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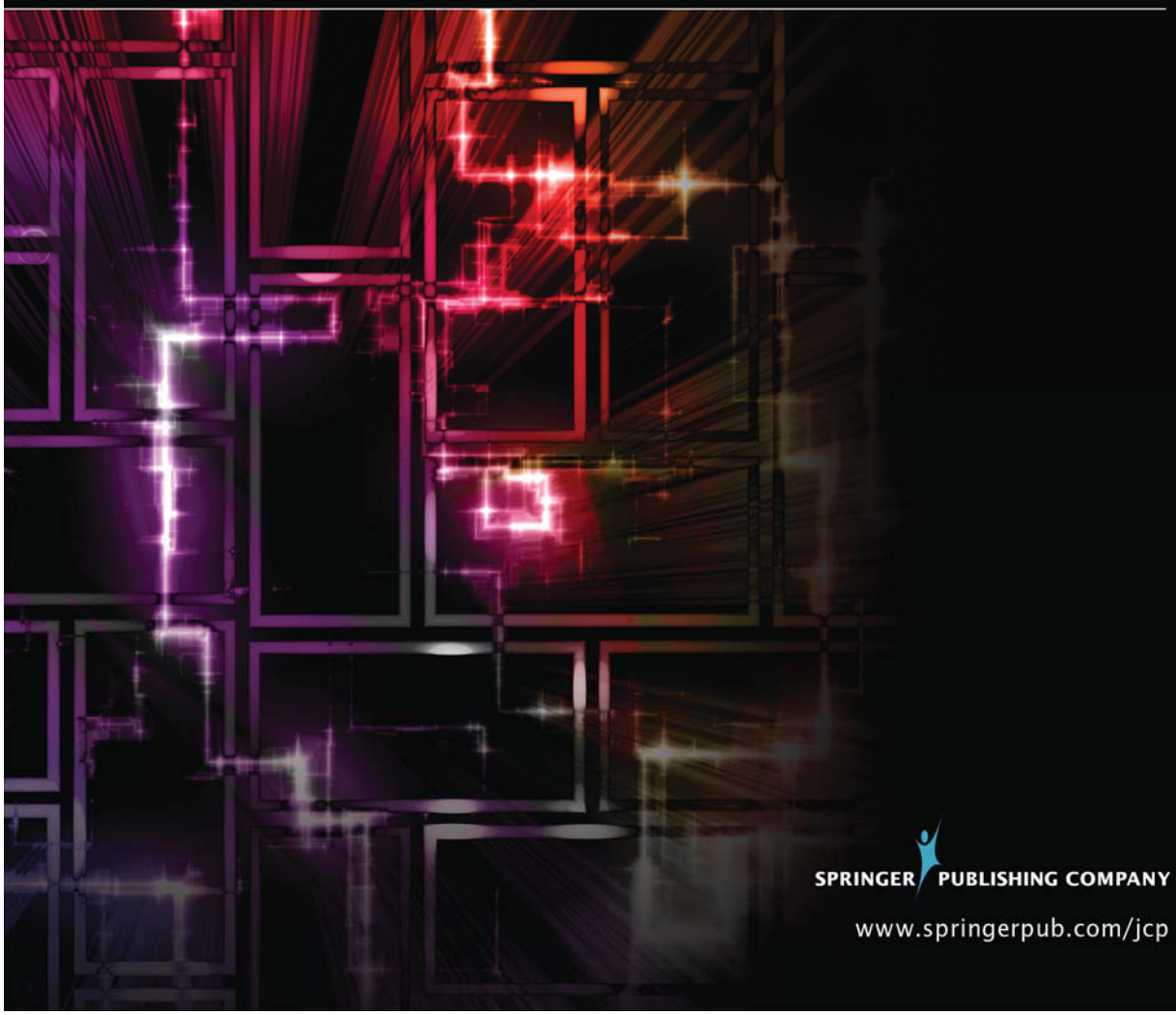

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Muscle Dysmorphia: An Overview of Clinical Features and Treatment Options

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An increasing public and empirical focus on male body image indicates that muscularity is a preeminent concern among boys and men. For some, these concerns develop into a complex and disabling psychiatric disorder termed *muscle dysmorphia* (*MD*), the hallmark of which is an intense preoccupation regarding one's (subjectively) insufficient muscularity. Treatment of MD is critical; however, evidence to inform treatment approaches is sorely lacking. The purpose of this article is twofold. First, we provide an overview of the clinical features of MD, drawing particular attention to the preoccupation, functional impairment and psychiatric comorbidity associated with the disorder. Second, we discuss and recommend potential treatment directions for MD, including techniques that have demonstrated efficacy in the treatment of related disorders, namely, body dysmorphic disorder and eating disorders (and anorexia nervosa in particular). Psychotherapeutic techniques, including cognitive restructuring of deleterious perfectionistic and egosyntonic beliefs, and dialectical behavioral techniques to improve the repertoire of emotion regulation skills available to afflicted individuals, are discussed, in addition to psychopharmacological approaches.

Keywords: muscle dysmorphia; muscle dysmorphic disorder; body dysmorphic disorder; male body image; treatment

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Although historically conceptualized as a women's issue, research suggests that body dissatisfaction has become an increasingly prominent issue among men (Griffiths, Hay, et al., 2016; H. G. Pope, Phillips, & Olivardia, 2000). In contrast to the thin physiques often sought by females, a plethora of research points out that men commonly hold a desire to become increasingly large and muscular; this is believed by some researchers to be consequent on the internalization of media messages admiring and promoting these aspects of appearance as core characteristics of the ideal male physique (H. G. Pope et al., 2000; Parent, 2013). This increasing pressure facing males relating to the attainment of a muscular build may result, in some men, in an unhealthy and pathological pursuit of this type of physique—a hallmark symptom of muscle dysmorphic disorder or muscle dysmorphia (MD).

MD is characterized by a pathological preoccupation that one's body and appearance is insufficiently muscular or lean, or too small (H. G. Pope et al., 2000). The condition is often referred to as *bigorexia* because of its association with a drive toward developing muscle mass, or muscle leanness (which enhances the visibility of muscle mass), polarizing the drive for thinness that is associated with anorexia nervosa. Although firm estimates of prevalence rates of MD are not currently known (some estimates among young males have been as high as 6.99%; Compte, Sepulveda, & Torrente, 2015), anecdotal evidence that men are increasingly seeking psychological help for muscular-related body image problems (Davey & Bishop, 2006; Morgan, 2008; Olivardia, Pope, & Hudson, 2000), as well as proxy indicators such as elevated steroid use (e.g., Iversen, Linsen, Kwon, & Maher, 2017; Partnership for a Drug-Free America, 2013), suggest that prevalence may be increasing. For example, a recent Australian community-based sample of adolescents found that 44.1% of males who reported severe body image pathology held at least one body area of concern related to muscularity or small body build (compared to only 4.3% of female respondents; Schneider, Mond, Turner, & Hudson, 2017). Furthermore, little is known about the etiological and risk factors that contribute to the development and maintenance of MD. There is also a relative paucity of published data on efficacious treatment approaches. This may be partly accounted for by the fact that the condition first appeared in the psychiatric literature less than two decades ago when it was understood, and even reported, as "reverse anorexia nervosa" (H. G. Pope, Gruber, Choi, Olivardia, & Phillips, 1997). Another contributing factor may stem from the difficulty of recruiting clinical samples of men with MD, given the stigma faced by males with mental illness and, in particular, of males with body image and/or eating-related disorders (Griffiths, Mond, Murray, & Touyz, 2015; Griffiths, Murray, & Touyz, 2015).

The aim of this article is twofold. First, we provide an overview of existing research on the defining features of MD. Clinical features of MD are outlined and epidemiology discussed, and we also review the association between features of MD and steroid use and psychiatric comorbidity. Finally, we articulate potential treatment foci and recommendations for treating MD in a clinical context, drawing attention to techniques and approaches which may be efficacious considering the unique issues the disorder presents. In reading this article, the following points should be kept in mind. First, the focus of this article is not on the debate surrounding the nosological status of MD but, rather, treatment options for the disorder (see Murray, Rieger, Touyz, & De la Garza García, 2010; Phillipou, Blomeley, & Castle, 2016, for discussion regarding the classification of MD). Second, this article is novel in that the research findings and clinical descriptions of MD provided within are primarily gleaned from the relatively few studies which have employed clinical MD samples.

Defining Features of MD

MD is a condition characterized by a preoccupation with the belief that one's body is insufficiently muscular and often marked by a relentless pursuit of a hypermuscular appearance (Choi, Pope, & Olivardia, 2002). The condition is currently cited in the *Diagnostic and Statistical Manual*

TABLE 1. Diagnostic Criteria for Muscle Dysmorphia Proposed by H. G. Pope et al. (1997)

A. Preoccupation with the idea that one's body is not sufficiently lean and muscular. Characteristic associated behaviors include long hours of lifting weights and excessive attention to diet.
B. The preoccupation is manifested by at least two of the following four criteria:
   i. The individual frequently gives up important social, occupational, or recreational activities because of a compulsive need to maintain his or her workout and diet schedule.
   ii. The individual avoids situations where his or her body is exposed to others or endures such situations only with marked distress or intense anxiety.
   iii. The preoccupation about the inadequacy of body size or musculature causes clinically significant distress or impairment in social, occupational, or other important areas of functioning.
   iv. The individual continues to work out, diet, or use ergogenic (performance-enhancing) substances despite knowledge of adverse physical or psychological consequences.
C. The primary focus of the preoccupation and behaviors is on being too small or inadequately muscular, as distinguished from fear of being fat as in anorexia nervosa, or a primary preoccupation only with other aspects of appearance as in other forms of body dysmorphic disorder.

of Mental Disorders (5th ed., *DSM-5*) as a specifier for body dysmorphic disorder (BDD), an illness characterized by a preoccupation with a perceived flaw in appearance associated with distress and psychosocial disability (American Psychiatric Association, 2013). Because neither of the current versions of the *DSM* nor the International Classification of Diseases (ICD) include diagnostic criteria for MD, researchers and clinicians alike have relied on criteria first proposed by H. G. Pope and colleagues 20 years ago (1997; Table 1).

Preoccupation

The hallmark feature of MD is an abiding and intense preoccupation that one is not muscular enough (H. G. Pope et al., 1997). This preoccupation can manifest behaviorally across a multitude of "fixing" (i.e., behaviors intended to contribute to attainment of desired appearance such as excessive weight lifting and muscle-building exercises, protein-loaded diet, supplement use), camouflaging/avoidance (e.g., wearing baggy clothing), reassurance seeking (e.g., "Do my arms look big?"), and checking (e.g., mirror examinations, "flexing") behaviors (Olivardia, 2001). To put this into perspective, studies have suggested that men with MD can obsess and mull over achieving a more muscular physique for up to 10 times longer per day than gym-using controls (e.g., >5 hours per day; Cafri, Olivardia, & Thompson, 2008; Olivardia et al., 2000). Men with MD have been found to engage in mirror checking up to 4 times more frequently (up to 13 times a day) than gym-using controls as well as weigh themselves 5 more times during the week (Cafri et al., 2008; Olivardia et al., 2000).

Demographics

At this stage, evidence suggests that MD affects males almost exclusively. However, given the early misperceptions that eating disorders only affected females (Hudson, Hiripi, Pope, & Kessler, 2007; Madden, Morris, Zurynski, Kohn, & Elliot, 2009), the male-dominated prevalence in MD should not be considered a defining feature of the disorder. Furthermore, body image problems are a

slippery phenomenon, and just as we have seen increases in male body image symptoms related to a drive for thinness and muscularity, we would also expect similar changes among women and a drive for muscularity should our sociocultural ideals also shift in this direction (as suggested has been the case concerning more traditional eating disorder symptoms in nonstereotypical groups such as males; Mitchison, Hay, Slewa-Younan, & Mond, 2014). However, this is purely speculation because we are not aware of any epidemiological studies investigating changes in muscularity ideals among women—an important gap in knowledge and research. Interestingly, emerging literature indeed suggests females are attuned to, and sought, muscular ideals, with recent experimental research showing that females became increasingly dissatisfied with their own bodies after viewing either images of thin bodies or thin plus *muscular* bodies (i.e., bodies which were lean and toned), compared to images women who were either average weight or women with large muscles mass (Benton & Karazsia, 2015).

Although the population prevalence of MD has not yet been established, it is estimated that 10%–12% of professional male weightlifters meet the diagnostic criteria (Grieve, 2007; Lantz, Rhea, & Cornelius, 2002; Leone, Sedory, & Gray, 2005; H. G. Pope, Katz, & Hudson, 1993). In addition, individuals with a clinical diagnosis of MD tend to be aged in their mid-20s to mid-30s, White, and single (Cafri et al., 2008; Hitzeroth, Wessels, Zungu Dirwayi, Oosthuizen, & Stein, 2001; Murray, Maguire, Russell, & Touyz, 2012; Olivardia et al., 2000; C. Pope et al., 2005). In addition, sexual orientation does not appear to related to MD (Griffiths & Murray, 2017), with an earlier, and perhaps the most comprehensive, study noting that men with the disorder were no more likely to be homosexual (or report homosexual experiences) than those without (Cafri et al., 2008). To the authors' knowledge, only one study recruited women with MD as part of their sample, wherein 3 of 15 individuals, or 20%, were female (Hitzeroth et al., 2001). There are several theoretical accounts for why males are overrepresented in the condition. For instance, it may reflect the male pursuit of the muscular ideal often exemplified in the Western media (H. G. Pope et al., 2000), similar to a pursuit of a thin ideal observed among females (Harper & Tiggemann, 2008; Mishkind, Rodin, Silberstein, & Striegel-Moore, 1986). Finally, it is estimated that the age of onset of MD is around the late teens (Olivardia et al., 2000), which coincides with the late adolescent/early adulthood period in which males experience rapid changes in muscle and adipose tissue. In the context of MD, this pivotal stage in development is important because it may reinforce perceptions of failing to reach the ideal muscularity and produce symptoms resembling MD (e.g., extreme body dissatisfaction, use of appearance-enhancing substances; McCabe & Ricciardelli, 2004).

Steroid Use

Individuals with MD appear to be at a particularly high risk for using anabolic-androgenic steroids and other such compounds. These types of steroids are synthetic derivatives of testosterone and have been demonstrated to build muscle tissue in humans at a rate impossible to achieve with diet and exercise alone (Griffiths, Murray, Mitchison, & Mond, 2016). Therefore, unsurprisingly, an individual with MD may be strongly motivated to use steroids to enhance muscularity far more quickly than what would be typically achievable through more conventional means (Bhasin et al., 2001; Griffiths, Murray, et al., 2016). Even in the face of serious and more distal physical and psychological harm, individuals with MD may be particularly drawn to the proximal muscle-building "rewards" of steroid use (Mosley, 2009).

Preliminary findings suggest that steroid use can help distinguish men with MD from men without MD. For example, Olivardia et al. (2000) compared 24 men with MD with 30 weightlifter controls and found that 11 of the 24 (46%) men with MD reported using steroids, in comparison to only 2 (7%) in the control group. These findings are echoed by more recent estimates of steroid use in individuals with MD (e.g., Cafri et al., 2008). Although stark, these statistics should

be interpreted with caution because it is likely that steroid use is underreported in such studies as well as other studies examining MD. It is likely that the stigma attached to steroid and other illicit drug use (Griffiths, Murray, et al., 2016; Palamar, Kiang, & Halkitis, 2011) is conducive to secrecy among users, along the fact that steroid use is illegal in most industrialized nations.

Comorbidity

People with severe MD show an array of psychiatric comorbidity. In one study, Cafri et al. (2008) found that 17 out of 23 (74%) men with MD reported a lifetime prevalence of a mood disorder compared to 8 out of 28 (29%) gym-using controls. In addition, it was found that 10 out of 23 (43%) men with MD reported a lifetime prevalence of an anxiety disorder compared to only 2 out of 28 (7%) gym-using controls. Research also shows that a substantial comorbidity exists between MD and other forms of BDD. In one study, C. Pope et al. (2005) found that 86% of their sample of men with MD had an additional history of non-muscle-related BDD, with the concern often directed toward thinning hair or skin blemishes. Notably, these are appearance concerns that one has less control over regarding appearance-fixing behaviors. It may be speculated that shifting one's focus to enhance muscularity may represent an attempt by such individuals to compensate for this lack of control and improve or deflect unwanted attention on other aspects of appearance. On the other hand, in an earlier study of 193 individuals with a nonmuscular-related BDD diagnosis, H. G. Pope et al. (1997) found that 9% of these individuals additionally met the diagnostic criteria for MD. It should be noted that despite the comorbidity between MD and BDD, the presentation of the disorders are distinct in several important ways. Compared to men with nonmuscle BDD, those with MD engage in a much greater level of weight lifting, exercise, and dieting (i.e., "fixing type behaviors"; C. Pope et al., 2005). In addition, those with MD have been found to report higher number of suicide attempts, poorer quality of life, and a higher frequency of substance use disorder and steroid abuse than those with nonmuscle BDD (C. Pope et al., 2005).

Substantial comorbidity also exists between MD and eating disorders. For example, research shows that men with MD exhibit severe eating disorder psychopathology compared to healthy controls (Garner, 1991; Murray & Griffiths, 2015; Murray et al., 2012), including that related to thinness-oriented (e.g., binge eating and purging) and muscle-oriented disordered eating pathology (e.g., rigid and rule-driven dietary plans, typically in the form of frequent intakes of high-protein foods/drinks and low fat/carbohydrate intake; Murray et al., 2012). In addition, eating disorders and MD are often characterized by compulsive exercise, typically in the form of weight training for those with MD (Olivardia et al., 2000). In another study, men with MD were much more likely to report a lifetime history of a comorbid eating disorder, including anorexia nervosa, bulimia nervosa, and binge-eating disorder, than those without (29% vs. 0%; Olivardia et al., 2000). Furthermore, a recent case study even suggests that, through treatment for anorexia nervosa (where emphasis is on weight gain and volitional eating), thinness-oriented disordered eating can transition into muscularity-oriented (Murray, Griffiths, Mitchison, & Mond, 2017). In this case, the individual was discharged from treatment after restoration of bodyweight and an abated drive for thinness; however, the concurrent development of muscularity-oriented disordered eating patterns was masked/overlooked (which could subsequently transition into equally unhealthy and incapacitating MD symptoms; Murray et al., 2012; Murray et al., 2017). It has been argued that individuals with MD and anorexia nervosa share comparable eating disorder psychopathology to achieve their respective idealistic, yet polarized, physiques (Griffiths, Murray, et al., 2015; Mosley, 2009; Murray et al., 2016). For this reason, the current BDD-related criteria for MD have been criticized for not taking into account central eating and exercise-related practices (see for discussion Murray & Baghurst, 2013). Indeed, some researchers have suggested that MD be grouped with the eating disorders rather than as a subtype of BDD (Murray et al., 2010).

Special Challenges in MD Treatment

MD is an extremely debilitating disorder, and afflicted individuals are functionally impaired in several psychosocial domains. For instance, individuals with MD are highly avoidant, particularly in contexts where their bodies are believed to be scrutinized (e.g., the beach; Murray et al., 2012; Olivardia et al., 2000). This can lead to prolonged periods being housebound (e.g., for weeks at a time), absenteeism and neglect from occupational and academic roles because of their MD symptoms (Griffiths & Murray, 2017). Men with MD also find it difficult to maintain interpersonal relationships and engage in sexually intimate relationships because of the disabling anxiety, embarrassment, and shame elicited when their body is exposed (Griffiths & Murray, 2017; Olivardia et al., 2000). Disturbingly, MD is also associated with a high rate of suicide, with one study finding that 50% of men with the disorder reported having attempted suicide at least once throughout their lifetime (C. Pope et al., 2005). To put this in perspective, the same study found this rate to be significantly lower (16%) in individuals with non-MD BDD (C. Pope et al., 2005).

Given the relationship between MD and negative outcomes demonstrated in the literature, including poor general mental health, impaired daily psychosocial functioning and substance abuse, establishing effective treatment is critical. Regrettably, however, there has been limited examination of best practice treatment for those with MD and, consequently, treatment protocols for the condition are still in their infancy (Lavender, Brown, & Murray, 2017). This lack of focus on treatment for MD may be exacerbated by the fact that many men have an aversion to seeking treatment and the seemingly "healthy" exercise and dieting behaviors encapsulated by the disorder may mean it often goes unrecognized (and therefore untreated; Hitzeroth et al., 2001). There have been no large-scale outcome research or randomized controlled trials and, consequently, the efficacy of treatment options have relied heavily on evidence gleaned from anecdotal evidence and case reports (e.g., Murray & Griffiths, 2015).

Accepting these limitations, the following section synthesizes the available literature on the treatment approaches for MD. This section will commence by highlighting several special challenges in MD treatment including steroid discontinuation and the presence of promuscularity content online, both of which may interfere with effective treatment. Second, research on several specific and promising treatment approaches for MD, including that which can be extrapolated from knowledge of related disorders such as BDD and eating disorders (and may be applied to MD), will be reviewed. General recommendations for engaging sufferers in a clinical setting will be provided throughout.

Discontinuation of Steroid Use. As noted earlier, steroids are powerful compounds frequently used by individuals with MD to increase muscularity. Steroid use acts to exacerbate and maintain the disorder; hence, discontinuation of use is critical in treating the condition. However, the discontinuation of use can itself lead to unexpected and serious deterioration of the mental health of the individual, and users generally realize this (Griffiths, Murray, et al., 2016).

Once steroid use is ceased, rapid loss of muscle gained prior can occur. As such, users often report undergoing postcycle therapy (PCT) immediately after cessation, which involves taking pharmaceutical drugs in an attempt to reregulate hormonal levels (endogenous levels of testosterone are significantly depleted during a steroid cycle) and maintain gained muscle mass in this off cycle (Hildebrandt, Langenbucher, Lai, Loeb, & Hollander, 2011). Colloquially referred to as the "postcycle blues," the hormonal fluctuation that can occur during this period is often coupled with emotional instability as well feelings of depression, anxiety, and a lack of sex drive (Griffiths, Henshaw, McKay, & Dunn, 2017). Alarmingly, withdrawal from a cycle of steroids has also been associated with suicide (H. G. Pope & Brower, 2000).

Symptoms of steroid cessation typically begin between 1 day and 1 week after last using, and usually resolve within a month (Griffiths & Murray, 2017). If symptoms persist, an endocrinologist

may need to be consulted and incorporated into the treatment plan to help expedite hormonal re-regulation. It is crucial that health care practitioners take care to avoid stigmatizing steroid use as a therapeutic strategy as this may increase reluctance for the user to divulge their level of use and symptoms, fostering negative treatment outcomes as a result (Dunn, Henshaw, & McKay, 2016; Griffiths, Murray, et al., 2016). To ease patients into commencing a dialogue regarding use, it may be beneficial for clinicians to be aware of the legal status of steroids in their country so that they can inform patients about the potential outcomes of disclosure. For example, in Australia at least, no mandatory reporting requirement triggered by a disclosure of steroid consumption exists. In addition, it is important that health care practitioners be well-versed in steroid use because patients may shy away from entering a dialogue with practitioners if they are perceived to be uninformed about steroids and their impact on one's physical and psychological well-being (Kanayama, Brower, Wood, Hudson, & Pope, 2010).

Finally, to help and maintain discontinuation of steroid use, patients should remove all steroids and steroid paraphernalia (e.g., syringes, empty vials) and other cues which may entice relapse such as subscription from of promuscularity and prosteroid use social media profiles (Griffiths & Murray, 2017).

Promuscularity Content. Like the proanorexia or thin-centric online trends (e.g., "thinspiration") targeted toward women (Ghaznavi & Taylor, 2015; Lewis & Arbuthnott, 2012), practitioners should also be aware of recent evidence pointing toward the emergence of the promuscularity online community targeted toward men. In a recent study, Murray et al. (2016) conducted thematic content analysis of promuscularity websites and found that a substantial "promuscularity" community exists on the Internet. The websites that form this community were found to endorse an array of beliefs and behaviors relating to an intense drive for muscularity and share some important similarities with existing proanorexia nervosa websites. The three most prominent themes revealed in the study were rigid dietary practices (e.g., "Total protein should be your goal bodyweight in pounds $\times$ 1.5"), rigid exercise rules (e.g., "Never miss a scheduled workout, come hell or high water. If you do, you should make up for it the very next day, or be prepared to watch your sculpted gains dissolve to fat") and broader benefits of muscularity (e.g., "When in doubt, just get really, really strong. It tends to cure most problems in training, and in life"). In another thematic analysis study of social media content, Pila, Mond, Griffiths, Mitchison, and Murray (2017) found that *cheat meal* engagement, defined as consuming a very large quantity of calorie dense food, and their accompanying text/commentary (e.g., "snaccident: eating an entire pizza/box of chocolates/family size bag of chips by mistake"), paralleled core characteristics of bulimia nervosa (e.g., "loss of control" when eating, immediate and harsh behaviors to counteract, or compensate for, the impact of the large calorie intake). These social media posts often also consisted of objectified muscular bodies and weight lifting, suggesting that such behaviors may be associated with a broader pursuit of muscularity (Pila et al., 2017). Given the research linking exposure to proeating disorder websites with body dissatisfaction and negative affect (e.g., Rodgers, Lowy, Halperin, & Franko, 2016), it is likely that exposure to such promuscularity content will have similar effects and may further reinforce egosyntonic beliefs (discussed further on), even though the impact of internalizing this material has not yet been studied. As such, it is recommended that individuals with MD avoid participation in, and exposure to, these online communities and social networking groups.

Treatment Approaches

Cognitive Behavioral Therapy. To the authors' knowledge, no research has been undertaken to specifically assess the utility of cognitive behavioral therapy (CBT) in the context of MD. However, given the well-noted utility of CBT in the context of eating disorders (e.g., Murphy, Straebler,

Cooper, & Fairburn, 2010; Wade, Byrne, & Allen, 2017) and BDD (see Harrison, de la Cruz, Enander, Radua, & Mataix-Cols, 2016), the core tenants of CBT may also be useful to address MD. For example, individuals with MD may benefit from a CBT technique known as exposure and response prevention, which aims to help affected individuals practice tolerating distress without intervening with safety/ritual or escape behaviors (Greenberg, Blashill, Ragan, & Wilhelm, in press). Safety behaviors are actions within situations designed to prevent feared catastrophe, and although they may briefly decrease distress or uncertainty, they are typically counterproductive and increase self-consciousness, preoccupation, and negative appraisal (Veale, 2004). MD manifests behaviorally through various safety behaviors, such as wearing of loose fitting and oversized clothes to mask one's subjectively deemed inadequate body shape, repeated body checking and gauging the muscularity and adiposity of specific areas (e.g., flexing in front of the mirror for significant amounts of time), and reassurance-seeking behaviors (e.g., asking family members if their arms look smaller today; Murray et al., 2012; Olivardia, 2001; Olivardia et al., 2000; H. G. Pope et al., 1997). Reports also suggest avoidance behaviors are central to presentations of MD (e.g., only attending the gym late at night) because of the intense shame and anxiety associated with the thought of exposing others to their body (Murray et al., 2012; Olivardia et al., 2000). Reducing the occurrence of these behaviors is important because, as is the case with BDD, they likely serve to maintain the disorder (Veale, 2001).

Cognitive Restructuring—Perceptions of Masculinity. Given the negative automatic thoughts and cognitive set that underpin MD, cognitive restructuring may be a fruitful CBT technique to help treat the disorder. Cognitive restructuring involves the identification, evaluation, and restructuring of automatic, maladaptive thoughts (Greenberg et al., in press). The literature suggests several cognitive distortions which may be worth targeting and dismantling, including perceptions of masculinity, perfectionistic thinking, and egosyntonic beliefs.

First, distorted perceptions about what it means to be the "perfect" or "ideal" man should be addressed. It is argued that individuals may strive to attain, or use, a hypermesomorphic physique as a salient and tangible means of expressing traditionally masculine qualities, such as power and strength, to others (Blashill, 2011; Griffiths, Murray, et al., 2015). This theoretical framework is known as the *masculinity hypothesis*, which posits that the pursuit of and adherence to traditional male gender roles may predispose men toward developing a drive for muscularity (Blashill, 2011; Griffiths, Murray, et al., 2015; Mishkind et al., 1986). Men may feel pressure to attain such sociocultural idealistic physiques (e.g., large and well-defined arms and chest) to portray their "manhood" which, in decades past, could have been communicated through other means (e.g., by being the primary income earner or "breadwinner"; Blashill, 2011). This motivation to become overtly muscular may be particularly salient if an individual feels that their masculinity is under threat (see *threatened masculinity*; Hunt, Gonsalkorale, & Murray, 2013; Mills & D'Alfonso, 2007; Mishkind et al., 1986).

There is empirical research to support these theoretical accounts. Evidence for a muscularity–masculinity link derives from studies showing that (a) men with MD and steroid users both exhibit stricter adherence to traditional male gender norms (Kanayama, Barry, Hudson, & Pope, 2006; Murray, Rieger, Karlov, & Touyz, 2013) and (b) preliminary evidence that the endorsement of such beliefs are associated with body image pathology regarding muscularity more generally (Griffiths, Mond, et al., 2015; Murray et al., 2013; H. G. Pope et al., 2000). In the aforementioned case report of an adolescent boy with MD, the patient negatively compared himself with "the more manly boys at school" and described frequent episodes of bullying and "feeling weak" (Murray & Griffiths, 2015). There is also evidence to suggest that in line with societal gender role expectations, there is a tendency for the public to perceive individuals with MD as possessing masculine qualities, whereas those with anorexia nervosa are seen as "feminine," despite the sex of the afflicted individual (Griffiths, Mond, et al., 2015; Griffiths & Murray, 2017).

Cognitive Restructuring—Perfectionistic Thinking. Perfectionist attitudes and thinking are included in cognitive-behavioral models of the development and maintenance of BDD (Veale, 2004; Veale et al., 1996; Wilhelm, 2006), as well as in transdiagnostic models of eating disorders (Fairburn, Cooper, & Shafran, 2003). Furthermore, research indicates that men with MD as well as men with body image pathology more generally (Cunningham, Griffiths, Baillie, & Murray, 2016), exhibit high levels of perfectionist thinking (Olivardia et al., 2000). These individuals report having low self-esteem and seldom perceive themselves as important, which may partially account for their unforgiving pursuit of the "perfect" or "ideal" body as a way of gaining some importance and acceptance (H. G. Pope et al., 2000).

Perfectionism is associated with several cognitive distortions and rigid thinking. A prime example of this is dichotomous or "all-or-nothing" thinking. For example, among individuals with MD, the perception of failing to reach the idealized muscular physique (e.g., "I *should* look like that," "I *must* look like that") may automatically equate to perceptions of one's body being puny, frail, and unattractive (Olivardia, 2001). Relatedly, perfectionistic attitudes may lead to "jumping to conclusions" type cognitive distortions (e.g., "Nobody will ever love me if I look scrawny"). This irrational thinking may be particularly salient in MD as derived from an overvaluation of appearance (H. G. Pope et al., 1997), which is also a core tenet within theoretical models of eating disorders (Fairburn et al., 2003) and is pronounced in individuals with BDD (Hartmann, Thomas, Wilson, & Wilhelm, 2013). Exacerbating this exaggeration of the importance of perceived appearance flaws is the concurrent discounting or ignoring of the positives of one's appearance or, more generally, one's self (e.g., being intelligent or good at sports; Olivardia, 2001).

CBT should teach sufferers to observe and challenge these perceptions, recognizing that perfection is unattainable. In addition, challenging this abnormal thinking should include helping the individual highlight, and place more value on, other positive aspects of physical appearance (Olivardia, 2001). These measures may help normalize excessively high appearance-related standards in MD and reduce tendencies to self-criticize when comparing one's appearance with others, including that of perceived sociocultural ideals.

Cognitive Restructuring—Egosyntonic Beliefs. Egosyntonic beliefs are often present in individuals suffering from MD (H. G. Pope et al., 2000). That is, individuals with MD often deny that they have a problem and perceive their symptoms as positive or comforting. For individuals with eating disorders, egosyntonicity of beliefs is associated with higher levels of psychopathology (Mond, Hay, Rodgers, Owen, Beumont, 2004; Mond, Robertson-Smith, & Vetere, 2006), as well as ambivalence and reluctance when it comes to undergoing treatment (Guarda, 2008; Mond et al., 2006). In the context of MD, individuals may selectively overstate the "positive sides" of the excessive exercise and strict dieting used to achieve their muscular physique (H. G. Pope et al., 2000). Because these behaviors are also often highly praised within Western culture, these individuals may receive considerable external validation for their compulsive behaviors which may, in turn, be positively reinforcing. As alluded to earlier, egosyntonic beliefs may also be in part reinforced by promuscularity content found online.

To the authors' knowledge, only one study has directly examined the endorsement of egosyntonic beliefs in relation to MD. Thus, Griffiths, Mond, et al. (2015) found that university students, both men and women, tended to positively endorse symptoms of MD, including strict avoidance of fatty foods, eating a surplus of "healthy" foods and compensatory behaviors when dietary or exercise practices are not adhered to. In addition, the individuals who positively valued MD symptoms were also themselves more likely to display elevated eating disordered symptomology. These results suggest that young adults are likely to express a level of admiration for an individual (e.g., an individual with MD) who can implement a stringent and meticulous level of control over their eating, exercise, weight, and shape, even if this control negatively impacts on the individual's well-being. These findings highlight the fact that MD, unlike most other mental health conditions, is liable to be viewed in a positive light by young adults.

Acceptance and Commitment Therapy. Acceptance and commitment therapy (ACT) rests on the premise that although an individual's internal experience may not be amenable to change, their reaction to this experience is (Hayes, Strosahl, & Wilson, 1999). ACT seeks to provide individuals with the necessary repertoire of skills to be increasingly accepting of distressing cognitions and feelings, given that attempting to control unwanted experiences is often ineffective if not maladaptive (Hayes, 2004). Therapies encapsulated by ACT can include mindfulness skills training as a method of promoting acceptance and awareness of private experiences in the present moment (i.e., thoughts, emotions, memories) as well as exposure/response prevention (discussed earlier). Numerous case reports and treatment studies have provided preliminary evidence for the efficacy of these psychotherapies in treating binge eating disorder, bulimia nervosa, and anorexia nervosa (see Baer, Fischer, & Huss, 2005, for a review).

Although ACT has not been evaluated in the context of MD, there are conceptual reasons why the treatment approach might be useful. For example, ACT might be well-suited for MD because of its focus on reducing cognitive control. Like anorexia nervosa and bulimia nervosa, MD is characterized by experiential avoidance and a strong desire to maintain control over eating- and exercise-related behaviors, urges, thoughts, and feelings (Mangweth et al., 2001; Murray et al., 2012). Although these behaviors may temporarily reduce negative affect, they often act to reinforce beliefs about being too small and skinny (Olivardia et al., 2000). To overcome this vicious cycle, ACT techniques help promote the acceptance of such unpleasant thoughts and feelings so that the individual is not "compelled" to engage in maladaptive strategies to avoid or alter them (Hayes, 2004).

Another reason that ACT might be useful in the treatment of MD relates to the low motivation for change characteristic of most affected individuals. This lack of motivation likely relates to the intense overvaluation of the pursuit of muscularity and the perception of this as a life goal warranting prioritization over other important areas of life (H. G. Pope et al., 1997). This all-consuming lifestyle revolving around workout schedules and diet can compromise the undertaking of certain occupations which are not compatible with these schedules and strain or preclude the formation of intimate interpersonal relationships (because of fear of interference with training and dieting; H. G. Pope et al., 1997). The emotional and interpersonal distress deriving from such behaviors may further encourage the implementation of strenuous muscle-building activity and binge episodes to regulate affect (Murray et al., 2012). ACT may be particularly useful in this regard because of its focus on identifying and clarifying individuals' ultimate life values. By identifying core values and the broader goals emanating from them, ACT may help affected individuals reorient attention toward not only more meaningful activities but also to become more willing to tolerate internal discomfort for the sake of what is truly important (e.g., to relax diet adherence to eat food at a restaurant for a friend's birthday; Hayes, 2004).

Dialectical Behavior Therapy. Originally developed to treat borderline personality disorder, dialectical behavior therapy (DBT; Linehan, 1993) aims, inter alia, to address emotion regulation difficulties. An intersection of cognitive-behavioral and acceptance-base approaches, DBT teaches patients adaptive coping skills that enhance their emotion regulation capabilities and thus discourage the reliance on maladaptive behaviors to attenuate distress. To the authors' knowledge, DBT has not yet been assessed in the context of BDD or MD treatment. It has, however, been broadly applied to the treatment of eating disorders (Safer, Telch, & Chen, 2009).

Central to the application of DBT to MD is that the disorder may include episodes of binge eating and purging, in addition to compulsive exercise, which serve an emotional regulation function (as they commonly do with eating disorders; Meyer, Taranis, & Touyz, 2008; Safer et al., 2009). In another earlier case report of an adolescent male who met the diagnostic criteria for both an eating disorder and MD, Murray et al. (2012) observed that the patient undertook strenuous muscle-building gym sessions directly as a result of interpersonal stressors, while

also engaging in episodes of binge/purge episodes to regulate his affective experience. He also reported purging without prior binge episodes, although these occurred exclusively on the days in which he did not attend the gym. Binges were also triggered by nonattendance at the gym, or training not "going well," as well as in response to interpersonal stressors (e.g., ". . . to help me get away from the problems . . ."). The patient reported that these behaviors were undertaken to regulate affect and were somewhat effective in doing so. However, these strategies tended to maintain focus and attention on his body and eating behavior. Pathological exercise is central to our understanding of MD (Olivardia, 2001), although this appears to be the first reported case of such exercise serving emotional regulatory functions alongside of muscle-building functions (Murray et al., 2012). DBT may act to replace these dysfunctional emotional-modulating behaviors with those which are constructive and do not draw attention back to the negative appraisal of one's appearance.

Family-Based Treatment. One of the most widely advocated evidence-based treatments for adolescent anorexia nervosa is currently thought to be family-based treatment (FBT; Le Grange, Lock, Loeb, & Nicholls, 2010; Lock & Le Grange, 2015). FBT in this context centrally mobilizes parental resources to bring about nutritional rehabilitation in their child, ensuring complete cessation of all ecological and maintaining factors of the disorders, while siblings are encouraged to adopt a supportive stance (Lock & Le Grange, 2015; Murray & Griffiths, 2015). More specifically, FBT typically aims to encourage full parental authority around all food-based decisions until (a) weight is restored and (b) all eating-disordered behaviors have abated.

Murray and Griffiths (2015) published a case-report of an adolescent boy with MD, treated using an adapted form of FBT, with the treatment programme being largely consistent with the core tenets of those for treating anorexia nervosa (Lock & Le Grange, 2015). Prior to treatment, the patient's full-scale score on the Muscle Dysmorphic Disorder Inventory (MDDI; Hildebrandt, Langenbucher, & Schlundt, 2004) was 59. For reference, the average full-scale MDDI score for men with MD is 52 (Hildebrandt et al., 2004). The patient's parents were encouraged to intervene directly in symptom maintenance. For example, parent intervention was required not only to ensure the patient did not eat only foods which were high-protein and low-fat, but also to ensure the absence of disordered eating behavior (including attempting to cut the fat out of meats and placing protein powder on his meals instead of salt). A similar level of parental supervision was required in limiting exercise and weight-lifting practices such that the patient was temporarily not allowed to exercise until his parents were confident that his fear of some foods had abated and that he was not driven toward compensation (via exercise) after eating these foods. Over a period of 10 sessions, spanning 7 months, the patient appeared to have recovered, signalled by a full-scale score on the MDDI of 10. For reference, the average full-scale MMDI score for gym-using men without MD is 25 (Murray et al., 2012). Although promising, the results of this case study, and the efficacy of FBT in the realm of MD more generally, need to be replicated in larger clinical samples. In addition, because of the onset of MD to be later in adolescence/early adulthood and when individuals may not be necessarily living with family members, the feasibility of FBT in the realm of MD needs to be further investigated.

Pharmacotherapy. Currently, the data regarding pharmacological treatment for MD derive largely from uncontrolled case series and reports, and there is an absence of rigorous clinical trials (H. G. Pope et al., 2000). However, there is some limited evidence suggesting that antidepressant medication may be beneficial in treating particularly severe forms of MD (Phillips, 2000). For example, selective serotonin reuptake inhibitors (SSRIs), traditionally antidepressant medication which has been shown to be successful in treating BDD (Phillips & Hollander, 2008; Phillipou, Rossell, Wilding, & Castle, 2016), can be used to diminish obsessional thinking and compulsive behaviors by increasing the levels of serotonin in the brain (Phillips & Hollander, 2008). Patients who get better with an SSRI usually experience improvement on a spectrum of BDD symptoms

including less frequent obsessions, reduced urges to perform compulsive/safety behaviors, and overall better control over appearance-related obsessions and compulsions (Phillips & Hollander, 2008). Some studies have also found that insight regarding the perceived appearance flaws in BDD, which also appears to be an issue in MD (Cafri et al., 2008), improves with the use of SSRIs (Phillips & Hollander, 2008). Previous pharmacological trials for BDD have mainly investigated SSRIs such as citalopram (Phillips & Najjar, 2003), escitalopram (Phillips, 2006), clomipramine (Hollander et al., 1999), fluvoxamine (Phillips, McElroy, Dwight, Eisen, & Rasmussen, 2001) and fluoxetine (Phillips, Albertini, & Rasmussen, 2002). It has been recommended that SSRIs could be a particularly suitable option for patients with significant impairment believed to be manifested from depression symptoms derived from appearance concerns (Parent, 2013).

Conversely, clinical investigations in the use of SSRIs for eating disorders have yielded mixed results (Hay & Claudino, 2012; Mayer & Walsh, 1998). Particularly in the case of anorexia nervosa, it has been postulated that the lack of consistent efficacy of such drugs may be a consequence of inadequate supply of nutrients (because of dietary constraint) essential for optimal serotonergic functioning (Hay & Claudino, 2012). This issue may not be as salient in the context of MD, given the characteristically large, albeit selective, intake of food to promote muscle gain (Mosley, 2009; Murray et al., 2012). However, relative malnutrition may still be possible despite an adequate calorie supply if the afflicted individual has restricted their diet to only a small, select group of foods.

Conclusion

MD is a severe body-image disorder associated with significant distress and impairment in important areas of functioning. Despite a burgeoning literature on the condition, it frequently goes unrecognized. Even when it is recognized, health practitioners are tasked to treat the condition based on scant clinical evidence. The treatment research that has been undertaken has largely been based on case reports and small-scale descriptive case-control studies, which are largely confined to Western (North American, British, and Australian) males. In lieu of rigorous treatment research, this article is novel in considering that approaches which have demonstrable efficacy for two related disorders, namely, body dysmorphic disorder and eating disorders (particularly anorexia nervosa), may usefully be applied to the treatment of MD, potentially at least. For example, CBT may be used to address irrational beliefs and cognitive rigidity concerning the masculinity–muscularity link as well as perfectionistic and egosyntonic beliefs. Well-established pharmacological approaches, particularly using SSRIs, may help control the obsessions and compulsive behaviors sufferers of MD engage in. If patients are using steroids, this needs to be discontinued and the involvement of an experienced practitioner would be beneficial in achieving this. Moving forward, the primary task for investigators should be to rigorously examine the efficacy of these treatment practices in well-defined clinical populations.

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