

TESTING A COMPREHENSIVE MODEL OF MUSCLE DYSMORPHIA
SYMPTOMATOLOGY IN A NONCLINICAL SAMPLE OF MEN

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As increasing emphases are placed on the importance of a muscular male physique in Westernized culture, more men are experiencing eating, exercise, and body image (EEBI) disturbances. Clinician-researchers have identified a syndrome, termed muscle dysmorphia (MD), in which individuals, usually men, are pathologically preoccupied with their perceived lack of muscularity. The current study tested a modified version of an extant theoretical model of MD symptomatology as well as an alternative model of MD symptomatology. Over 700 adult men completed a demographic questionnaire, a symptom inventory, a self-esteem questionnaire, a measure of perfectionism, a measure of the media's influence on EEBI disturbances, and measures of body dissatisfaction and MD symptoms. Structural equation modeling (SEM) was used to examine the goodness of fit of the proposed models. Overall, the first model demonstrated poor fit with the data. Conversely, the alternative model fit the data adequately. The alternative model was cross validated with a second sample, and also fit this data adequately.

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TABLE OF CONTENTS

	Page
ACKNOWLEDGEMENTS	iii
LIST OF TABLES	v
LIST OF ILLUSTRATIONS	vi
Chapters	
1. INTRODUCTION	1
2. METHOD	26
3. RESULTS	36
4. DISCUSSION	47
APPENDICES	77
REFERENCE LIST	86

LIST OF TABLES

	Page
1. Demographic Information for Sample A and Sample B.....	67
2. Descriptive Statistics, Internal Consistencies, and Mean Inter-item Correlations for all indicators in Sample A and Sample B.....	68
3. Correlations Between Measured Variables in Sample A and Sample B	70
4. Standardized Parameter Estimates for the Measurement Models.....	72
5. Model Fit for the Structural Models	73

LIST OF ILLUSTRATIONS

	Page
1. Diagram of Grieve's modified theoretical model with standardized parameter estimates and variance accounted for (R^2)	74
2. Diagram of final measurement model with standardized parameter estimates	75
3. Diagram of alternative model with standardized parameter estimates and variance accounted for (R^2)	76

CHAPTER 1

INTRODUCTION

For several decades, high rates of eating, exercise, and body image (EEBI) disturbances have been observed among women in Westernized cultures, and the mass media's pervasive and persistent portrayal of the thin female has been identified as a contributing factor in the development of EEBI concerns (Cusumano & Thompson, 1997; Iancu, Spivak, Ratzoni, Apter, & Weizman 1994; Striegel-Moore, Silberstien, & Rodin, 1986). Prevalence rates of eating disorders such as anorexia nervosa (AN) and bulimia nervosa (BN) among women are concerning, and subclinical symptoms of eating disorders are not uncommon [e.g., severe calorie restriction, bingeing, excessive exercise (Hoek, 2006; Leon, Fulkerson, Perry, & Early-Zald, 1995; Scarano & Kalodner-Martin, 1994; Striegel-Moore, Silberstein, Frensch, & Rodin, 1989)]. In fact, dissatisfaction with weight and appearance among college women is so common that researchers termed it a normative discontent (Rodin, Silberstein, & Striegel-Moore, 1984).

To date, majority of EEBI research focuses on women (e.g., Stice, Ziemba, Margolis, & Flick, 1996; Fredrickson & Roberts, 1997), and less is known about EEBI concerns for men. In recent years, however, it has become evident that, just as women are exposed to an ultra-thin ideal, men in Westernized cultures have been increasingly exposed to a mesomorphic, hypermuscular ideal, which may place them at risk for EEBI disorders (Pope, Phillips, & Olivardia, 2000). For example, from 1973 to 1999, the body

body mass index (BMI) and musculature of male models in popular magazines increased dramatically, with male models displaying extreme, seemingly unattainable levels of muscularity (Leit, Pope, & Gray, 2001). Boys' action figures have also become more muscular in appearance overtime, and many of these figures display levels of muscularity whose proportions would be impossible to achieve in reality without anabolic steroids (Pope, Olivardia, & Borowiecki, 1999). Recently, Schwartz (2010) analyzed the content of more than 1500 media images from magazines targeted toward gay men and found that from 1967 to 2008, the bodies of male models in these magazines became significantly leaner and more muscular. Moreover, the male body has been increasingly objectified in the media (i.e., images of men that focus on discrete male body parts versus whole bodies), as evident in magazines such as *Sports Illustrated* (Farquhar & Wasylkiw, 2007).

As an emphasis on a lean, muscular male body has increased in Westernized cultures, men have become increasingly dissatisfied with their bodies (Olivardia, Borowiecki, & Cohane, 2004; Pope et al., 2000; Ricciardelli, McCabe, & Banfield, 2000). Furthermore, an overall increase in eating disorders has been observed in men, including anorexia nervosa (AN), bulimia nervosa (BN), and binge eating disorder [BED (e.g., Blouin & Goldfield, 1997; Carlat, Camargo, & Herzog, 1997; Leit et al., 2001; McCreary & Sasse, 2000; Pope, Katz, & Hudson, 1993; Pope, Gruber, Choi, Olivardia, & Phillips, 1997; Pope et al., 2000; Spitzer, Henderson, & Zivian, 1999)]. As prevalence rates of EEBI disturbances in men have increased, researchers and clinicians have become aware of a form of body dysmorphic disorder (BDD), termed muscle dysmorphia (MD), in which individuals, often men, are preoccupied with the concern that their bodies

are not sufficiently muscular or large enough (Pope et al., 1993; Pope & Katz, 1994; Pope et al., 1997; Pope et al., 2000). The disorder was originally termed “reverse anorexia” because its sufferers are dissatisfied with being too small as opposed to too big, and it is also marked by symptoms that are similar to AN (Blouin & Goldfield, 1995; Pope et al., 1993; Pope et al., 2000). For example, individuals with these two disorders experience distorted perceptions of their bodies and high rates of body dissatisfaction. They also experience pathological preoccupation with appearance and employ extreme techniques to change their bodies, such as excessive exercise and compulsive, ritualistic eating behavior (*Diagnostic and Statistical Manual; 4th ed., text rev; DSM-IV-TR*; American Psychiatric Association, 2000; Olivardia, 2001; Pope et al., 1993; Pope et al., 2000). Individuals with MD often engage in harmful muscle-building behaviors (e.g., anabolic steroid abuse and excessive weightlifting) in an effort to alleviate their body dissatisfaction and attain the “perfect” muscular physique (Pope et al., 1997; Pope et al., 2000).

As with any psychiatric disorder, MD is associated with impairments in occupational, social, or other areas of functioning (Pope et al., 1993; Pope et al., 1997; Pope et al., 2000). For example, individuals with MD may avoid social situations including work, school, or parties for fear that their bodies will be exposed. Furthermore, MD may lead to neglect of interpersonal relationships, as individuals with the disorder often maintain their rigid workout regimens at the expense of relationships with significant others. Individuals with MD may also sacrifice their jobs or risk getting fired in order to maintain their demanding workout schedules. Biological impairment may

also occur, as the physical health of individuals with MD is often compromised due to harmful muscle-building behaviors such as anabolic steroid abuse (Olivardia, 2001). Though not yet recognized as a formal clinical disorder (4th ed., text rev; *DSM-IV-TR*; American Psychiatric Association, 2000), the following diagnostic criteria have been proposed to understand MD (as cited in Pope et al., 1997, p. 556):

1. Preoccupation with perceived inadequate muscularity. Behaviors related to the preoccupation include excessive weightlifting and obsessive preoccupation with one's diet.
2. This preoccupation leads to significant psychological distress or impairment in social, occupational, or other important areas of functioning, as demonstrated by at least two of the following four criteria:
 - a. The individual frequently gives up important social, occupational, or leisure activities because of a rigid, compulsive adherence to a workout and diet routine.
 - b. The individual avoids situations in which his or her body is exposed or endures such situations with marked distress.
 - c. The preoccupation with perceived inadequacies in musculature causes clinically significant distress or impaired social, occupational or other important functioning.
 - d. The individual continues to workout, diet, or use performance-enhancing substances (e.g., anabolic steroids) despite knowledge of negative effects.

3. The individual's preoccupation is on being too small or inadequately muscular, rather than fear of being fat, as in AN, or with other aspects of appearance (e.g., nose), as in other forms of BDD.

Overall, although researchers have not determined exact prevalence rates of MD in the general population, it appears that less than 1% of men in the United States experience the full-blown disorder (Pope et al., 1997; Pope et al., 2000). It is likely, however, that a large number of men experience subclinical symptoms of MD, suggesting that the disorder may exist along a continuum of severity (Kaminski, McFarland, & Chapman, 2005). Whereas a continuum of disordered eating behaviors and attitudes is well-researched for women (e.g., Leon et al., 1995; Scarano & Kalodner-Martin, 1994; Striegel-Moore, et al., 1989), few researchers have examined this phenomenon for MD symptomatology among men. There is evidence to suggest, however, that many men report subclinical symptoms of the disorder such as high levels of body dissatisfaction or distorted body image (e.g., Betz, Mintz, & Speakmon, 1994; Goodale, Watkins, & Cardinal, 2001; Riccardelli, McCabe, & Banfield, 2000). Furthermore, men with a high drive for muscularity who do not have full-blown MD often engage in harmful muscle building behaviors including excessive weightlifting and anabolic steroid use (Kaminski et al., 2005; Olivardia, 2001). Thus, more research is needed to determine if a continuum of MD exists for men and what factors place men at risk for progression along the continuum.

To date, few researchers have examined the pathways that contribute to the development of symptoms of MD. Using a biopsychosocial model, Grieve (2007) was

among the first to propose that several etiological variables interact to influence the development of the disorder (see Figure 1). First, Grieve proposed BMI as a biological variable in his model. The next category, socioenvironmental factors, includes media pressure and participation in sports that emphasize muscularity (e.g., football, bodybuilding). Grieve also proposed psychological and emotional factors, including negative affect, body dissatisfaction, ideal body internalization, poor or low self-esteem, body distortion, and perfectionism. Although this model is seemingly comprehensive, examination of the extant MD and EEBI literature suggests that Grieve may have failed to account for other important factors that influence MD symptom development. In particular, a history of childhood trauma (e.g., Feldman & Meyer, 2007; Kinzl, Mangweth, Traweger, & Biebl, 1997) may be another important etiological variable.

Although a comprehensive etiological model has yet to be tested, a number of researchers have demonstrated relationships between many of the proposed variables and MD symptomatology as well as other EEBI disturbances that are related to MD. Such disturbances include symptoms that are part of the diagnostic criteria for MD (e.g., body dissatisfaction) and other full-blown disorders that have symptoms, comorbidities, and/or associated features in common with MD [e.g., people with BN and those with MD tend to report high rates of negative affect (Dykens & Gerrard, 1986; Olivardia, Pope, & Hudson, 2000)]. Furthermore, men with MD symptomatology often display symptoms that are characteristic of eating disorders [e.g., body distortion, abnormal eating behaviors, excessive exercise (Olivardia, 2001; Pope et al., 1993)]. Because of the similarities between symptoms of MD and other EEBI disturbances, it is likely that

common etiological pathways contribute to their development. Thus, in order to better understand the relationships between the proposed etiological variables and symptoms of MD in nonclinical men and to support their use in the current study, literature addressing both MD and other EEBI disturbances will be reviewed.

Body Dissatisfaction

Body dissatisfaction has been defined as an overall negative appraisal of one's physique (Stice & Shaw, 2002), and/or a perceived discrepancy between one's actual body size and that which one views as ideal (Grieve, 2007; Olivardia et al., 2004). This construct represents an important component of EEBI disorders [e.g., AN, BN, and MD (4th ed., text rev; *DSM-IV-TR*; American Psychiatric Association, 2000)]. Across the lifespan, both men and women report high rates of dissatisfaction with their appearance (Betz et al., 1994; Cafri, Strauss, & Thompson, 2002; Gruber, Pope, Borowiecki, & Cohane, 1999; Pope et al., 2000; Kaminski & Hayslip, 2006; McCreary & Sasse, 2000; Rodin et al., 1984; Vartanian, Giant, & Passino, 2001). Experts suggest that the majority of women believe that they are overweight and desire a thinner, smaller physique (Cash & Henry, 1995; Davison, Markey, & Birch, 2003; Rodin, et al., 1984). Men, on the other hand, experience body dissatisfaction in a more complex manner. That is, among men who are dissatisfied with their bodies, on average, approximately half report a desire to lose body mass, whereas the other half report wanting a larger body mass [e.g., increased muscularity (Drewnowski, & Yee, 1987; Furnham, & Calnan, 1998)]. Men wishing to lose weight are at increased risk for the same types of unhealthy weight loss strategies women use, such as severe calorie restriction [e.g., fasting (Kaminski et al., 2005)] or

compensatory behaviors [e.g., purging (Neumark-Sztainer, Paxton, Hannan, Haines, & Story, 2006)]. Conversely, men wishing to gain weight and/or muscle may be at risk for unhealthy muscle-building behaviors that are characteristic of MD such as anabolic steroid abuse and excessive weightlifting (e.g., Blouin & Goldfield, 1995; Irving, Wall, Neumark-Sztainer, & Story, 2002).

As society's emphasis on the hypermesomorphic ideal has increased, men have become more dissatisfied with their bodies in general. In particular, dissatisfaction with muscle mass has increased for men, and many men report a drive to increase their muscularity (Betz, et al., 1994; Gray & Ginsberg, 2007; Pope et al., 2000; Ricciardelli, McCabe, & Banfield, 2000). Researchers have also observed that many men endorse an ideal body type that is much leaner and more muscular than their actual bodies (Olivardia et al., 2004; Pope et al., 2000). That body dissatisfaction has become widespread for men raises concern, as it is associated with unhealthy behaviors (e.g., excessive weightlifting, steroid abuse) and/or distorted body image (Cafri, van den berg, & Thompson, 2006; Cafri, Olivardia, & Thompson, 2008; Kaminski et al., 2005; McFarland & Kaminski, 2009; Olivardia, 2001; Olivardia et al., 2004; Pope et al., 1997; Pope et al., 2000). Among some men, body dissatisfaction contributes to an intense preoccupation with perceived inadequacies in muscularity. This may become so pathological as to result in full-blown MD. In fact, although dissatisfaction with muscularity is not a specific diagnostic criterion of MD, it is generally a central feature of the disorder. That is, men with MD often become so preoccupied perceived defects in their appearance and the

belief that their muscularity is insufficient that they experience functional impairment (Pope et al., 1997; Pope et al., 2000).

It is important to differentiate body dissatisfaction as a symptom of MD from body dissatisfaction as a risk factor for MD. Specifically, if a man is generally dissatisfied with his body (e.g., he believes that he deviates from the ideal physique) but does not experience impairments in functioning and/or engage in extreme, unhealthy behaviors to change his appearance and/or increase his musculature, he does not have MD (Olivardia, 2007). The experience of body dissatisfaction may place this man at risk, however, for later development of MD (Grieve, 2007). On the other hand, if a man is consumed by body dissatisfaction, particularly with regard to muscularity, and experiences functional impairment as a result (e.g., avoids social situations in which his body is exposed, neglects important obligations to maintain a rigid workout schedule), then a diagnosis of MD is warranted (Cafri et al., 2008; Olivardia, 2001; Pope et al., 1993; Pope et al., 1997; Pope et al., 2000). At the same time, however, other researchers have observed cases of hypermesomorphic men with problematic eating and exercise behaviors who report high levels of body satisfaction (e.g., Kaminski et al., 2005; McFarland & Kaminski, 2009; Woodruff, 2010). These differential findings suggest that the role of body dissatisfaction in MD symptom development is variable and complex, and more research is necessary to understand the function of body dissatisfaction in MD symptom development.

Although many men experience general body dissatisfaction and specific dissatisfaction with their muscularity, most do not develop MD. Thus, it is possible that

for some men, body dissatisfaction contributes to MD development only when other risk factors are also present (Cafri et al., 2008; Grieve, 2007; Olivardia, 2007; Pope et al., 1997). In Grieve's model, the majority of the etiological variables included contribute to MD symptomatology through their influence on body dissatisfaction. Specifically, Grieve proposes that body dissatisfaction mediates the influence of perfectionism, self-esteem, negative affect, media pressure, and ideal body internalization on MD symptomatology. How each of these hypotheses is supported by the extant literature is described below (e.g., Cafri et al., 2002; Dyl, Kittler, Phillips, & Hunt, 2006; Grammas & Schwartz, 2009; Kaminski et al., 2005; Leit et al., 2001; Macedo et al., 2007; Maida & Armstrong, 2005; McFarland & Kaminski, 2009; Olivardia et al., 2004; Wolke & Sapouna, 2008; Woodruff, 2010).

Media Pressure and Ideal Body Internalization

Sociocultural pressure to attain the muscular ideal in conjunction with internalization of this ideal are thought to be integral to the development of MD symptomatology (Gray & Ginsberg, 2007; Grieve, 2007; Leit, et al., 2001; Pope et al., 2000). In fact, although there is no agreed upon theory of MD development currently, media theory is the most widely used explanation in the extant literature. According to this theory, men and women are continually exposed to unrealistic cultural ideals of attractiveness through media outlets such as magazines, television, and billboards (Harrison & Cantor, 1997; Spitzer, Henderson, & Zivian, 1999; Turner, Hamilton, Jacobs, Angood, & Dwyer, 1997), and these media outlets are responsible for dictating and communicating cultural ideals of attractiveness to society (Gray & Ginsberg, 2007).

Whereas the media emphasizes impossible standards of thinness for women, men are pressured to achieve unattainable ideals of muscularity coupled with leanness (e.g., Mintz & Betz, 1986; Silberstein, Striegel-Moore, Timko, & Rodin, 1988; Vartanian et al., 2001). According to theories of media influence, when an individual perceives pressure from the media to achieve the unrealistic ideal, he or she is increasingly likely to internalize this ideal as something important to strive for [i.e., accept and adopt the ideal and engage in behaviors aimed at achieving it (Thompson, Heinberg, Altabe, & Tantleff-Dunn, 1999)]. It is suggested that this combination of variables contributes directly to EEBI disturbances in men and women (e.g., Agliata & Tantleff-Dunn, 2004; Arbour & Ginis, 2006; Ogden & Munday, 1996; Richins, 1991; Shaw & Stein, 1994).

Although the influence of media pressure and ideal body internalization in the development of EEBI disturbances in women is well-established (e.g., Ogden & Munday, 1996; Stice, 2002; Stice, Schupak-Neuberg, Shaw, & Stein, 1994; Striegel-Moore et al., 1986; Thompson & Stice, 2001), less is known about the relationship of these variables to MD symptomatology or other EEBI disturbances among men. Researchers have observed, however, that exposure to media images of hypermuscularity (e.g., television and magazine advertisements) and perceived pressure from the media to achieve the muscular ideal directly influence body dissatisfaction for men, particularly with regard to muscularity (Baird & Grieve, 2002; Knauss, Paxton, & Alsaker, 2008; Leit et al., 2001; Lorenzen, Grieve, & Thomas, 2004; Patel, 2005). Media pressure has also been linked to other symptoms of MD, including harmful strategies to build muscle [e.g., steroid use and excessive weightlifting (Botta, 2003; McCabe, Ricciardelli, & Holt, 2010;

Smolak, Murnen, & Thompson, 2005). Furthermore, an association between internalization of the muscular ideal and body dissatisfaction as well as MD behaviors (e.g., anabolic steroid use, excessive weightlifting) is well-established for men (Bray, 2010; Daniel & Bridges, 2010; Giles & Close, 2008; Grammas & Schwartz 2009; Karazsia & Crowther, 2009; McVey, Tweed, & Blackmore, 2005; Smolak et al., 2001; Warren, 2008).

Based on Grieve's model, it is hypothesized that when men perceive media pressure to achieve the muscular ideal and internalize this ideal as something important to strive for, they are at increased risk for body dissatisfaction. It is unlikely, however, that media pressure and ideal body internalization are sufficient to cause the development of MD for all men. For example, nearly every man in Westernized cultures is exposed to media images of hypermuscularity, but only a small number of men actually succumb to MD (Pope et al., 1997; Pope et al., 2000). If media pressure/ideal internalization were the primary risk factors, prevalence rates of MD would be much higher (Olivardia, 2007). Thus, men may be more susceptible to pressure from the media when other risk factors are also present (Bardone-Cone et al., 2008; Gray & Ginsberg, 2007; Grieve, 2007; Knauss et al., 2008).

Sports Participation

Researchers and theorists have suggested that male athletes who participate in sports that emphasize appearance, leanness, and muscularity may experience higher rates of MD symptomatology than men who do not participate in such sports (e.g., Baghurst & Lirgg, 2009; 1994; Grieve, 2007; Hallsworth, Wade, & Tiggemann, 2005; Olivardia et

al., 2000). In his model, Grieve hypothesizes that participation in sports that reward high muscle mass contributes to MD symptom. This hypothesis is supported by the extant literature, as participation in sports that emphasize muscularity, (e.g., football and bodybuilding) has been consistently associated with symptoms of MD. For example, higher rates of body dissatisfaction have been observed in men who engage in sports that reward high muscle mass such as bodybuilding, weightlifting, lacrosse, soccer, and football as compared to other sports that do not emphasize muscularity (Baghurst & Lirgg, 2009; Blouin & Goldfield, 1995; Brower, et al., 1994; Hallsworth, et al., 2005; Olivardia et al., 2000; Parks & Reed, 1997; Rauden & Meyer, 2003; Ravaldi et al., 2003; Yesalis & Bahrke, 1995).

According to Grieve, ideal body internalization may be a mechanism by which participation in sports that emphasize muscularity influences MD symptomatology. Specifically, he proposes that, because men who participate in sports that reward muscularity are regularly exposed to other highly muscular men (e.g., at bodybuilding competitions), they may be more likely to internalize the hypermesomorphic ideal. Consequently, these men may be at increased risk for body dissatisfaction and other symptoms of MD.

Although there is evidence to suggest that participation in sports that emphasize muscularity places men at risk for MD symptomatology, it is possible that for some men, participation in such sports has no effect on body image and could actually serve a protective function. That is, men who may otherwise be at risk for the development of MD may be protected from development of the disorder through participation in sports.

For example, researchers have found lower rates of EEBI disturbances among individuals who participate in refereed sports (e.g., basketball) as compared to judged sports [e.g., gymnastics (Zucker, Womble, Williamson, & Perrin, 1999)]. Furthermore, sports participation has been identified as a protective factor against other psychological disturbances that are linked to EEBI disorders, such as depression (Boone & Leadbeater, 2006).

Body Mass

Body mass index (BMI) is included in Grieve's model as a biological risk factor for MD symptomatology. BMI provides an estimate of an individual's body fat based on height and weight [i.e., weight in kg/(height in m)² (Centers for Disease Control and Prevention, 2010)]. BMI is only an estimate of body fat because people vary in the density of their bones, muscularity, and amount of water weight (among other variables). BMI scores fall into the following four categories that describe a person's weight status: a) scores of 18.4 or below indicate that a person is underweight, b) scores from 18.5 to 24.9 indicate that a person is of normal weight, c) scores from 25 to 29.9 indicate that a person is overweight, and d) scores from 30.0 and above indicate that a person is obese. Men with clinical MD are exceptionally muscular, however, so they will typically have an unusually high BMI (i.e., in the overweight or obese category), even though they do not have excessive body fat. In fact, high body mass coupled with low body fat often serves as a diagnostic criterion for the disorder (Pope et al., 1997).

BMI has been suggested as a putative biological risk factor in the development of MD symptomatology. For example, low BMI has been linked with increased strategies

aimed at building muscle, including steroid use and overeating to gain weight (Bahrke, 2000; Cafri et al., 2005; Neumark-Sztainer et al., 1999). Conversely, high BMI has been associated with behaviors aimed at weight loss [e.g., severe dieting, calorie restriction (Neumark-Sztainer, et al., 1999; Vincent & McCabe, 2000)]. Overall, findings regarding the role of BMI in the development of MD symptomatology are equivocal and inconsistent (Cafri et al., 2005). A number of researchers have included BMI in theoretical models of MD symptom development (e.g., Cafri et al., 2005). Specifically, Grieve contends that high BMI is important in MD, as it is one criterion by which the disorder is diagnosed. Moreover, Grieve proposes that high BMI indirectly contributes to MD symptomatology through its reciprocal relationship with participation in sports that emphasize muscularity. However, BMI is not included as a diagnostic criterion for MD, and it is unclear if this variable is important in the etiology and development of the disorder. Thus, BMI “needs to be stringently evaluated for continued acceptance as an etiological factor in MD development” (Grieve, 2007, p. 69).

Body Distortion

Body distortion is a variable included in Grieve’s etiological model of MD symptom development, and this construct serves as a primary diagnostic criterion for MD. Grieve loosely defines body distortion as a discrepancy between one’s actual appearance (e.g., musculature, BMI) and one’s perception of their appearance. He does not offer a formula or method for measuring or calculating body distortion, however.

In general, men with clinical MD experience a distorted body image. That is, they underestimate their body mass and perceive themselves as small and inadequately

muscular, even though they are extremely muscular with unusually high BMI (Olivardia, 2001; Pope et al., 1997; Pope et al., 2000). Such body distortion is typically associated with high levels of body dissatisfaction for men with MD, which may be so extreme as to result in psychological distress and functional impairment (Pope et al., 1997). For example, some men with MD will often avoid public places altogether in order to hide perceived defects in their bodies, or they may experience extreme distress when exposed to situations in which their bodies are exposed (Pope et al., 1997; Pope et al., 2000).

In his model, Grieve proposes a reciprocal relationship between body distortion and body dissatisfaction. Moreover, he asserts that this relationship directly influences MD symptom development. A relationship between body distortion and body dissatisfaction is supported by the extant literature as high rates of body dissatisfaction have been found in individuals who have a distorted body image (Gardner & Tockerman, 1993). Grieve contends that these variables, in conjunction with high BMI lead to a diagnosis of MD. However, the exact relationship between body distortion and MD symptomatology is complex and equivocal, making it difficult to understand how this variable contributes to MD symptom development. For example, some men with MD have insight that their fear that they are not muscular enough is irrational (Olivardia et al., 2000). Furthermore, men who experience subclinical symptoms of MD (e.g., body dissatisfaction, steroid use) but do not have the full-blown disorder may not have body distortion at all and may, instead, perceive their bodies accurately (Woodruff, 2010). Thus, similar to BMI, body distortion must be critically evaluated to determine if it should be included in the model of MD symptom development.

Negative Affect

Although the sociocultural and biological factors in Grieve's model probably play a critical role in the etiology of MD, psychological and emotional factors appear to contribute to MD symptomatology as well. In Grieve's model, negative affect (i.e., depression and anxiety) is included as a psychological variable that interacts with other factors to influence development of MD symptoms. Consistent with this hypothesis, there is evidence to suggest that negative affect influences the development of MD symptomatology. In particular, a number of researchers have observed an association between negative affect (e.g., depression, anxiety) and symptoms of MD (e.g., body dissatisfaction, harmful muscle-building behaviors). Negative affect is also closely associated with AN and BN symptomatology (e.g., Cafri, et al., 2002; Ebbeck, Watkins, Concepcion, Cardinal, & Hammermeister, 2009; Leon et al., 1999; Lock, Resiel, & Steiner, 2001; McCabe & Ricciardell, 2003; McCabe & Vincent, 2003; McFarland & Kaminski, 2009; Paxton, Neumark-Sztainer, Hannan, & Eisenberg, 2006; Ross & Ivis, 1999; Woodruff, 2010).

In addition to the more general findings related to negative affect, there is empirical evidence to support the specific constructs of "depression" and "anxiety" as risk factors for the development of MD symptomatology. For example, depression is closely related to MD symptomatology in men, including body dissatisfaction and body distortion (e.g., Cafri et al., 2002; McFarland & Kaminski, 2009; Olivardia et al., 2004; Paxton et al., 2006; Presnell, Bearman, & Stice, 2004; Woodruff, 2010). Researchers have also found that depression is predictive of symptoms of MD (Goodale, Watkins, &

Cardinal, 2001). Men who have been diagnosed with mood disorders also report higher rates of harmful muscle-building behaviors, and depressive symptomatology is strongly associated with steroid abuse (Denham, 2009; Dyl, Kittler, Phillips, & Hunt, 2006; Olivardia et al., 2000; Pallesen, Josendal, Johnsen, Larsen, & Molde, 2006).

Similar to depression, anxiety is closely linked with MD symptomatology and other EEBI disturbances (e.g., Bas, Asci, Karabudak, & Kiziltan, 2004; Cafri et al., 2008; Chandler, Grieve, Derryberry, & Pegg, 2009; McFarland & Kaminski, 2009; Olivardia et al., 2000; Woodruff, 2010). For example, anxiety is predictive of body dissatisfaction for adolescent boys (Kostanski & Gullone, 1998). Furthermore, male body builders with MD symptomatology report increased symptoms of anxiety as compared to bodybuilders without symptoms of MD (Wolke & Sapouna, 2008), and men with full-blown MD have higher rates of comorbid anxiety disorders than men who do not have MD (Olivardia et al., 2000). Because a relationship between anxiety and MD symptomatology is supported in the extant literature, this variable will be included in the current model as a component of negative affect.

In Grieve's model, it is hypothesized that negative affect directly fuels MD symptomatology while it also influences symptoms of MD through a relationship with body dissatisfaction and low self-esteem. Although ample evidence suggests that negative affect is closely linked to body dissatisfaction and other symptoms of MD (e.g., Cafri et al., 2002; Kostanski & Gullone, 1998; McFarland & Kaminski, 2009; Olivardia et al., 2000; Olivardia et al., 2004; Paxton et al., 2006), the mediating role of negative

affect in the relationship between self-esteem and MD symptomatology has yet to be examined.

Self-Esteem

A number of theorists suggest that low self-esteem is a psychological variable that contributes to MD symptom development (e.g., Grieve, 2007; Olivardia, 2007; Olivardia, 2001; Olivardia, 2004; Pope et al., 2000). In particular, it is hypothesized that “the way a man feels about himself is closely tied to the way he feels about his body” (Mishkind, Rodin, Silberstein, & Striegel-Moore, 1986, p. 550), and men who perceive that they are small or deficient in muscularity may feel inadequate and lacking in self-worth. Researchers suggest that for some men, such feelings of low self-worth may contribute to a drive for muscularity (Grieve, 2007; Mishkind et al., 1986).

In his etiological model, Grieve proposes that low self-esteem influences the development of MD symptomatology. This hypothesis is supported by current literature, as low levels of self-esteem have been observed in men with symptoms of MD. For example, in several studies, men with low self-esteem reported dissatisfaction with muscularity (Cafri et al., 2002; Olivardia et al., 2004; Wolke & Sapouna, 2008). Furthermore, on average, men who experience anxiety about the appearance of their physiques also have lower self-esteem than men who do not report anxiety about their physiques (Grieve, Jackson, Reece, Marklin, & Delaney, 2008). Additionally, low self-esteem has been observed in men who report anabolic steroid abuse and exercise dependence (Blouin & Goldfield, 1995; Chittester & Hausenblas, 2009; Olivardia, et al., 2004), as well as extreme guilt about non-exercise (Kuennen & Waldron, 2007).

In order to understand the role of self-esteem in MD symptom development, it is important to examine mediating variables. In Grieve's model, body dissatisfaction mediates the negative relationship between self-esteem and MD symptomatology. Although few researchers have examined this hypothesis, it has been observed that low self-esteem is closely associated with body dissatisfaction in adult and adolescent men (Cafri et al., 2002; Cohane & Pope, 2001; McCreary & Sasse, 2000; Olivardia et al., 2004; Wolke & Sapouna, 2008; van den Berg, Mond, Eisenberg, Ackard, & Neumark-Sztainer, 2010). Thus, it seems plausible that body dissatisfaction mediates the relationship between self-esteem and MD symptomatology for men.

Grieve also proposes that self-esteem negatively influences MD symptomatology through a reciprocal relationship with negative affect. In support of this hypothesis, both negative affect and low self-esteem have been observed in men with symptoms of MD [e.g., drive for muscularity, use of muscle-enhancing substances (e.g., McCabe & Ricciardelli, 2000; Olivardia et al., 2004)]. Low self-esteem has also been observed in psychiatric inpatients who have been diagnosed with both binge eating disorder (BED) and comorbid mood and/or anxiety disorders (Grilo, White, & Masheb, 2009).

Perfectionism

Perfectionism is an additional psychological factor that Grieve proposes influences the development of MD symptomatology. In particular, individuals who are perfectionistic may be more inclined than the average person to engage in extreme, even unhealthy behaviors to achieve their goals (Frost, Marten, Lahart, & Rosenblate, 1990; Hewitt & Flett, 1991a; Hewitt & Flett, 2004). If men who are perfectionistic are

interested in achieving muscularity, it serves that they may be more inclined to engage in MD-like behaviors (e.g., excessive weightlifting, steroid abuse) in an effort to obtain the “perfect” muscular physique (Woodruff, 2010). Thus, perfectionism may be an important variable in understanding the development of MD symptomatology.

The role of perfectionism in MD development is supported by the extant literature, as an association has been observed between perfectionism and MD symptomatology, as well as other EEBI disorders. For example, competitive bodybuilders, recreational bodybuilders, and men with BN symptomatology all display elevated levels of perfectionism (Goldfield, Blouin, & Woodside, 2006; Joiner, Katz, & Heatherton, 2000; Macedo et al., 2007). Perfectionism is also closely linked to both binge eating and extreme weight loss behaviors in adolescent boys [e.g., food restriction, laxative use (Leon et al., 1995; McCabe & Vincent, 2003)]. Furthermore, high rates of perfectionism have been observed in men who report rigid adherence to workout regimens and guilt about non-exercise (Kuennen & Waldron, 2004; Maida & Armstrong, 2005).

Perfectionism has been conceptualized as a multidimensional personality trait, which includes self-oriented, other-oriented, and socially-prescribed perfectionism (Frost et al., 1990; Hewitt & Flett, 1991a; Hewitt & Flett, 2004). Self-oriented perfectionism is marked by an intrinsic drive for perfection in which individuals set high, exacting standards for themselves and behave in rigid, often extreme ways to achieve those standards. Socially prescribed perfectionism, on the other hand, is marked by individuals’ perceptions or beliefs that others (e.g., friends, family, society) hold

unrealistically high expectations for them. Moreover, individuals with high levels of socially prescribed perfectionism believe that they must meet others' expectations of perfection in order to obtain approval and feel worthy. Finally, individuals with other-oriented perfectionism as a personality trait set high standards and expectations for others (Hewitt & Flett, 1991; Hewitt & Flett, 2004).

Based on a review of the extant EEBI literature, it appears that only self-oriented and socially prescribed are important in the development of MD and eating disorder symptomatology (e.g, Boone, Soenens, Braet, & Goossens, 2010; Brannan & Petrie, 2008; Grammas & Schwartz, 2009; Hewitt, Flett, & Ediger, 1995; Maida & Armstrong, 2005; Soares et al., 2009). For example, among college men, socially prescribed perfectionism is directly related to both drive for muscularity and dissatisfaction with one's perceived level of body fat (Grammas & Schwartz, 2009). Furthermore, both socially prescribed perfectionism and self-oriented perfectionism are closely linked with MD symptomatology, including excessive weightlifting and distorted cognitions regarding appearance (Woodruff, 2010). Both forms of perfectionism have also been associated with BN symptomatology and other dieting concerns among Portuguese men (Macedo et al., 2007).

Whereas Grieve proposes that perfectionism contributes to directly to MD symptomatology, he also suggests that body dissatisfaction partially mediates this relationship. Although few researchers have examined the pathways by which perfectionism influences MD development in men, researchers have examined the role of perfectionism in the relationship between body dissatisfaction and eating disorder

symptomatology for women. For example, in a recent study, perfectionism mediated the relationship between body dissatisfaction and both AN and BN symptomatology (Welch, Miller, Ghaderi, & Vaillancourt, 2009). Other researchers have found that perfectionism moderates the relationship between body dissatisfaction and eating disorder symptomatology in women (Brannan & Petrie, 2008; Downey & Chang, 2007). It is possible that similar relationships and pathways influence MD symptom development in men.

Statement of Purpose

Research addressing the factors that contribute to MD symptomatology among men is limited. Furthermore, few researchers have examined specific pathways implicated in the development of symptoms of the disorder from a biopsychosocial perspective. Thus, the current study aimed to extend the MD literature by testing the complex relationships between the variables proposed by Grieve (2007) and their role in the development of symptoms of MD. Specifically, a modified version of Grieve's model (see Figure 2) and an alternative model (see Figure 3) were tested using structural equation modeling (SEM).

Grieve's Model

In the current study, Grieve's modified model included the following constructs: BMI, participation in sports that emphasize muscularity, media pressure/ideal body internalization, self-esteem, negative affect, perfectionism, body dissatisfaction, and MD symptomatology. Although Grieve's model includes body distortion, this variable was

not included in the current study due to lack of agreed upon measurement methods for body distortion.

Specifically, in Grieve's modified model, BMI was hypothesized to have a positive and direct effect on participation in sports that reward muscularity. Participation in sports that reward muscularity was hypothesized to have a positive and direct effect on media pressure/ideal body internalization. Media pressure/ideal body internalization was hypothesized to have a positive and direct effect on body dissatisfaction, and media pressure/ideal body internalization was also hypothesized to partially mediate the relationship between participation in sports that emphasize muscularity and body dissatisfaction. Self-esteem was hypothesized to have a negative and direct effect on media pressure/ideal body internalization, negative affect, and body dissatisfaction. Media pressure/ideal body internalization was also hypothesized to partially mediate the negative relationship between self-esteem and body dissatisfaction. Negative affect was hypothesized to have a positive and direct effect on body dissatisfaction and a positive and direct effect on MD symptomatology. Negative affect was also hypothesized to partially mediate the negative relationship between self-esteem and body dissatisfaction. Perfectionism was hypothesized to have a positive and direct effect on body dissatisfaction and a positive and direct effect on MD symptomatology. Body dissatisfaction was hypothesized to have a direct and positive effect on MD symptomatology. Additionally, body dissatisfaction was hypothesized to partially mediate the relationship between media pressure/ideal body internalization and MD

symptomatology, self-esteem and MD symptomatology, negative affect and MD symptomatology, and perfectionism and MD symptomatology.

The Alternative Model

The alternative model, a variation and extension of Grieve's proposed model, did not include BMI, body distortion, or participation in sports that emphasize muscularity. Media pressure/ideal body internalization was hypothesized to have a positive and direct effect on body dissatisfaction and a positive and direct effect on MD symptomatology. It was also hypothesized that body dissatisfaction partially mediates the relationship between media pressure/ideal body internalization and MD symptomatology. Self-esteem was hypothesized to have a negative and direct effect on media pressure/ideal body internalization and on negative affect. Media pressure/ideal body internalization was also hypothesized to partially mediate the negative relationship between self-esteem and body dissatisfaction. Negative affect was hypothesized to have a positive and direct effect on body dissatisfaction. Negative affect was also hypothesized to partially mediate the negative relationship between self-esteem and body dissatisfaction. Perfectionism was hypothesized to have a positive and direct effect on media pressure/ideal internalization, and media pressure/ideal internalization was hypothesized to partially mediate the relationship between perfectionism and body dissatisfaction. Perfectionism was also hypothesized to have a positive and direct effect on body dissatisfaction, and body dissatisfaction was hypothesized to partially mediate the positive relationship between perfectionism and MD symptomatology. Finally, body dissatisfaction was hypothesized to have a positive and direct effect on MD symptomatology.

CHAPTER 2

METHOD

Participants

Participants consisted of 789 undergraduate men from large public university in the southwest United States. Participants ranged from 18 to over-24-years-old and represented the demographic make-up (e.g., race/ethnicity, marital status, orientation) of the broader population of undergraduate men on the campus (see Table 1).

Measures

Demographic survey. The demographic survey (see Appendix A) was specifically developed for this study. This survey provided a means of describing the characteristics of the sample (e.g., age, ethnicity, year in school), as well as a method of assessing information related to EEBI disturbances (e.g., weight history, exercise schedules) and participation in sports that emphasize muscularity.

Observed body type (OBT). For participants whose body mass index (BMI) was categorized as high, it was important to assess whether these individuals had high BMI because of excessive body fat or because of excessive muscularity. Therefore, a variable called observed body type (OBT) was created. Specifically, a research assistant observed each participant's body type and categorized it based on the following six categories: underweight, low-average, high average, overweight, very overweight, or very muscular [because average is a broad category and contains a wide range of body types, this variable was divided into two categories (i.e., low-average and high-average)].

Male Eating Behavior and Body Image Evaluation (MEBBIE). The MEBBIE (Kaminski & Caster, 1994; Kaminski et al., 2002; Kaminski et al., 2005) is a 57-item self-report instrument for men that measures attitudes, behaviors, and concerns related to eating, exercise, and body image. Questions are responded to on a 6-point Likert-type scale that ranges from 1 = never/strongly disagree to 6 = always/strongly agree. The MEBBIE produces scores on 8 theoretically and empirically derived scales (Kaminski & Caster, 1994; Kaminski et al., 2002; Kaminski et al., 2005). The original 7 scales have no item overlap; the newest scale, however, assesses MD symptomatology by combining relevant items from 4 of the original 7 scales. The Body Dissatisfaction (BD) scale (10 items) measures self-consciousness about one's body and perceptions of having an inferior physique. The Drive for Muscularity scale (7 items) assesses beliefs about body size (e.g., that one's physique is too small) and assesses aspirations for greater muscularity. Higher scores on the Emotional and Binge Eating scale (9 items) indicate a tendency to eat in response to negative affect and to feel out of control while eating. The Drive for Thinness scale (8 items) measures the desire for a leaner and thinner body as well as the use of unhealthy dieting techniques to obtain such a physique. Higher scores on the Over-exercise scale (7 items) indicate compulsive exercising habits and the experience of negative affect when unable to exercise. High scores on the Fear of Fatness scale (11 items) indicate ruminations and irrational beliefs about being or becoming fat. The Distorted Cognitions scale (5 items) measures faulty beliefs about one's body, such as assuming others are routinely attending to one's physique or that others are harshly judging the appearance of one's body. Finally, the Muscle

Dysmorphia (mebMD) scale (16 items), described below, measures muscle dysmorphia symptomatology. The MEBBIE had a test-retest reliability coefficient of $r = .72$ in a sample of undergraduate men, and the measure converges with others instruments that assess EEBI disturbances (Kaminski et al., 2002). For example, the Body Dissatisfaction scale was significantly, positively correlated with the Body Dissatisfaction subscale of the EDI-2 ($r = .74, p < .01$) and the Body Dissatisfaction subscale of the EAT ($r = -.65, p < .01$).

MEBBIE Muscle Dysmorphia scale. The Muscle Dysmorphia scale (mebMD) is a 16-item subscale that was developed from MEBBIE items to assess for muscle dysmorphia symptomatology (Kaminski et al., 2005). To choose items for this scale, 7 expert raters selected MEBBIE items that were characteristic of MD. Experts were defined as researchers who were at least the first or second author on a peer-reviewed paper with the construct of muscle dysmorphia in the title. Among these raters were Dr. Pope and Dr. Olivardia, the first researchers to recognize and describe the disorder. Raters reviewed MEBBIE items and endorsed them based on their likelihood to be endorsed by men with MD. Items were included on the mebMD scale if they were given extreme ratings (i.e., 1 or 6) in the pathological direction by Dr. Pope, Dr. Olivardia, and at least 4 of the 5 remaining experts. Of the 57 MEBBIE items, 16 met these criteria. The mebMD items cover the spectrum of MD symptoms including body dissatisfaction, drive for muscularity, tendency to over-exercise, and distorted cognitions about one's body, such as believing one's physique is being continually evaluated by others. Of the

other 7 MEBBIE subscales, the mebMD shares items with the Body Dissatisfaction, Drive for Muscularity, Over-Exercise, and Distorted Cognitions subscales.

Of the 8 MEBBIE scales, only the BD and mebMD scales were included in the current analysis. For this study, an abbreviated version of the BD scale with 8 items was used so that MEBBIE items from this scale that overlap with items from the mebMD were not included in both scales. Internal consistency reliability was established for these scales, with alpha coefficients of $\alpha = .89$ for the abbreviated BD scale and $\alpha = .83$ for the mebMD.

Drive for Muscularity Scale (DMS). The DMS is a 15-item self-report instrument that assesses body image concerns related to a muscular, mesomorphic physique (McCreary & Sasse, 2000). Specifically, the DMS measures “attitudes and behaviors that reflect the degree of people’s preoccupation with increasing their muscularity” (McCreary & Sasse, 2000, p. 300). Items are responded to on a 6-point Likert-type scale ranging from always to never. All items are reverse-scored so that a higher score represents a higher drive for muscularity. McCreary, Sasse, Saucier, and Dorsch (2004) demonstrated through factor analysis that the DMS has higher order Drive for Muscularity factor that consists of all 15 items. Additionally, these researchers have found that the DMS has an underlying structure that consists of two factors. The first factor, Attitudes (DMSAtt, 7 items), measures an individual’s endorsement of a mesomorphic body image and the extent to which they perceive that they deviate from this body image (e.g., “I think that my arms are not muscular enough”). The second factor, Behaviors (DMSBeh, 7 items), measures the extent to which an individual

engages in behavioral strategies aimed at increasing muscularity and leanness (e.g., “I lift weights to build up muscle”). The item, “I think about taking anabolic steroids” loads weakly onto the DMSBeh factor and is not included when calculating scores for these factors. Internal consistency reliability for these scales was good, with alpha coefficients of $\alpha = .88$ for DMSAtt and $\alpha = .81$ for DMSBeh. Test-retest reliability is also satisfactory with 7 to 10 day correlations ranging from $r = .84$ to $r = .96$ (Cafri & Thompson, 2004). Construct validity has been demonstrated, as the overall DMS score has shown significant gender differences (i.e., boys and men score higher than girls and women). Convergent validity has also been established, as the DMS is correlated with other theoretically similar constructs (e.g., weight training, desire to gain weight). Additionally, divergent validity has been demonstrated, as the DMS is not correlated with instruments that measure dissimilar constructs (e.g., drive for thinness as measured by the Eating Attitudes Test). In this study, the DMSAtt subscale was hypothesized as an indicator of body dissatisfaction, and the DMSBeh subscale was hypothesized as an indicator of MD.

Symptom Checklist-90-Revised (SCL-90-R). The SCL-90-R (Derogatis, 1994) is a 90-question symptom inventory. The following subscales assess emotional distress: Interpersonal Sensitivity (sclIPS), Depression (sclDEP), Anxiety (sclANX), Hostility, Phobic Anxiety, Paranoid Ideation, and Psychoticism. In this study, sclDEP and sclANX, were originally hypothesized as indicators of negative affect, and sclIPS was originally hypothesized as one indicator of self-esteem.

The SCL-90-R is a widely used measure for which reliability and validity have been well-established (Hafkenscheid, 1993; Martinez, Stillerman, Waldo, 2005; Simonds, Handel, & Archer, 2008). Respondents indicate their current level of distress related to a variety of symptoms by endorsing 1 of 5 answer choices ranging from not at all to extremely. Internal consistency reliability was good in this sample with alpha coefficients ranging from $\alpha = .84$ to $\alpha = .92$ (see Table 2). Test-retest reliability ranges from $r = .80$ to $r = .90$ over a period of 10 weeks. The SCL-90-R is a construct valid measure as demonstrated through factor analysis (Derogatis, 1994).

Rosenberg Self-Esteem Scale (RSES). The RSES (Rosenberg, 1965) is a 10-item unidimensional measure of global self-concept. Overall, it assesses one's general level of life satisfaction, self-worth, and attitude toward self (Byrne, 1996; Rosenberg, 1965). Questions are responded to on a four-point scale that ranges from 1 = strongly agree to 4 = strongly disagree. The RSES demonstrated very good internal consistency in this study, with alpha coefficients ranging from $\alpha = .81$ to $\alpha = .82$. Test-retest reliability for the RSES over seven months was also adequate in a sample of high school students [$r = .63$ (Byrne, 1983)] and over 4 weeks in a sample of undergraduates [$r = .84$ (Martin-Albo, Nunez, Navarro, Grijalvo, 2007)]. In addition to sclIP, the RSES was originally hypothesized as an indicator of self-esteem.

Sociocultural Attitudes Toward Appearance Questionnaire-3 (SATAQ-3). The SATAQ-3 (Thompson et al., 2004) is a 30-question inventory that measures the media's influence on EEBI disturbances with four subscales. Items are responded to on a 5-point Likert-type scale that ranges from definitely disagree to definitely agree. The

Internalization-General subscale (InternalizationGen; 9 items) measures endorsement and acceptance of unrealistic images of body figures presented in the media. The Internalization-Athletic subscale (InternalizationAth; 5 items) measures endorsement and acceptance of an athletic physique (e.g., lean and muscular). The Information subscale (Inf; 9 items) measures the importance one places on the media for obtaining information about ideals of appearance. Finally, the Pressures subscale (Press; 7 items) measures the amount of pressure one perceives from the media to achieve sociocultural ideals of attractiveness. In the current study, the InternalizationGen subscale and the InternalizationAth subscale were originally hypothesized as indicators of Ideal Body Internalization, and the Inf subscale and the Press subscale were hypothesized as indicators of Media Pressure.

Because many items from the original SATAQ-3 assess ideals of female attractiveness (e.g., “thinness,” being pretty”), a modified version will be used for this study in which items are reworded to emphasize muscular ideals of appearance (Karazsia & Crowther, 2008). Reliability and validity of the modified SATAQ-3 have been established in samples of undergraduate men. Internal consistency was high for all subscales in the current study, with coefficient alphas ranging from $\alpha = .87$ to $\alpha = .95$. Construct validity of the modified version of the SATAQ-3 has been demonstrated through factor analysis (Karazsia & Crowther, 2008).

Multidimensional Perfectionism Scale (MPS). The MPS (Hewitt & Flett, 1991) is a 45-question inventory that measures dimensions of perfectionism. These include self-oriented perfectionism (SOP; 15 items), which measures intrinsic demands for perfection

and related stringent and rigid standards of behavior that one imposes on oneself and socially-prescribed perfectionism (SPP; 15 items), which is marked by perceived pressure from friends, family, and society to be perfect as well as the belief that failure to meet others' demands for perfection will result in disapproval (Hewitt & Flett, 2004). Reliability and validity of the MPS have been established in undergraduate samples. Internal consistency was adequate in this study, with alpha coefficients ranging from $\alpha = .76$ to $\alpha = .82$. Construct validity of the MPS has been demonstrated through factor analysis, and the MPS is correlated with The Burns Perfectionism Scale (Burns, 1980), another measure of perfectionism (Hewitt & Flett, 1991; Hewitt, Flett, Turnbull-Donovan, & Mikail, 1991). In this study, SOP and SPP were originally hypothesized as indicators of the latent construct, perfectionism.

Sports that emphasize muscularity. The demographic questionnaire was used to assess participation in sports that emphasize muscularity. Specifically, each respondent indicated the sport(s) in which he participates from a list provided on the demographic questionnaire. This list included club, team, and competitive sports that are organized at the university where the current data was collected. Based on previous literature in this area (e.g., Baghurst & Lirgg, 2009; Parks & Reed, 1997; Rauden & Meyer, 2003; Yesalis & Bahrke, 1995), each sport was then ranked on a 4-point scale that ranges from 0 = no emphasis on muscularity, 1 = low emphasis on muscularity, 2 = moderate emphasis on muscularity, and 3 = high emphasis on muscularity.

Procedure

After obtaining approval from the UNT Institutional Review Board (see Appendix I), participants from psychology courses were recruited through the psychology department-sponsored online recruiting system in which students can search and sign up for participation in research studies. After using this recruitment technique for four months, it was suspected that the prevalence of apparent MD in the sample was low. Inspection of the OBT variable confirmed that only one of 150 men in the sample was “very muscular.” Subsequently, in an effort to oversample men at higher risk for MD, participants were also recruited at the university’s sport and recreation center. Specifically, a research assistant identified men with a “very muscular” observed body type (OBT) and asked them if they would like to participate for \$10 compensation or a gift certificate to a local business. Attempts were also been made to recruit participants by posting flyers (see Appendix K) across campus and at community gyms and local “health food” stores, as men who are concerned with their appearance and muscularity likely frequent the latter facilities. Although the attempts to recruit off campus were unsuccessful, oversampling “very muscular” men at the university recreation center increased the upper range of variables assessing MD symptoms.

Each participant spent 45 to 90 minutes completing one of three versions of a counter-balanced questionnaire packet before having their height and weight measurements taken. Participants completed the survey packets either individually or in groups of no more than ten men in a classroom large enough to accommodate 50 people. These packets included the demographic survey, MEBBIE, DMS, SCL-90, MPS, RSES,

SATAQ, and CTQ, in addition to several other questionnaires that were included as part of a separate research project. After completing the survey packets, participants were taken individually to a private room where an undergraduate research assistant measured their height and weight twice to ensure accuracy of measurement. The undergraduate research assistant also documented each participant's OBT (i.e., underweight, low-average, high average, overweight, very overweight, or very muscular). After completing the study, participants received a debriefing form that described the purpose of the study and provided referral information for men with EEBI concerns (see Appendix L). Each participant also received either three points of extra credit, \$10 cash, or a coupon for a local business as compensation for their time.

CHAPTER 3

RESULTS

Prior to analyzing the data, basic screening procedures were used to examine the accuracy of data entry, check for missing values and outliers, and test the assumptions of structural equation modeling (SEM). First, the undergraduate research assistant double-checked the accuracy of data entry by comparing every third participant's survey responses to the corresponding values recorded in the database. Frequency tables were then examined to further identify data entry errors and missing values. Cases for which more than 5% of the items for a given subscale were missing were deleted for the analyses in which that specific subscale was used (Field, 2009). Specifically, 41 cases were deleted for missing values. Ipsative imputation was then used to replace randomly missing items observed in the remaining cases (Schafer & Graham, 2002). Next, data were screened for univariate and multivariate outliers by examining box-plots and studentized deleted residuals (Field, 2009). Two multivariate outliers were detected, and these cases were deleted. Conversely, although univariate outliers were detected in each of the analyses, these were not deleted because they were expected for most of the variables measured and techniques used in SEM are generally considered robust to such violations (McDonald & Ho, 2002).

The assumptions of maximum likelihood (ML) in SEM – univariate and multivariate normality of data, non-collinearity between predictors, homoscedasticity, and linearity between independent and dependent variables – were tested by examining

independent and dependent variables (McDonald & Ringo-Ho, 2002; Schumacker & Lomax, 2004; Weston & Gore, 2006).

First, the assumptions of normality were tested by assessing normal probability plots and histograms as well as skew and kurtosis for all variables (see Table 2). As predicted, three variables from the Symptom Checklist-90 Revised (SCL-90-R) that were transformed to *t* scores (i.e., depression, anxiety, interpersonal sensitivity) did not meet the assumption of normality as their distributions were platykurtic and slightly positively skewed. The platykurtic distribution was due in part to the conversion of SCL-90 raw subscale scores (i.e., depression, anxiety, and hostility) to *t* scores, which limits the minimum scores to 38, 40, and 41, respectively, and the maximum scores to 81, resulting in a large number of scores at each end of the distributions. Furthermore, because the SCL-90 measures clinical phenomena (e.g., depression), the *t* score conversion necessarily creates a positively skewed distribution because only a small number of participants are likely to report elevations on a given subscale, resulting in a larger number of scores at the asymptomatic end of the distribution. The Multidimensional Perfectionism Scale (MPS) was positively skewed as well, and the Rosenberg Self-Esteem Scale (RSES) was negatively skewed. Each of these variables were logarithmically transformed to account for non-normality (Field, 2009, Tabachnick & Fidell, 2007).

Finally, the assumptions of homoscedasticity and linearity were tested by examination of scatterplots in which predicted values for variables were plotted on the *y*-

axis and standardized residuals for variables were plotted on the x -axis. Assessment of these scatterplots indicated that these assumptions were not violated for any variables. Means, standard deviations, and intercorrelations for the variables are presented in Tables 2 and 3.

Forty-three participants were removed from the sample if more than 5% of the items for a given subscale were missing for these participants' survey packets. Because the purpose of the study was to identify the best-fitting model, then confirm that it in a second, holdout sample, the 746 qualified participants were divided randomly into two separate groups: Sample A ($n = 373$; exploratory sample) and Sample B ($n = 373$; confirmatory sample). T -tests revealed that the two groups did not differ significantly on any important variables (see Table 2 for sample means).

The Mplus (Muthen & Muthen, 1998-2010) statistical software program was used to conduct the SEM analysis. SEM is a multivariate statistical technique for examining relationships between observed variables (i.e., manifest or measured variables) and their underlying theoretical constructs (i.e., latent variables) through a complex theoretical model (Bentler, 1980; Martens, 2005). That is, the ways in which the observed variables defined the latent constructs of interest was hypothesized a priori through a measurement model (see Figure 2). Next, the specific causal structure of the relationships between these latent constructs was hypothesized a priori through Grieve's structural model and the alternative structural model (see Figures 1 and 3). A two-step process was then followed to test the a priori hypotheses. First, confirmatory factor analysis (CFA) was used to test the measurement model (i.e., how adequately the observed variables

measured the latent constructs). Variables that did not load significantly on their respective latent constructs (t -value < 1.96) were dropped from the model (Weston & Gore, 2006; Worthington & Whitaker, 2006). After the measurement model was confirmed, Grieve's model and the alternative structural model were tested separately to examine the strength and significance of the hypothesized pathways among the latent constructs. ML procedure was used in Mplus for parameter estimation in the current analysis. The goodness of fit of the two structural models was then compared in Mplus by examining the chi-square values for each model (McDonald & Ring Ho, 2002; Weston & Gore, 2006).

Originally, it was hypothesized that each latent construct was represented by at least two measured variables. However, for several latent constructs in the measurement model (i.e., body dissatisfaction, MD, perfectionism, self-esteem, and perfectionism), one or more measured variables were dropped due to poor fit, resulting in only one remaining measured variable for each of these latent constructs. Because researchers warn against testing models with latent constructs that have only one indicator (Bollen, 1989), items from the remaining measured variables were parceled to create two indicators (Russell, Kahn, Spoth, & Altmaier, 1998). Specifically, through an exploratory factor analysis (EFA), a single factor was extracted for each remaining scale. Items from each scale were then rank-ordered based on the magnitude of their factor loadings on the single factor. Items were then assigned from the highest to lowest factor loadings to the two separate parcels to create equalized, average loadings of each parcel for its respective latent construct. Total scores for each parcel were represented by the average of the

items on that parcel. Internal consistency reliabilities, mean inter-item correlations, means, standard deviations, and correlations among all the total scores are presented in Tables 2 and 3.

Measurement Model – Sample A

In the measurement model, body dissatisfaction was represented by the original proposed indicators of the Drive for Muscularity Scale Attitudes (DMSAtt) and MEBBIE Body Dissatisfaction (BD) scales. Due to low factor loadings ($\beta = .60$) the DMSAtt scale was dropped. Consequently, the BD scale was parceled to create two indicators (Russell, Kahn, Spoth, & Altmaier, 1998). These parcels loaded highly and positively on the body dissatisfaction construct, indicating that higher scores on this latent variable represent higher levels of body dissatisfaction (see Table 4).

The latent construct, MD, was represented in the measurement model by the Drive for Muscularity Scale Attitudes (DMSBeh) and MEBBIE Muscle Dysmorphia (mebMD) scales. The factor loadings for the DMSBeh were low on the MD latent variable ($\beta = .57$); thus, this subscale was dropped from the analysis. Once again, the parceling procedure was used to create two indicators (as was done in the creation of all subsequent parcels). Because these parcels loaded highly and positively on the MD latent variable, higher scores are indicative of higher levels of MD symptomatology (see Table 4).

In the measurement model, Ideal Body Internalization/Pressure was represented by the four factors from the Sociocultural Attitudes Toward Appearance Questionnaire-3 (SATAQ-3): Internalization-General (Internalization-Gen), Internalization-Athletic

(Internalization-Ath), Pressures (Press), and Information (Inf). The Inf subscale was dropped because of low factor loadings ($\beta = .59$). The other three subscales, however, loaded positively and highly on this latent construct and represented internalization of cultural standards of attractiveness for men as well as perceived pressure to adhere to those standards (see Table 4). Thus, higher scores on this latent construct indicate greater ideal body internalization and perceived media pressure to achieve the ideal muscular physique.

Self-esteem was represented in the measurement model by the RSES and the Interpersonal Sensitivity subscale (sclIPS) of the SCL-90-R. The sclIPS was dropped due to low factor loadings ($\beta = .55$). Thus, the RSES was parceled to create two indicators. Both parcels loaded highly and positively on the Self-Esteem construct, indicating that higher scores on this latent construct are associated with higher levels of self-esteem (see Table 4).

Negative affect was originally represented in the measurement model by the depression (sclDEP) and anxiety (sclANX) subscales of the SCL-90-R. Upon inspection of the correlation matrix for each of the indicators, it was observed that the sclIPS subscale actually had a stronger relationship with the sclANX ($r = .67$) and sclDEP ($r = .79$) than with the RSES (as originally proposed). Thus, the sclIPS was dropped as an indicator for self-esteem and added as an indicator for the negative affect variable. All three of these subscales loaded positively and highly on this latent variable, with higher scores indicating higher levels of negative affect (see Table 4).

In the measurement model, the Self-oriented Perfectionism (SOP) and the Social Prescribed Perfectionism (SPP) subscales of the MPS were used to measure the latent construct, perfectionism. Because factor loadings for the SOP were low ($\beta = .51$), this subscale was dropped, a decision supported by past literature (Woodruff, 2010). The SPP subscale was then parceled to create two indicators. These parcels loaded positively and highly on the perfectionism latent variable; thus, high scores on this latent construct indicate higher levels of perfectionism.

The final measurement model demonstrated good fit, and all of the factor loadings were satisfactory. See Table 4 and Figure 2 for factor loadings associated with each measured variable and Table 5 for measurement model fit indices for Sample A.

Grieve's Structural Model-Sample A

Examination of Grieve's structural model indicated that this model fit the data poorly. See Table 5 for fit indices including CVI/TLI, RMSEA, SRMR and Figure 1 for parameter estimates. Subsequently, examination of the alternative revealed that this model represented a better fit to the data than did Grieve's model.

Alternative Structural Model-Sample A

The overall fit of the alternative model reflected a significant improvement in model fit over Grieve's modified structural model $\Delta\chi^2 = 217.273, p < .001$. See Table 5 for model fit results. For Sample A, overall, the SRMR, TLI, CFI, and RMSEA suggest that the model reproduced the observed data well, as these values are within the good fit range. All pathways in the alternative model were significant and in the expected directions.

Direct effects were examined within the better fitting alternative model. Self-esteem was directly and negatively related to negative affect ($\beta = -.624, p = .000$), accounting for 39% of the variance in negative affect. Self-esteem was also directly and negatively related to ideal body internalization/media pressure ($\beta = -.238, p = .000$). Socially prescribed perfectionism was directly and positively related to ideal body internalization/media pressure ($\beta = .354, p = .000$). Together, self-esteem and socially prescribed perfectionism accounted for 24.3% of the variance in ideal body internalization/media pressure. Body dissatisfaction was directly and positively determined by ideal body internalization/media pressure ($\beta = .369, p = .000$), perfectionism ($\beta = .183, p = .001$), and negative affect ($\beta = .281, p = .000$); together, these variables accounted for 38% of the variance in body dissatisfaction. MD symptomatology was determined directly by ideal body internalization/media pressure ($\beta = .365, p = .000$) and body dissatisfaction ($\beta = .526, p = .000$); together, these variables accounted for 60.8% of the variance in MD symptomatology.

Indirect Effects-Sample A

Mediating effects were also examined for the alternative model with Sample A. Negative affect partially mediated the negative relationship between self-esteem and body dissatisfaction ($\beta = -.176, p = .000$). Additionally, ideal body internalization/media pressure partially mediated the negative relationship between self-esteem and body dissatisfaction ($\beta = -.088, p = .000$), although the effect size of this relationship was small. The total effect of self-esteem on body dissatisfaction was moderate ($\beta = -.254, p = .000$). Ideal body internalization/media pressure partially mediated the relationship

between perfectionism and body dissatisfaction ($\beta = .131, p = .000$). Furthermore, body dissatisfaction partially mediated the relationship between perfectionism and MD symptomatology ($\beta = .096, p = .002$), although the effect size of this relationship was small. Body dissatisfaction partially mediated the relationship between ideal body internalization/media pressure and MD symptomatology ($\beta = .194, p = .000$), and body dissatisfaction also partially mediated the relationship between negative affect and MD symptomatology ($\beta = .148, p = .000$).

Measurement Model-Sample B

The final measurement model used in Sample A was tested on Sample B for cross validation. The same measured variables loaded similarly in Sample B and the measurement model demonstrated good fit across both samples. See Table 4 and Figure 2 for factor loadings associated with each measured variable and Table 5 for measurement model fit indices for Sample B.

Alternative Structural Model-Sample B

Because it was the better fitting model, the alternative structural model was also tested with Sample B. The overall fit of the alternative model was adequate in Sample B. Specifically, the SRMR, TLI, CFI, and RMSEA suggest that the model fit the observed data well for Sample B, as most of these values were within the good fit range (see Table 5). However, contrary to Sample A, the direct pathway between socially prescribed perfectionism and body dissatisfaction was nonsignificant in Sample B ($\beta = .063, p = .194$). Additionally, body dissatisfaction did not mediate the relationship between

perfectionism and MD symptomatology in Sample B ($\beta = .035, p = .199$). All of the other pathways in the model were significant and in the expected directions.

Direct effects were examined with sample B. Negative affect was determined directly by self-esteem ($\beta = -.618, p = .000$). Self-esteem was directly and negatively related to ideal body internalization/media pressure ($\beta = -.168, p = .000$), and socially prescribed perfectionism was directly and positively related to ideal body internalization/media pressure ($\beta = .200, p = .000$). Together, self-esteem and socially prescribed perfectionism accounted for 8.3% of the variance in ideal body internalization/media pressure. Body dissatisfaction was directly determined by ideal body internalization/media pressure ($\beta = .394, p = .000$) and negative affect ($\beta = .389, p = .000$); together, these variables accounted for 36.9% of the variance in body dissatisfaction. MD symptomatology was determined directly by ideal body internalization/media pressure ($\beta = .315, p = .000$) and body dissatisfaction ($\beta = .559, p = .000$). Together, these variables accounted for 57.4% of the variance in MD symptomatology.

Indirect Effects-Sample B

Mediating effects were examined for the alternative model with Sample B. Negative affect partially mediated the negative relationship between self-esteem and body dissatisfaction ($\beta = -.223, p = .000$). Ideal body internalization/media pressure also partially mediated the negative relationship between self-esteem and body dissatisfaction ($\beta = -.065, p = .001$), although this effect size was small. The total effect of self-esteem on body dissatisfaction was moderate ($\beta = -.228, p = .000$). Ideal body

internalization/media pressure partially mediated the relationship between perfectionism and body dissatisfaction ($\beta = .131, p = .001$). Body dissatisfaction partially mediated the relationship between ideal body internalization/media pressure and MD ($\beta = .220, p = .000$), and body dissatisfaction also partially mediated the relationship between negative affect and MD symptomatology ($\beta = .217, p = .000$).

CHAPTER 4

DISCUSSION

This study tested and compared a modified version of Grieve's (2007) model of muscle dysmorphia (MD) symptom development to an alternative model which excluded certain variables [i.e., Body Mass Index (BMI), participation in sports that emphasize muscularity, body distortion]] and particular pathways found in Grieve's model. Overall, Grieve's (2007) modified model did not fit the data well. Conversely, the alternative model demonstrated slightly improved fit to the data. As a result, the alternative model was cross validated with a second sample (Sample B). The alternative model also fit the data in Sample B adequately, although the significance of two hypothesized pathways was not replicated across samples.

There are several possible reasons why Grieve's (2007) model was not supported. First, Grieve hypothesized about the development of significant symptoms of MD, perhaps even the full-blown disorder. However, the low prevalence rate of MD in the general population presents significant challenges to obtaining a clinical sample large enough to test a structural model. Because of such sampling difficulties, this study utilized a nonclinical group of men to test Grieve's model. It is possible, however, that Grieve's model is a good representation of MD development for men who are more symptomatic or men who have the full-blown disorder. To fully assess the goodness of fit of Grieve's model, it must be tested using clinical samples of men with MD.

It is also possible that Grieve included certain pathways in his model that are not relevant to MD symptom development. Specifically, Grieve included direct pathways from negative affect to MD and perfectionism to MD. However, in this study, these variables were only indirectly related to MD through their relationship with body dissatisfaction. This finding highlights the importance of differentiating body dissatisfaction as a *symptom* of MD from body dissatisfaction as a specific *risk factor* in the development of MD. Specifically, although “dissatisfaction” with muscularity is not a specific diagnostic criterion of MD, it is essentially implied by the “chronic preoccupation that one is insufficiently muscular” (p. 550, Pope et al., 1997) criterion. In an effort to shed light on the role of body dissatisfaction in MD, this study examined body dissatisfaction as risk factor (i.e., body dissatisfaction was a separate latent variable) rather than incorporating it as a symptom of MD. It is possible, however, that the aforementioned pathways included by Grieve may be significant if body dissatisfaction is included as a symptom of, rather than a risk factor for, MD. That is, for some men, body dissatisfaction may be a risk factor, whereas for others it may be a symptom of MD. Moreover, body dissatisfaction may serve as both a risk factor and a symptom of MD for some men.

The inclusion of sports participation and BMI in Grieve’s model may have also limited its goodness of fit. The role of both of these variables in MD symptom development remains equivocal, and research findings are inconsistent. For example, although some researchers have identified an association between participation in sports

that emphasize muscularity and symptoms of MD, others suggest that participation in such sports may actually protect men from MD symptom development (e.g., Zucker, Womble, Williamson, & Perrin, 1999). Furthermore, although BMI is associated with increased strategies aimed at building muscle, low BMI has been suggested as a risk factor for MD symptomatology as well (Bahrke, 2000; Cafri et al., 2005; Neumark-Sztainer et al., 1999). Future studies should incorporate these variables in an effort to further investigate their role in MD symptom development.

Summary of Findings for the Alternative Model

Regarding the alternative model, across both samples, 57% to 60% of the variance in MD symptomatology was explained by the direct and indirect effects of body dissatisfaction, ideal body internalization/media pressure, low self-esteem, and negative affect. These variables were all related to MD symptomatology as hypothesized. Unexpectedly, however, perfectionism did not contribute consistently to the proposed alternative model.

In the alternative model, the ideal body internalization/media pressure construct was directly related to MD symptomatology, with a medium effect size. This finding suggests that some men who perceive media pressure to obtain a muscular ideal and internalize this body type as something important to strive for are at risk for symptoms of MD, a finding that is well-supported by past literature (e.g., Baird & Grieve, 2006; Bardone-Cone, Cass, & Ford, 2008; Lorenzen, Grieve, & Thomas, 2004). Specifically, because the male body type portrayed in the media is unrealistic and generally unattainable without the use of extreme, unhealthy measures (e.g., excessive

weightlifting, anabolic steroid abuse), it makes sense that men who value this ideal and internalize it as something to strive for may be at increased risk for engaging in MD-like behaviors in an effort to achieve that kind of mesomorphic physique.

Conversely, although internalization/media pressure may contribute directly to MD symptomatology for some men, this variable may not adequately explain MD symptom development for all men. Instead, it appears that several other variables and pathways may also work in conjunction with internalization/media pressure to contribute to the development of MD symptoms. For example, in the current study, body dissatisfaction partially mediated the internalization/media pressure-MD symptomatology relationship. Thus, for some men, perceived media pressure and ideal internalization contribute to body dissatisfaction, which may subsequently compel these men to engage in MD-like behaviors (e.g., steroid abuse, excessive exercise) in an effort to reduce their body dissatisfaction and achieve the muscular ideal. As MD behaviors continue, these men may become increasingly invested in their muscularity. Additionally, they may be more likely to see other men who are highly muscular (e.g., at the gym, in fitness magazines), causing them to further internalize the hypermuscular ideal. As this ideal is more strongly internalized, the risk for getting caught in a cycle of body dissatisfaction fueling symptoms of MD may increase.

That some men who experience internalization/media pressure develop symptoms of MD without first experiencing body dissatisfaction deviates from the extant literature with women. For women, media pressure and internalization of the thin ideal generally contribute to body dissatisfaction first, which then leads to eating pathology [e.g.,

anorexia nervosa, bulimia nervosa (Stice, Schupak-Neuberg, Shaw, & Stein, 1994)]. It may be that, dissimilar to women, some men who experience internalization/media pressure are able to pursue the ideal male body type and actually perceive that they are achieving it with success. Additionally, other people may reinforce these men for increasing their muscularity, which may further encourage them to accelerate their muscle-building behaviors. Consequently, some men may eventually develop symptoms of MD as they pursue the muscular ideal without ever developing body dissatisfaction. This hypothesis is supported by other cases of hypermesomorphic men with problematic eating and exercise behaviors who report adequate or high levels of body satisfaction (e.g., Kaminski et al., 2005; McFarland & Kaminski, 2009; Woodruff, 2010). These findings further demonstrate the complex and variable nature of body dissatisfaction in MD development, highlighting the importance of additional research.

Based on the current model, it is evident that low self-esteem is also an important variable for understanding the influence of internalization/media pressure on symptoms of MD. In this study, internalization/media pressure partially mediated the negative relationship between self-esteem and body dissatisfaction, although the effect size of this relationship was small. Nonetheless, it is possible that for some men, low self-esteem may increase their vulnerability to media pressure and ideal body internalization. For example, social comparison theory suggests that human beings compare themselves to others as a means of evaluating themselves. Sometimes, individuals engage in upward comparison (i.e., they compare themselves to others who are superior in some way), and sometimes they engage in downward comparison [i.e., they compare themselves to others

who are inferior in some way (Festinger, 1954)]. In particular, researchers have observed that individuals with low self-esteem tend to engage in upward social comparison (e.g., Corning, Krumm, & Smitham, 2006; Thompson, Coovert, & Stormer, 1999). Thus, a man with low self-esteem may be inclined toward upward social comparison and, rather than evaluating his physique as it compares to the average man, he relies on media images of lean, hypermuscular men as a gauge for his own attractiveness. Continual comparisons of himself to this ideal may contribute to internalization of the muscular ideal as something important to strive for, leading to the belief that achieving this body type will increase his self-esteem and overall self-worth. This experience of body dissatisfaction may further diminish the self-esteem of this man, however, making him increasingly vulnerable to internalization/media pressure and further exacerbating body dissatisfaction.

In addition to internalization/media pressure, negative affect also partially mediated the negative relationship between self-esteem and body dissatisfaction. It is important to note, however, that low self-esteem and negative affect alone may not be sufficient to result in body dissatisfaction for all men. For example, for some men, this pathway in conjunction with the presence of other variables (e.g., internalization/media pressure) and pathways may result in body dissatisfaction. Thus, if a man with this combination of symptoms places value on his appearance (i.e., he has internalized the hypermesomorphic ideal), he may be at heightened risk for perceiving that he is deficient in muscularity and leanness. Hypothetically, this experience of body dissatisfaction could further diminish this man's self-esteem and increase negative affect, ultimately

exacerbating body dissatisfaction. A longitudinal research design should be implemented by future researchers to further understand these relationships and which processes are recursive.

According to the current findings, the positive relationship between negative affect and MD symptomatology was partially mediated by body dissatisfaction. That is, when some men experience symptoms of depression, anxiety, and interpersonal sensitivity, they are more likely to experience body dissatisfaction, with the ultimate potential of contributing to symptoms of MD. Specifically, when men experience negative affect, they are at increased vulnerability for a number of negative outcomes, one of these being EEBI disturbances (Cafri, et al., 2002; Ebbeck, Watkins, Concepcion, Cardinal, & Hammermeister, 2009; McFarland & Kaminski, 2009; Olivardia et al., 2004; Woodruff, 2010). Given that Westernized culture places increasingly strong emphasis on the importance of muscularity and leanness for men, it is not surprising that one negative outcome associated with negative affect is body dissatisfaction. For example, a depressed man may feel self-conscious about his body and perceive that his appearance is inadequate, especially if this man has internalized the hypermesomorphic ideal. Consequently, this man may believe that his physique is unattractive or insufficiently muscular. Similarly, when a man with anxiety places emphasis on the importance of his appearance, he may become preoccupied with and worried about perceived inadequacies with his physique, increasing the likelihood that he will experience body dissatisfaction.

It is also possible that, as has been noted among community samples of women (Kaminski, Klinger, Riggs, & Hoffman, 2004), the ubiquitousness of body dissatisfaction

may indicate that, in our time and culture, body dissatisfaction itself has become a way of expressing negative affect. That is, just as ruminating is a symptom and expression of anxiety, perhaps body disparagement is one of many outlets for various types of dysphoria. The relationship between negative affect and body dissatisfaction in men has only recently been explored and more research is needed to understand its complexities.

Another conceptualization of body dissatisfaction as a mediator of the relationship between negative affect and MD symptoms is that excessive exercise, rigid diets, and preoccupation with building muscularity may be attempts at coping with negative affect. In a continued effort to reduce negative affect (and alleviate body dissatisfaction), these men may develop and maintain symptoms of MD (e.g., rigid workout schedules, unusual dieting practices). These behaviors may operate as a form of distraction from either the negative affect and/or the stressors fueling dysphoria. Alternatively, some behaviors associated with MD may function as a form of self-medication, perhaps by increasing pleasure-inducing neurotransmitters (e.g., Boecker et al., 2009). Although one could argue that exercise or a focus on nutritious eating are healthy forms of self-medication, when they become extreme and/or interfere with other aspects of functioning, they can become problematic.

Whereas body dissatisfaction played an important role in the current model as a mediator, this latent variable was also strongly and *directly* related to MD symptomatology. In fact, body dissatisfaction was the variable with the strongest direct relationship to MD symptomatology in the entire model, suggesting that, as proposed by prominent MD researchers (e.g., Pope et al., 1997; Pope et al., 2000), it may be critical in

understanding symptom development. This finding makes sense in light of the fact that body dissatisfaction is generally a central feature of MD, and a man with full-blown MD may be so highly dissatisfied with his body that he experiences severe functional impairment. For example, some men with MD symptomatology may be preoccupied with and distressed about perceived inadequacies in their appearance to the extent that they avoid social situations in which their bodies may be exposed (Pope et al., 1997). Such men may also be so dissatisfied with perceived deficiencies in musculature that they sacrifice important obligations to maintain their rigid workout schedule. For example, some men with full-blown MD have reported that they have forgone occupational obligations to spend more time in the gym, resulting in job loss (Pope et al., 2000). Thus, body dissatisfaction often plays a central role in MD symptomatology. On the other hand, because cases have been observed in which men with MD symptomatology report adequate or high levels of body satisfaction (e.g., Kaminski et al., 2005; McFarland & Kaminski, 2009; Woodruff, 2010), it is possible that some men may develop MD symptoms without ever experiencing body dissatisfaction.

Overall, although research remains equivocal, the current study suggests that body dissatisfaction precedes MD symptomatology, placing many men at risk for developing the disorder. Reverse causation may also occur for some men (i.e., MD symptomatology may cause body dissatisfaction), and a bidirectional relationship may also exist. For example, body dissatisfaction may compel a man to engage in behaviors characteristic of MD in an effort to relieve concerns about his appearance. As these MD-like behaviors persist, this man may become increasingly invested in his muscularity. He is also likely

to be more and more exposed to the muscular ideal at increasing rates (e.g., in the gym, by reading fitness magazines), leading him to further increase his goals for muscularity. Increasingly unrealistic goals could explain stagnant or worsening body dissatisfaction, despite objective increases in muscularity. Consequently, a bi-directional process may develop for some men in which body dissatisfaction fuels MD symptoms and vice-versa. It is important to note that in the extant literature, there are few detailed case reports with men who are high in symptoms of MD. In-depth interviews with these men are imperative to gain a comprehensive understanding of the role of body dissatisfaction in MD symptom development. It seems likely that a number of diverse pathways may result in MD symptom development.

In the current study, a relationship was also observed between socially prescribed perfectionism and ideal body internalization/media pressure. Thus, some men who believe that others demand them to be perfect may also perceive pressure from the media to achieve a hypermesomorphic physique and to internalize it as something important to strive for. Furthermore, ideal body internalization/media pressure partially mediated the relationship between socially prescribed perfectionism and body dissatisfaction, although the effect size of this relationship was small. Nonetheless, it appears some men who perceive that others (e.g., friends, family, and society) demand them to be perfect in various domains may be more likely to accept and adopt sociocultural ideals of attractiveness as something important to strive for. Subsequently, this pathway may contribute to body dissatisfaction for this man, particularly if he perceives that he deviates from the hypermesomorphic ideal.

In Sample A, socially prescribed perfectionism contributed directly to body dissatisfaction. Additionally, socially prescribed perfectionism contributed to MD symptomatology indirectly via body dissatisfaction. Unexpectedly, however, these pathways were not significant in Sample B. There may be several plausible explanations for these inconsistent findings. For example, it is possible that among college men with high socially prescribed perfectionism, there are individual differences in which pressure from others to achieve perfection is perceived. Some men who reported high levels of perfectionism may be driven to achieve in domains unrelated to appearance, such as academics or interpersonal relationships. Consequently, these men may be less susceptible to body dissatisfaction or other appearance related concerns. Because it was not possible to test this hypothesis with the current data, future researchers should investigate this hypothesis.

At the same time, however, for some men with socially prescribed perfectionism and MD symptomatology, a “honeymoon phase” may exist. That is, initially, men who perceive pressure from others to achieve a muscular body type may experience body dissatisfaction. They may then be compelled them to engage in MD-like behaviors (e.g., excessive weightlifting, steroid use) in an effort to reduce body dissatisfaction and please others. Such behaviors will move these men closer to the societal ideal of muscularity, and they may receive reinforcement from others (e.g., friends, family) for their increased muscularity and leanness. As a result, they may temporarily perceive that they are meeting others’ demands for perfection (i.e., regarding their physiques), contributing to a sense of satisfaction with their appearance. As symptoms of MD persist, however,

concerns about meeting societal ideals of muscularity may increase and become more unrealistic. Over time, body dissatisfaction may re-emerge for these men, further fueling MD symptomatology (e.g., increased weightlifting, body distortion). Although the honeymoon phase is consistent with previous findings and other samples (i.e., Kaminski et al., 2005; McFarland & Kaminski, 2009; Woodruff, 2010), additional research is necessary to determine if this is an actual phenomenon.

Theoretical Implications and Future Research Directions

Numerous theoretical implications resulted from this study. First, the findings suggest that MD symptom development may be best understood from the theoretical framework of developmental psychopathology (Cicchetti, 1984). According to this paradigm, psychopathology manifests from complex interactions between individual factors (e.g., genes, neurobiology, personality) and environmental factors (e.g., culture, geography) as they occur across multiple contexts (Baltes, Reese, & Lipsitt, 1980). Consequently, there is great potential for diversity, both in developmental processes and developmental outcomes. Following this logic, it makes sense that different variables and diverse pathways may lead to similar pathological outcomes across individuals, a phenomenon referred to as equifinality. On the other hand, the same variables and similar pathways may lead to different outcomes across individuals, a phenomenon called multifinality (Cicchetti, 1984; Cicchetti & Rogosch, 1996).

The concepts of equifinality and multifinality may accurately explain the diversity in pathways and inconsistencies in findings across samples in the current study. For example, results from the alternative model suggest that, whereas some men who

experience ideal internalization and media pressure may develop MD symptoms without the presence of body dissatisfaction, other men who experience ideal internalization and media pressure may only be at risk for MD symptom development when body dissatisfaction is also present. Thus, contrary to much of the extant literature (e.g., Pope et al., 2000), although body dissatisfaction may be necessary for MD symptom development in some men, this may not be the case for all men. That is, different variables and pathways may ultimately contribute to MD symptom development across individuals, resulting in equifinality.

Conversely, multifinality may explain the inconsistent findings regarding perfectionism. Specifically, the hypothesized role of socially prescribed perfectionism in MD symptom development was only significant in one sample. It is possible that for some men, this variable contributes to MD and other eating, exercise, and body image (EEBI) disturbances [a finding that is supported by past research (e.g., Grammas & Schwartz, 2009; Maida & Armstrong, 2005, Woodruff, 2010)], whereas this variable may result in a different set of outcomes for other men. For example, socially prescribed perfectionism has also been associated with other forms of psychological distress, such as depression (Hewitt, Flett, & Ediger, 1996). Thus, multifinality may explain inconsistencies across samples regarding the role socially prescribed perfectionism in MD symptom development.

This study also broadens theoretical knowledge of MD by indicating that symptom development occurs within a biopsychosocial framework. Specifically, although researchers and clinicians increasingly acknowledge that a multidimensional

model accurately captures the development of MD symptomatology [and other EEBI disturbances (e.g., Grieve, 2007; Pope et al., 1997; Pope et al., 2000)], few researchers have comprehensively examined MD symptom development from a biopsychosocial perspective. In fact, this study is the first to test a comprehensive, pathway model of MD symptom development. Based on the current results, it is evident that a number of biological, psychological, sociocultural, and emotional variables lead to MD symptomatology, highlighting the importance of a biopsychosocial framework in understanding symptom development. Future research should extend theoretical knowledge of MD by replicating the current study with other samples of men.

Clinical Implications

To date, there is a dearth of literature addressing treatment techniques for MD (Kanamaya & Pope, 2011). In fact, MD has not yet been incorporated into the DSM-IV-TR (4th ed., text rev; *DSM-IV-TR*; American Psychiatric Association, 2000). However, results from this study indicate that men experience MD symptomatology, such as body dissatisfaction and preoccupation with muscularity, suggesting the importance of clinical prevention and intervention for symptoms of MD. Perhaps most notable in this study is the strong relationship between body dissatisfaction and MD symptomatology, which indicates that many men who experience body dissatisfaction (e.g., negative appraisal of appearance, perceived inadequacies regarding physique) are at increased risk for developing symptoms of MD. Clinicians should identify men who are body dissatisfied and implement interventions aimed at reducing body dissatisfaction and preventing development of additional symptoms of MD (e.g., using anabolic steroids to improve

body satisfaction). Furthermore, when men with high levels of body dissatisfaction are identified, clinicians should inquire about the behavioral effects of body dissatisfaction (e.g., does body dissatisfaction motivate these men to take steroids?). Additionally, because men who perceive pressure from the media to achieve the ideal muscular body and internalize this ideal as something to strive for are at increased for body dissatisfaction and other MD-like behaviors, clinicians should identify these men and implement techniques aimed at reducing the influence and internalization of hypermuscular media ideal. Such intervention efforts may be particularly important in college counseling centers, as the average age of onset for MD occurs during the early college years (i.e., 19-years-old). Thus, reducing body dissatisfaction and challenging acceptance of the muscular ideal with this age group may be particularly useful for preventing later development of MD symptomatology. For example, as has become the norm in outreach programs for college women (e.g., McMillan, Stice, & Rhode, 2011; Neumark-Sztainer, 1996), psychoeducational interventions that facilitate discussion about the unrealistic nature of the media's appearance ideals and promote acceptance of one's own body type may be useful.

Conversely, clinicians should be aware that a honeymoon phase may occur during MD symptom development. Specifically, some men may experience temporary satisfaction with their increased muscularity as they begin engaging in MD-like behaviors. As symptoms endure, however, these men's investment in their muscularity may intensify, potentially contributing to full-blown MD. Thus, it is important that clinicians also recognize that men who present with symptoms of MD may be at

increased risk for the development of the full-blown disorder, even when body dissatisfaction is not present. Efforts aimed at intervention and prevention of subsequent body dissatisfaction and other MD symptoms may be useful for these men to prevent exacerbation of current symptoms or development of additional symptoms.

Professionals should be aware of certain emotional and psychological factors that are associated with MD symptomatology. Specifically, negative affect (e.g., depressive symptoms, interpersonal sensitivity, anxiety) makes men more vulnerable to MD symptom development, especially when body satisfaction is also present. Treating and alleviating negative affect may reduce body dissatisfaction for men, which could ultimately reduce the risk of further MD symptom development. For example, interpersonal process therapies are efficacious with individuals who struggle with EEBI disturbances such as anorexia nervosa, bulimia nervosa, and binge eating disorder (e.g., Tanofsky-Kraff & Wilfley, 2010). Such techniques may facilitate coping with and reducing symptoms of negative affect and body dissatisfaction. Clinicians should also implement techniques (e.g., cognitive behavioral therapy) aimed at coping with and managing anxiety (especially physique-related anxiety) in a wide variety of ways (e.g., deep muscle relaxation, thought records to combat negative attitudes toward one's physique), other than through MD-like behaviors (e.g., excessive exercise and weightlifting). Such intervention efforts should be focused on men with low self-esteem, as well. For example, therapy aimed at improving men's self-worth and self-concept may facilitate body acceptance. In particular, the effectiveness of mindfulness techniques aimed at self-acceptance has been established in treating body image disturbances in

women (Stewart, 2004), and such techniques may also be for increasing men's acceptance of their physiques.

Although findings in the current study were inconsistent, it is possible that socially prescribed perfectionism contributes to MD development through its negative influence on body dissatisfaction. Thus, clinicians should target men who perceive that others' acceptance and approval is contingent on their ability to achieve the perfect body and implement techniques aimed at modifying these distorted beliefs. For example, feminist therapy techniques aimed at empowerment and rejection of sociocultural ideals may help men with socially prescribed perfectionism to reduce their concerns about the demands and expectations of others [particularly regarding their appearance (e.g., Carolan, Bak, Hoppe-Rooney, & Burns-Jager, 2010)].

Limitations

There are several limitations of this study. First, only college men from one large, public university participated, as off campus recruitment was unsuccessful. Thus, it is possible that results may not generalize to other populations (e.g., men from other campuses or non-college men). Future researchers should replicate this study with other populations of men to examine the generalizability of the current findings.

There are also limitations related to the measurement model. Specifically, for four of the latent variables (i.e., self-esteem, negative affect, body dissatisfaction, and MD symptomatology), only two measured variables were included as indicators per latent. However, based on current best practices, it is recommended that researchers include three or more indicators per latent construct to maximize model specification

(Kline, 2005). Thus, future researchers should attempt to replicate the current structural model by including three or more indicators per latent variable.

Additionally, to adequately compare Grieve's modified model to the proposed alternative model, an additional step may be warranted. Specifically, another alternative model that does not include BMI and sports that emphasize muscularity but does include all of the other variables and pathways in Grieve's modified model should be tested to ensure direct comparison to Grieve's modified model. After this step, the alternative model proposed from this study should be tested to determine which of the three is the best fitting model.

Another limitation in this study is related to the use of self-report measures. For example, it is common for individuals to over or under-report symptoms on checklists and screeners, such as the Symptom Checklist-90 Revised (SCL-90-R) and Male Eating Behaviors and Body Image Evaluation (MEBBIE), which may limit validity and reliability of results. Furthermore, due to the sensitive nature of much of the data (e.g., childhood trauma, depression) some participants may have responded in a socially desirable manner (i.e., some respondents may have felt uncomfortable responding truthfully).

Another limitation of this study is related to the use of a nonclinical sample of college men. Specifically, Grieve hypothesized about MD symptom development among men with significant symptoms of the disorder. In samples of college men, however, low prevalence rates of MD in the general population indicate that the number of men with clinical MD in this sample was low as well. Thus, although Grieve's model was not

significant with the current sample, his model may accurately represent MD development among clinical samples. Thus, future researchers should replicate this study using with men who have full-blown MD.

Finally, although the aim of the current study was to understand the development of MD symptomatology, the use of a cross-sectional and correlational design makes it difficult to determine risk factors or infer causation. Although structural equation modeling (SEM) is useful for examining causality, it is a less effective design than longitudinal research. Thus, future researchers should extend the current study by using a prospective design to examine symptom development over time, as well as to identify factors that protect men from developing MD symptomatology. This will also facilitate a better understanding of the possibility of equifinality and multifinality in MD symptom development.

Conclusion

This is the first study to test and compare comprehensive models of MD symptom development in men. Specifically, a modified version of Grieve's (2007) model of MD symptom development was examined and compared to an alternative model with a large sample of college men. Overall, Grieve's (2007) modified model demonstrated poor fit with the data, whereas the alternative model demonstrated better fit to the data. As a result, the alternative model was cross validated with a second sample. The alternative model also fit this data adequately, although the significance of two pathways was not replicated across samples. Overall, the data indicate that, for college men, ideal body internalization, media pressure to achieve this ideal, and body dissatisfaction are central

factors in the development of MD symptoms. Furthermore, negative affect and low self-esteem contribute strongly to MD symptomatology. Additionally, results indicate that perfectionism may also contribute to MD symptom development, although findings were inconsistent across samples. Such inconsistencies suggest that equifinality and multifinality, concepts from developmental psychopathology may explain MD symptom development. That is, a number of different variables and pathways may ultimately contribute to MD symptoms across different individuals, whereas the same variables and pathways may contribute to MD symptomatology in some men but not others. Overall, the current findings strongly support a biopsychosocial conceptualization of MD symptom development and point to specific programs and future research efforts that will aid in prevention and intervention of MD symptomatology among college men.

Table 1
Demographic Information for Sample A (n = 373) and Sample B (n = 373)

Characteristic	Sample A		Sample B	
	<i>N</i>	%	<i>N</i>	%
Age at time of survey				
18	79	21.2	80	21.4
19	89	23.9	85	22.8
20	66	17.7	66	17.7
21	40	10.7	43	11.5
22	30	8.0	28	7.5
23	19	5.1	20	5.4
24	13	0.5	16	4.3
Over 24	36	9.7	33	8.9
Ethnicity of Participants				
African American	54	14.5	54	14.5
Asian American	25	15.0	26	7.0
European American	228	61.1	229	61.4
Latin American	56	0.3	44	11.8
Native American	1	2.1	1	.3
Other	8	99.7	16	4.3
Sexual Orientation				
Straight	345	94.6	343	92.0
Gay/Bisexual	27	5.4	29	7.7
Class Rank				
Freshman	124	33.2	139	37.3
Sophomore	121	32.4	95	25.5
Junior	76	20.4	76	20.4
Senior	47	12.6	59	15.8

Table 2
Descriptive Statistics, Internal Consistencies, and Mean Inter-item Correlations for indicators in Sample A (n = 373)

SAMPLE A							
Variable	# Items	<i>M</i>	<i>SD</i>	α	<i>MIC</i>	<i>Skew</i>	<i>Kurtosis</i>
1. BD-par1	5	2.787	1.07	.83	.58	4.57	.19
2. BD-par2	5	3.115	1.02	.77	.58	3.78	-.57
3. MD-par1	5	2.978	.95	.74	.43	1.66	-1.58
4. MD-par2	5	2.626	.92	.67	.39	3.83	-.46
5. SATAQ-IntGen	4	3.144	1.09	.88	.66	-2.77	-2.82
6. SATAQ IntAth	9	2.626	1.15	.95	.75	1.28	-4.19
7. SATAQ Press	10	2.299	1.10	.93	.71	3.65	-3.31
8. SPP-par1	5	3.481	1.17	.72	.52	1.87	-.77
9. SPP-par2	5	3.623	1.064	.69	.44	1.34	.43
10. SCL Dep	4	57.732	12.77	.90	.48	1.35	-3.77
11. SCL Anx	7	60.410	11.99	.92	.48	-1.01	-2.59
12. SCL IPS	4	61.536	11.59	.88	.48	-.16	-2.50
15. RSES-par1	5	3.351	.54	.82	.79	-5.96	1.02
16. RSES-par2	5	3.073	.64	.81	.76	-5.08	-1.13

(table continues)

Table 2 (continued).

Variable	# Items	<i>M</i>	<i>SD</i>	α	<i>MIC</i>	<i>Skew</i>	<i>Kurtosis</i>	<i>Range</i>
1. BD-par1	5	2.889	1.09	.80	.58	1.68	-2.88	0-5
2. BD-par2	5	3.213	1.09	.81	.63	3.25	-1.49	0-5
3. MD-par1	5	2.986	.95	.72	.41	1.75	-1.19	0-5
4. MD-par2	5	2.613	.86	.66	.38	3.66	-.87	0-5
5. SATAQ-IntGen	4	3.193	1.09	.87	.65	-2.22	-2.85	1-5
6. SATAQ IntAth	9	2.755	1.14	.95	.73	.48	-4.02	1-5
7. SATAQ Press	10	2.323	1.09	.93	.92	3.94	-2.87	1-5
8. SPP-par1	5	3.565	1.01	.66	.45	2.60	.54	1-7
9. SPP-par2	5	3.769	1.05	.65	.45	.25	.79	1-7
10. SCL Dep	4	56.881	11.32	.88	.45	-1.43	-3.78	40-81
11. SCL Anx	7	60.129	12.25	.91	.45	-4.33	-.73	38-81
12. SCL IPS	4	61.001	12.03	.84	.42	-4.75	-.92	40-81
15. RSES-par1	5	3.262	.53	.82	.28	-3.57	-.21	1-4.0
16. RSES-par2	5	2.994	.65	.81	.23	-2.12	-2.07	1-4.0

Note: BD = Body Dissatisfaction Scale; MD = Muscle Dysmorphia Scale; SATAQ-IntGen = Sociocultural Attitudes Toward Appearance Questionnaire Internalization General subscale; SATAQ IntAth = Athletic subscale; SATAQ Press = Pressure subscale; SPP = MPS Socially Prescribed Perfectionism; SCL Anx = SCL-90-R Anxiety scale; SCL Dep = SCL-90-R Depression scale; SCL IPS = SCL-90-R Interpersonal Sensitivity scale; RSES = Rosenberg Self-Esteem Scale.

Table 3
Correlations Between Measured Variables in Sample A (n = 373) and Sample B (n = 373)

Variable	1	2	3	4	5	6	7
1. BD-par1	1	.839**	.519**	.661**	.435**	.475**	.469**
2. BD-par2	.845**	1	.432**	.600**	.358**	.419**	.418**
3. MD-par1	.493**	.453**	1	.692**	.537**	.488**	.424**
4. MD-par2	.637**	.613**	.665**	1	.516**	.524**	.481**
5. SQ-IntGen	.405**	.354**	.511**	.533**	1	.747**	.660**
6. SQ-IntAth	.435**	.360**	.384**	.485**	.750**	1	.777**
7. SQ-Press	.460**	.400**	.368**	.441**	.590**	.757**	1

(table continues)

Table 3 (continued).

Variable	8	9	10	11	12	13	14
8. SPP-par1	1	.720**	.255**	.348**	.353**	-.282**	-.319**
9. SPP-par2	.621**	1	.277**	.345**	.341**	-.208**	-.276**
10. SCL-Anx	.149**	.242**	1	.745**	.671**	-.385**	-.452**
11. SCL-Dep	.160**	.255**	.727**	1	.795**	-.511**	-.594**
12. SCL-IPS	.189**	.257**	.666**	.800**	1	-.484**	-.556**
13. RSES-par1	-.107*	-.042	-.297**	-.463**	-.431**	1	-.810**
14. RSES-par2	-.201**	-.124*	-.411**	-.586**	-.549**	-.792**	1

Note. SPP = MPS Socially Prescribed Perfectionism; SCL Anx = SCL-90-R Anxiety scale; SCL Dep = SCL-90-R Depression scale; SCL IPS = SCL-90-R Interpersonal Sensitivity scale; RSES = Rosenberg Self-Esteem Scale. * = $p < .05$; ** = $p < .01$.

Table 4
Standardized Parameter Estimates for Measurement Models (n = 373 per sample)

Latent Variable	Observed Variable	<u>Sample A</u>		<u>Sample B</u>	
		Factor Loadings	Standard Error	Factor Loadings	Standard Error
Muscle Dysmorphia	MebMD-par1	.766	.014	.741	.030
	MebMD-par2	.904	.019	.898	.025
Body Dissatisfaction	MebBD-par1	.999	.028	.969	.013
	MebBD-par2	.840	.023	.872	.017
Internalization/Media Pressure	SQ-Internalization Gen	.799	.022	.790	.023
	SQ-Internalization Ath	.922	.015	.937	.015
	SQ-Pressure	.844	.019	.804	.022
Socially Prescribed Perfectionism	SPP-par1	.848	.039	.754	.067
	SPP-par2	.803	.039	.810	.070
Negative Affect	SCL-90-R-Anx	.769	.024	.769	.024
	SCL-90-R-Dep	.928	.015	.793	.015
	SCL-90-R-IPS	.847	.020	.848	.018
Self-Esteem	RSES-par1	.859	.020	.789	.027
	RSES-par2	.984	.017	.959	.023

Note. BD = Body Dissatisfaction Scale; MD = Muscle Dysmorphia subscale; SQ-IntGen = Sociocultural Attitudes Toward Appearance Questionnaire Internalization General subscale; SQ IntAth = Internalization Athletic subscale; SQ Press = Pressure subscale; SPP = MPS Socially Prescribed Perfectionism; SCL Anx = SCL-90-R Anxiety scale; SCL Dep = SCL-90-R Depression scale; SCL IPS = SCL-90-R Interpersonal Sensitivity scale; RSES = Rosenberg Self-Esteem Scale.

Table 5
Model Fit for the Structural Models (n = 373 per sample)

Model	df	Satorra-Bentler χ^2	CFI	TLI	SRMR	RMSEA (90% CI)	$\Delta\chi^2$
Sample A							
Grieve's Measurement Model	104	121.804	.983	.975	.031	.051 (.037-.064)	
Alternative Measurement Model	104	140.274	.985	.978	.029	.043 (.030-.055)	
Grieve's Structural Model	93	458.640	.901	.875	.139	.101 (.092-.111)	
Alternative Structural Model	110	217.273	.958	.943	.064	.077 (.065-.088)	241.36**
Sample B							
Alternative Measurement Model	104	201.390	.967	.953	.042	.062 (.051-.073)	
Alternative Structural Model	110	259.244	.942	.922	.072	.087 (.076 - .098)	

Note. df= degrees of freedom; CFI = Comparative Fit Index (> .90 indicates good fit); TLI = Tucker Lewis Index (> .90 indicates good fit); SRMR = Standardized Root Mean Squared Residual (< .08 indicates good fit); RMSEA = Root Mean Square Error of Approximation (90% Confidence Interval; < .06 indicates good fit); $\Delta\chi^2$ = change in chi-square values between the Model A and Model B. ** = $p < .001$.

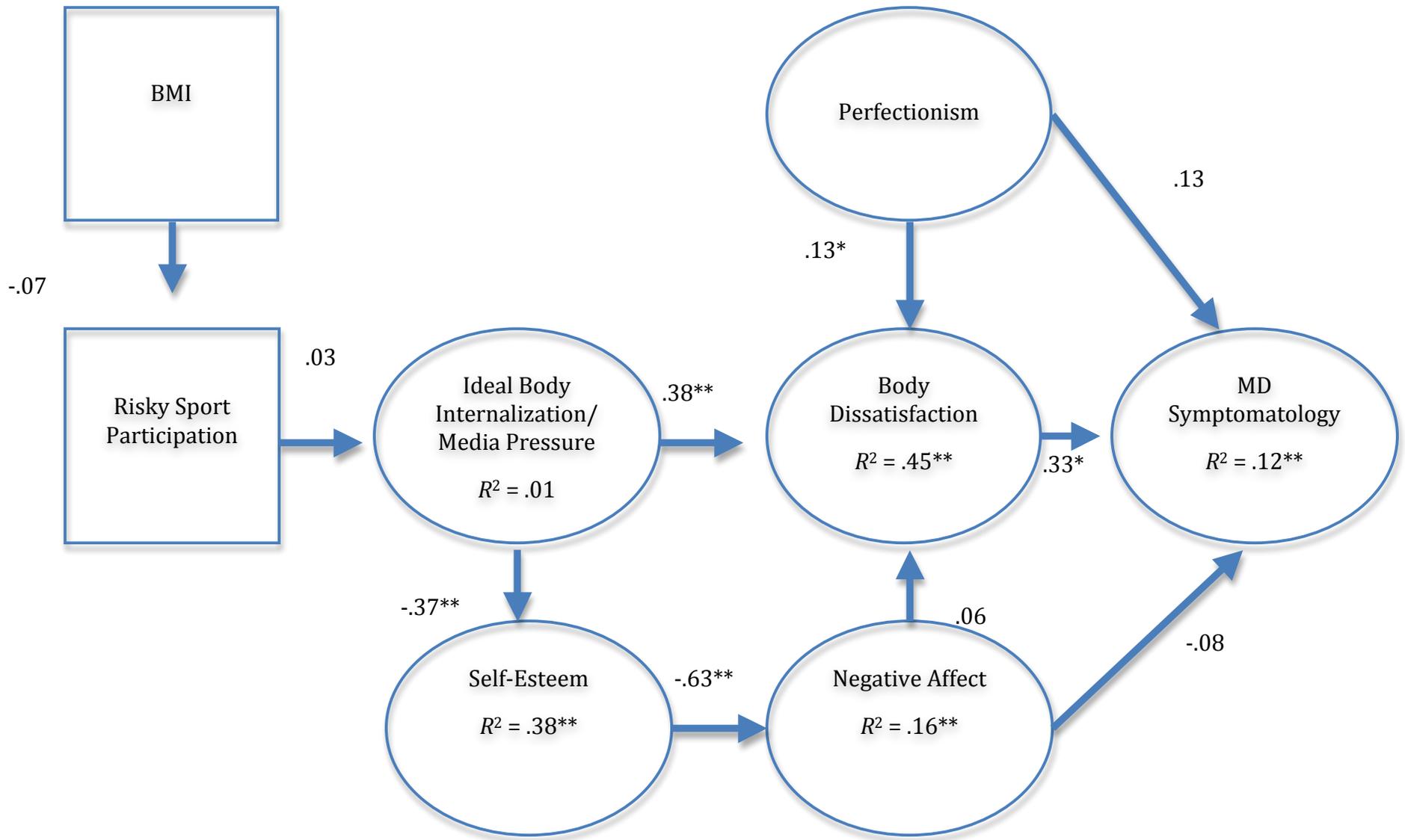


Figure 1. Diagram of Grieve's modified theoretical model with standardized parameter estimates and variance accounted for (R^2).

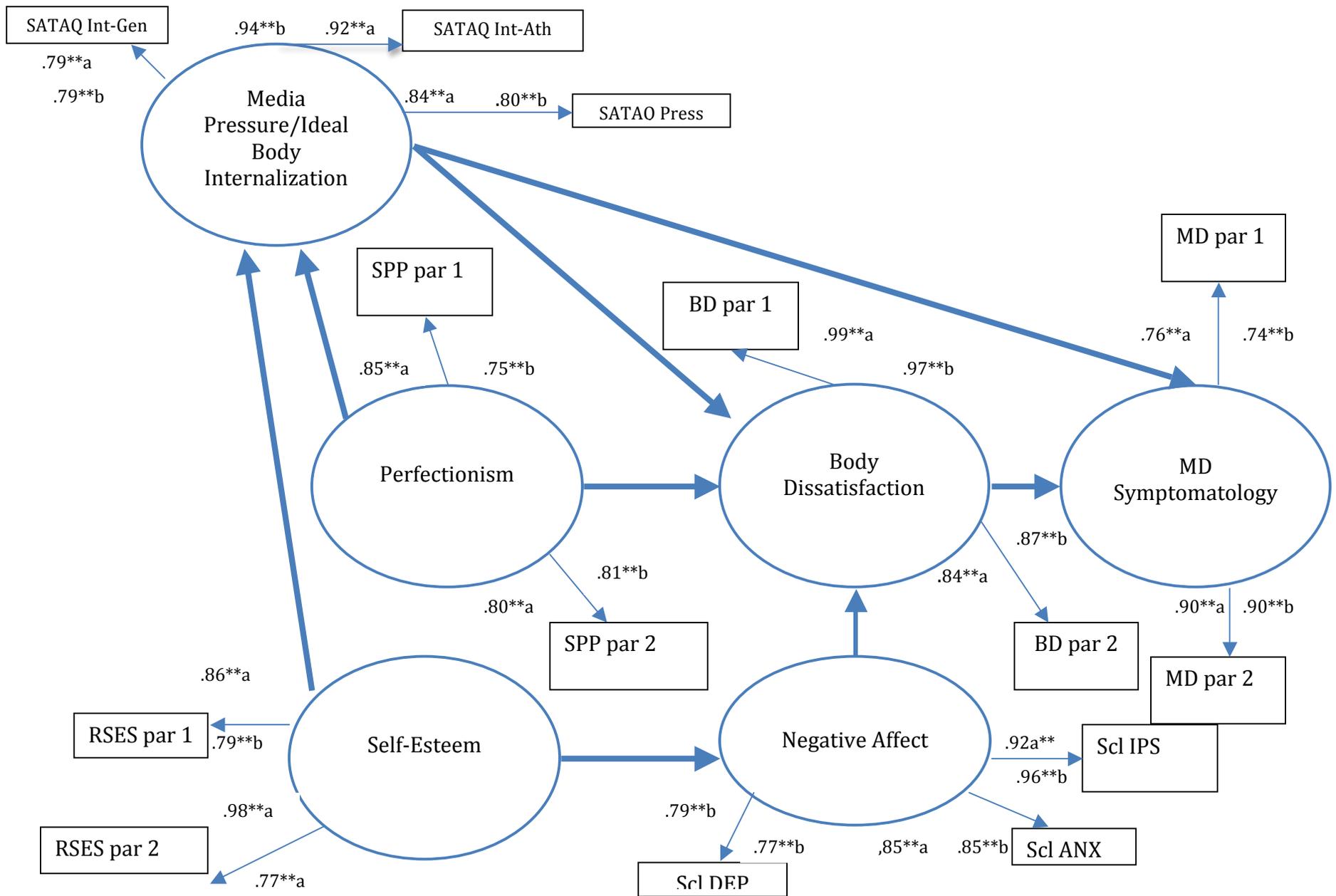


Figure 2. Final measurement model with standardized parameter estimates. a = Sample A. b = Sample B. ** $p < .01$.

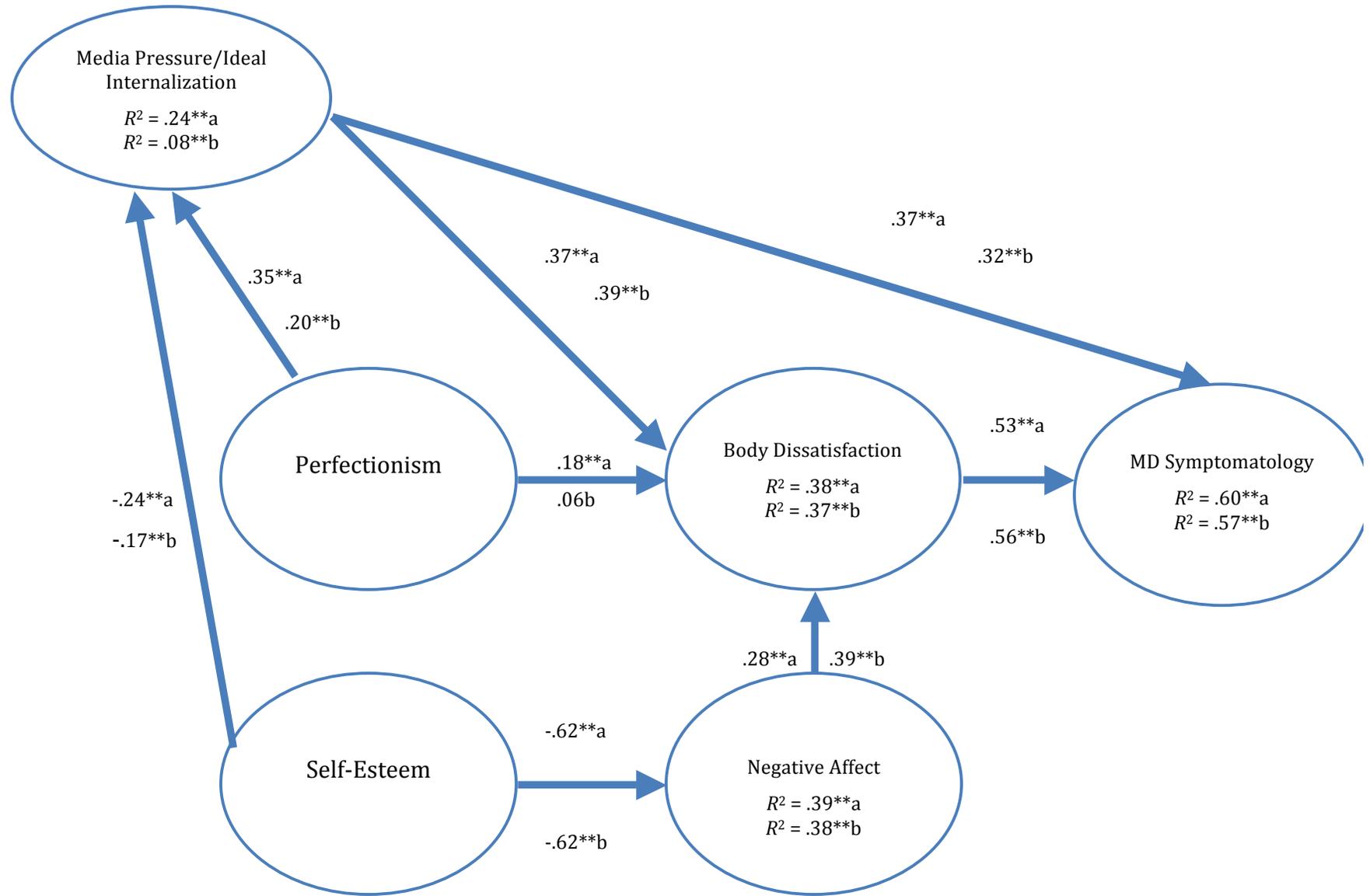


Figure 3. Alternative model with standardized parameter estimates and variance accounted for (R^2). a = sample A. b = Sample B. ** = $p < .01$.

APPENDIX A
DEMOGRAPHIC SURVEY

1. Ethnicity: (1) Asian-American (4) Latin-American
 (2) African-American (Black) (5) Native-American
 (3) European-American (Caucasian) (6) Other

2. Age: (1) 18 (2) 19 (3) 20 (4) 21 (5) 22 (6) 23
 (7) 24 (8) Over 24

3. Class Rank: (1) Freshman (3) Junior
 (2) Sophomore (4) Senior

4. Are you a serious athlete? (i.e., play(ed) for a high school or college team, or train(ed) on your own) (1) Yes (2) No

If yes, what sports or activities are you currently involved in?

- | <u>College</u> | (1) <u>Yes</u> | (2) <u>No</u> | <u>Intramural</u> | (1) <u>Yes</u> | (2) <u>No</u> |
|------------------|--------------------------|--------------------------|-------------------|--------------------------|--------------------------|
| a. football | <input type="checkbox"/> | <input type="checkbox"/> | j. flag football | <input type="checkbox"/> | <input type="checkbox"/> |
| b. basketball | <input type="checkbox"/> | <input type="checkbox"/> | k. golf | <input type="checkbox"/> | <input type="checkbox"/> |
| c. golf | <input type="checkbox"/> | <input type="checkbox"/> | l. water polo | <input type="checkbox"/> | <input type="checkbox"/> |
| d. track | <input type="checkbox"/> | <input type="checkbox"/> | m. tennis | <input type="checkbox"/> | <input type="checkbox"/> |
| e. hockey | <input type="checkbox"/> | <input type="checkbox"/> | n. volleyball | <input type="checkbox"/> | <input type="checkbox"/> |
| f. lacrosse | <input type="checkbox"/> | <input type="checkbox"/> | o. soccer | <input type="checkbox"/> | <input type="checkbox"/> |
| g. cross country | <input type="checkbox"/> | <input type="checkbox"/> | p. basketball | <input type="checkbox"/> | <input type="checkbox"/> |
| h. swimming | <input type="checkbox"/> | <input type="checkbox"/> | q. weightlifting | <input type="checkbox"/> | <input type="checkbox"/> |
| i. diving | <input type="checkbox"/> | <input type="checkbox"/> | r. softball | <input type="checkbox"/> | <input type="checkbox"/> |
| s. martial arts | <input type="checkbox"/> | <input type="checkbox"/> | | | |

t. other (Please describe) (1) _____

5. In an average week, about how many hours do you spend working out? (Please describe) _____

6. What is your current weight? _____

7. How tall are you? Ft. _____ In. _____

8. How certain are you that the number in question 6 is your accurate weight?

(1) Very uncertain (2) Somewhat uncertain (3) Somewhat certain (4) Very certain

9. How certain are you that the number in question 7 is your accurate height?

(1) Very uncertain (2) Somewhat uncertain (3) Somewhat certain (4) Very certain

10. What was the most you have ever weighed? _____

11. What was the least you have weighed as an adult? _____

12. What do you think is your ideal weight? _____

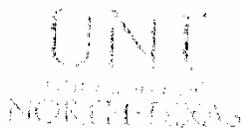
13. How many hours of television do you watch per day?

Less than 2 2 to 4 4 to 6 7 or more

14. How would you classify your sexual orientation?

(1) Straight/heterosexual (2) Gay/homosexual (3) Bisexual

APPENDIX B
IRB APPROVAL LETTER



February 1, 2010

Elissa Woodruff
Department of Psychology
University of North Texas

RE: Human Subjects Application No. 09001

Dear Ms. Woodruff:

The UNT Institutional Review Board has reviewed and approved the extension you requested to your project titled "The Development of Symptoms of Muscle Dysmorphia: An Examination of Mediating and Moderating Variables." Your extension period is for one year, **January 30, 2010 through January 29, 2011. Federal policy 45 CFR 46.109(e) stipulates that IRB approval is for one year only.**

Enclosed is your consent document with stamped IRB approval. Please copy and **use this form only** for your study subjects.

The UNT IRB must re-review this project prior to any modifications you make in the approved project. It is your responsibility according to U.S. Department of Health and Human Services regulations to submit annual and terminal progress reports to the IRB for this project. Please mark your calendar accordingly.

Please contact Shelia Bourns, Research Compliance Administrator, ext. 3940 or Boyd Hemdon, Director of Research Compliance, ext. 3941 if you need additional information.

Sincerely,

Debbie Rohwer, Ph.D.
Associate Professor
Faculty Member
Institutional Review Board

DR/sh

CC: Dr. Patricia Kaminski

APPENDIX C
RECRUITMENT FLYER

Male Research Participants Needed!

- **WHAT:** Make **\$10** in an hour for filling out questionnaires about body image in adult men
- **WHO:** Males 18 years old or older
- Call xxx-xxx-xxxx or email
- untbodyimage@yahoo.com

APPENDIX D
DEBRIEFING STATEMENT

Dear Research Participant:

Thank you for participating in our study. Our goal was to collect data to understand the psychological and social factors that contribute to disturbed eating and body image in adult males. The majority of research about eating and body image disturbances addresses females only, and the research from this study will facilitate a better understanding of these problems among men.

We hope that taking this questionnaire was not stressful for you. Nevertheless taking a questionnaire can cause stress and tension about life problems. If you have any questions about eating and/or body image disturbance, please let the researcher know right now. We can help you get an appointment with a mental health professional. If you have any questions after you leave today or would like help at a later date, call Dr. Trish Kaminski at (940-565-2671).

The following is a list of names and phone numbers of help lines and agencies that offer counseling and other services to help men with problems they might have dealing with eating and/or body image disturbances.

Counseling and Testing Services (UNT, Denton) – offers personal counseling services on campus to all students at no charge [940-565-2741].

National Alliance for The Mentally Ill – offers one on one conversation with someone who can help answer your questions, and is toll free [1-800-950-NAMI].

Massachusetts Eating Disorder Association, Inc. (www.medainc.org) Help line – staffed by trained/supervised individuals that can help you with your questions [617-558-1881].

National Eating Disorders Association (www.nationaleatingdisorders.org) – provides resources, education, and support to individuals affected by eating and body image disturbances [1-800-931-2237]

Psychology Clinic (UNT, Denton) – individual assessment and therapy with fees set according to income level [940-565-2631].

The results of our study will be available to you in the future. If you would like a copy of our results, please give us your address now or contact us at a later date. You may keep this sheet for your records.

Sincerely,

Trish Kaminski, PhD
Associate Professor of Psychology

Elissa Woodruff
Graduate student

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