problems were certainly aware of their difficulties which is not necessarily the case for MD men. This difference in terms of severity or awareness regarding their disorder could be a valid explanation for higher scores on self-esteem and body self-esteem in men with MD. Gender differences between groups could also explained this result considering that gender differences in self-esteem were previously reported in meta-analytical studies [51].

Strengths and Limitations

An important strength of the present study is the participation of clinical groups (ED and MD), as diagnosed with semi-structured interviews, considering that most studies on MD included non-clinical samples. It is also note worthy that the control group was a group of men who were more inclined and at risk of MD than the general population, allowing a comparison between men who endorsed the full diagnostic and those who slightly not, according to many variables. This proposes that between MD and non-MD people, there are those who share some characteristics with MD and some with the general population. In addition, few studies investigated the role of personality traits in MD. However, the use of self-reported questionnaires for most variables of interest may have affected participants' answers through social desirability. Finally, even if participants of the MD groups reported enough criteria to be considered as pathological, a group of men within a specialized clinical center would have allowed a more valid comparison with the ED group.

Conclusion

The general purpose of this study was to improve our knowledge on MD, by comparing MD, ED and a control group (risky MD group) regarding self-esteem and personality traits. Results revealed that individuals with MD and ED share personality traits such as perfectionism and narcissism, but that a preserved

self-esteem and a heightened grandiose narcissism are distinctive characteristics of MD. For now, we cannot exclude that these differences might be explained by gender differences or by differences in severity between our samples.

According to a systematic review conducted by dos Santos Filho [52] and his colleagues, current evidences on muscle dysmorphia are not sufficient to conclude to the classification of this condition. The results of the present study support the idea that it may be premature to classify MD as a body dysmorphic disorder. In fact, our results support that both ED and MD were significantly different from a MD risky group regarding body-image concerns, as well as perfectionism and narcissism and that they shared personality traits. Furthermore, the obsessive-compulsive traits were a common trait for those who endorsed body image preoccupations regardless of diagnosis issues. Based on similarities between ED and MD, more studies are needed before concluding MD in any classification. To document the eating behaviors of MD is a priority as disordered eating behaviors seem to be a secondary component of the symptomatology of MD compared to ED.

References

1. Murnen SK, Karazsia BT (2017) A review of research on men's body image and drive for muscularity. In: Levant RF, Wong YJ, The psychology of men and masculinities. American Psychological Association, Washington, DC, USA, 229-257.
2. Smolak L, Murnen SK, Thompson JK (2005) Sociocultural influences and muscle building in adolescent boys. *Psychology of Men & Masculinity* 6: 227-239.
3. Standford JN, McCabe MP (2005) Sociocultural influences on adolescent boys' body image and body change strategies. *Body Image* 2: 105-113.
4. Hatoum IJ, Belle D (2004) Mags and abs: Media consumption and bodily concerns in men. *Sex Roles* 51: 397-407.
5. Labre MP (2005) Burn fat, build muscle: A content analysis of men's health and men's fitness. *International Journal of Men's Health* 4: 187-200.
6. Leit RA, Pope HG, Gray JJ (2001) Cultural expectations of muscularity in men: The evolution of playgirl centerfolds. *The International Journal of Eating Disorders* 29: 90-93.
7. Barlett CP, Vowels C L, Saucier DA (2008) Meta-analyses of the effects of media images on men's body-image concerns. *Journal of Social and Clinical Psychology* 27: 279-310.
8. Griffiths S, Murray SB, Touyz S (2015) Extending the masculinity hypothesis: An investigation of gender role conformity, body dissatisfaction, and disordered eating in young heterosexual men. *Psychology of Men & Maculinity* 16: 108-114.
9. De Jesus AY, Ricciardelli LA, Frisén A, Smolak L, Yager Z, et al. (2015) Media internalization and conformity to traditional masculine norms in relation to body image concerns among men. *Eat Behav* 18: 137-142.
10. Gattario KH, Frisén A, Fuller-Tyszkiewicz M, Ricciardelli

- LA, Diedrichs PC, et al. (2015) How is men's conformity to masculine norms related to their body image? *Masculinity and muscularity across Western countries. Psychology of Men and Masculinities* 16: 337-347.
11. Jones WR, Morgan JF (2010) Eating disorders in men: A review of the literature. *Journal of Public Mental Health* 9: 23-32.
12. Olivardia R, Pope HG, Borowiecki JJ, Cohane GH (2004) Biceps and body image: The relationship between muscularity and self-esteem, depression, and eating disorder symptoms. *Psychology of Men & Masculinity* 5: 112-120.
13. McCreary DR, Saucier DM, Courtenay WH (2005) The drive for muscularity and masculinity: Testing the associations among gender-role traits, behaviors, attitudes, and conflict. *Psychology of Men & Masculinity* 6: 83-94.
14. American Psychiatric Association (2013) *Diagnostic and statistical manual of mental disorders*. (5th edn), Washington, DC: APA.
15. Pope HG, Gruber AJ, Choi P, Olivardia R, Phillips KA (1997) Muscle dysmorphia: An underrecognized form of body dysmorphic disorder. *Psychosomatics* 38: 548-557.
16. Olivardia R, Pope HG, Hudson JI (2000) Muscle dysmorphia in male weightlifters: A case-control study. *Am J Psychiatry* 157: 1291-1296.
17. Grieve FG (2007) A conceptual model of factors contributing to the development of muscle dysmorphia. *Eating disorders* 15: 63-80.
18. Grieve FG, Truba N, Bowersox S (2009) Etiology, assessment, and treatment of muscle dysmorphia. *Journal of Cognitive Psychotherapy* 23: 306-314.
19. Lopez A, Pollack L, Gonzales S, Pona A, Lundgren J (2015) Psychosocial correlates of muscle dysmorphia among collegiate males. *Journal of Psychological Inquiry* 20: 58-66.
20. Mosley PE (2009) Bigorexia: Bodybuilding and muscle dysmorphia. *Eur Eat Disord Rev* 17: 191-198.
21. Murray SB, Rieger E, Touyz SW, De La Garza García Y (2010) Muscle dysmorphia and the DSM-V conundrum: Where does it belong? A review paper. *The International Journal of Eating Disorders* 43: 483-491.
22. Murray SB, Rieger E, Hildebrandt T, Karlov L, Russell J, et al. (2012) A comparison of eating, exercise, shape, and weight related symptomatology in males with muscle dysmorphia and anorexia nervosa. *Body Image*, 9: 193-200.
23. Murray SB, Rieger E, Karlov L, Touyz SW (2013) An investigation of the transdiagnostic model of eating disorders in the context of muscle dysmorphia. *Eur Eat Disord Rev* 21: 160-164.
24. Henson C (2004) Potential antecedents of muscle dysmorphia. (Unpublished doctoral thesis). Western Kentucky University, Bowling Green, KY.
25. Maida D, Armstrong S (2005) The classification of muscle dysmorphia. *International Journal of Men's Health* 4: 73-91.
26. Davis C, Karvinen K, McCreary DR (2005) Personality correlates of a drive for muscularity in young men. *Personality and Individual Differences* 39: 349-359.
27. Lamana J, Grieve FG, Derryberry P, Hakman M, McClure A (2010) Antecedents of eating disorders and muscle dysmorphia in a non-clinical sample. *Eat Weight Disord* 15: E23-E33.
28. Davis C, Scott-Robertson L (2000) A psychological comparison of females with anorexia nervosa and competitive male bodybuilders: Body shape ideals in the extreme. *Eating behaviors* 1: 33-46.
29. Leone JE, Sedory EJ, Gray KA (2005) Recognition and treatment of muscle dysmorphia and related body image disorders. *J Athl Train* 40: 352-359.
30. Rosenberg M (1965) *Society and the adolescent self-image*. Princeton University Press, Princeton, NJ.
31. Vallières EF, Vallerand RJ (1990) Traduction et validation canadienne-française de l'échelle de l'estime de soi de Rosenberg. *International Journal of Psychology* 25: 305-316.
32. Mendelson BK, Mendelson DR, White DR (2001) Body-esteem scale for adolescents and adults. *Journal of Personality Assessment* 76: 90-106.
33. Valls M, Rousseau A, Chabrol H (2011) Étude de validation de la version française du Body Esteem Scale (BES) dans la population masculine. *Journal De Thérapie Comportementale Et Cognitive* 21: 58-64.
34. Confalonieri E, Gatti E, Ionio C, Traficante D (2008) Body esteem scale: A validation on Italian adolescents. *Testing, Psychometrics, Methodology in Applied Psychology* 15: 153-165.
35. Jónsdóttir SR, Arnarson EÖ, Smári J (2008) Body esteem, perceived competence and depression in Icelandic adolescents. *Nordic Psychology* 60: 58-71.
36. Frost RO, Marten P, Lahart C, Rosenblate R (1990) The dimensions of perfectionism. *Cognitive Therapy and Research* 14: 449-468.
37. Lazare A, Klerman GL, Armor DJ (1966) Oral obsessive and hysterical personality patterns: An investigation of psychoanalytic concepts by means of factor analysis. *Arch Gen Psychiatry* 14: 624-630.
38. Lazare A, Klerman GL, Armor DJ (1970) Oral, obsessive and hysterical personality patterns. *Journal of Psychiatric Research* 7: 275-290.
39. Summerfeldt LJ (1991) Obsessive-compulsive personality and anxiety: An application of the multidimensional interaction model (Unpublished doctoral thesis).
40. Pincus AL, Pimentel EB, Cain NM, Wright AGC, Levy KN, et al. (2009) Initial construction and validation of the pathological narcissism inventory. *Psychol Assess* 21: 365-379.
41. Wright AGC, Lukowitsky MR, Pincus AL, Conroy DE (2010) The higher order factor structure and gender invariance of the Pathological Narcissism Inventory. *Assessment* 17: 467-483.
42. Watson PJ, Grisham SO, Trotter MV, Biderman MD (1984) Narcissism and empathy: Validity evidence for the narcissistic personality inventory. *Journal of Personality Assessment* 48: 301-305.
43. Cassin SE, Von Ranson KM (2005) Personality and eating disorders: A decade in review. *Clinical Psychology Review* 25: 895-916.
44. Holliday J, Uher R, Landau S, Collier D, Treasure J (2006) Personality pathology among individuals with a lifetime history of anorexia nervosa. *J Pers Disord* 20: 417-430.
45. Maples J, Collins B, Miller JD, Fischer S, Seibert A (2011) Differences between grandiose and vulnerable narcissism

- and bulimic symptoms in young women. *Eat Behav* 12: 83-85.
46. Waller G, Sines J, Meyer C, Foster E, Skelton A (2007) Narcissism and narcissistic defences in the eating disorders. *International Journal of Eating Disorders* 40: 143-148.
47. Altman S, Shankman S (2009) What is the association between obsessive-compulsive disorder and eating disorders? *Clin Psychol Rev* 29: 638-646.
48. Chandler CG, Derryberry WP, Grieve FG, Pegg PO (2009) Are anxiety and obsessive-compulsive symptoms related to muscle dysmorphia? *International Journal of Men's Health* 8: 143-154.
49. Hildebrandt T, Schlundt D, Langenbucher J, Chung T (2006) Presence of muscle dysmorphia symptomology among male weightlifters. *Comprehensive Psychiatry* 47: 127-135.
50. Murphy R, Nutzinger DO, Paul T, Leplow B (2004) Conditional-associative learning in eating disorders: A comparison with OCD. *Journal of Clinical and Experimental Neuropsychology* 26: 190-199.
51. Kling KC, Hyde JS, Shower CJ, Buswell BN (1999) Gender differences in self-esteem: A meta-analysis. *Psychological Bulletin* 125: 470-500.
52. Dos Santos CA, Tirico PP, Stefano SC, Touyz SW, Claudino AN (2016) Systematic review of the diagnostic category muscle dysmorphia. *Aust N Z J Psychiatry* 50: 322-333.