IN VariANCE, CONVERGENT AND DISCRIMINANT VALIDITY ACROSS OCCASIONS FOR THE MALE BODY IMAGE DISTURBANCE SCALE

By

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The Male Body Image Disturbance Scale (MBIDS) is a multidimensional questionnaire to assess the symptoms associated with body image issues in men (Freson, 2011). The initial research developed a 25-item, five-factor questionnaire, where the five factors were Body Dissatisfaction (BDIS), Drive for Muscularity (DMUS), Drive for Leanness (DL), Obsessive Exercise Pattern (OEP), and Interference with Life Functions and Responsibilities (ILFR). The purpose of this study was to evaluate the invariance of the five-factor model along with the convergent and discriminant validity of the five-factors across the one-month interval. A random sample of men \((n = 626 \text{ at time one and } 308 \text{ at time 2})\) from the general population was used for these analyses. The sample was recruited with the assistance of Qualtrics, a company that specializes in online panel aggregation. The first two analyses applied an \textit{a priori} five-factor exploratory factor analysis to the time one and time two data (two separate analyses) for identification of any weak items (e.g., items with high cross-loadings). A total of 22 of the 25 items showed good convergent and discriminant validity. A series of confirmatory factor analyses were then used to evaluate the invariance of the scores on the 22-item MBIDS across the one-month interval (i.e., (1) invariance of form with correlated residuals between the same items across time; (2) invariance of like-item loadings; (3) invariance of like-item intercepts; (4)
invariance of like-item residuals; (5) invariance of like-factor variances; (6) invariance of like-factor covariances; and (7) and invariance of like-factor means) as well as the convergent and discriminant validity of the five-factors across the interval. The results provided strong support for the invariance of like item-loadings, like-item intercepts, like-item residuals, like-factor variances, like-factor covariances, and like-factor means. In the addition, the five-factors showed convergent validity (like factor correlations across the interval were significant and substantial) as well as discriminant validity (like factors correlated significantly stronger across the interval than different factors across the interval). The resulting MBIDS is a brief 22-item questionnaire with good construct validity for the assessment of male body image disturbance.
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CHAPTER 1
INTRODUCTION

Research and treatment for eating disorders and body image issues have historically focused on women. It was thought that body image issues were gendered and that men rarely struggled with how they looked. While researchers have examined body image disturbance in men for over the last 25 years, the false perception continues to be that women are the primary group who experience symptoms associated with eating disorders (Bordo, 2000; Cohane & Pope Jr, 2001; Glassner, 1995; Klein, 1993; Mishkind, Rodin, Silberstein, & Striegel-Moore, 1986).

Eating Disorder Prevalence Rates

Eating disorders and body image issues are a complex interaction of multiple factors that influence affective, cognitive, and behavioral disturbances. The prevalence of problematic eating and exercise behaviors reported in medical and mental health facilities have continued to increase in the United States over the last few decades. Early community-based epidemiological studies have reported that for every 10 females diagnosed with an eating disorder there is one male diagnosed (Andersen, 1995). This was supported by further research by Andersen in 1997, where he extrapolated from his data that approximately 10 million females and 1 million males struggling with Anorexia Nervosa (AN) and Bulimia Nervosa (BN) in the United States (Andersen & Holman, 1997). In early studies it was unclear why the prevalence rates significantly greater for women. Researchers proposed that men with eating disorders were less likely to seek professional help which in turn caused prevalence rates to be lower than the actual numbers (Andersen, 1992; Olivardia & Pope Jr., 1995). A study in 2007 utilized face-to-face household surveys in a national data collection (n=9,298) and reported lifetime prevalence of
AN, BN, and Binge Eating Disorder (BED) at 0.9%, 1.5%, and 3.5% respectively for women and 0.3%, 0.5%, and 2% respectively for men (Hudson, Hiripi, Pope, & Kessler, 2007).

**Potential Reasons for Lower Prevalence Rates in the Male Population**

There are numerous explanations for reduced diagnosis in the male population. First, there may be an under diagnosis of AN and BN by health care providers due to pervasive thought that eating disorders are primarily a women’s issue. Researchers frequently use body image constructs specific to women that do not fit for how men are socialized around their bodies (e.g., men feel pressured to be both lean and muscular). Second, this false perception may also drive men to be more secretive about their struggles with body image issues and question their masculinity. This shame may reduce the number of men who reach out for help in dealing with eating disorders, thus reducing their chances for recovery. Third, there is a lack of multifactor questionnaires assessing issues across the continuum of eating disorder and body image issues using language specific to men. If men are unwilling to seek help, a multifactor factor questionnaire assessing specific areas around body image disturbance could be used to better understand affective, cognitive, and behavioral issues for men.

**Body Dysmorphic Disorder, Muscle Dysmorphia Type**

In Western culture there is a strong correlation between muscularity, muscle belittlement, self-esteem depression and symptoms of eating disorders (Olivardia, Pope, Borowiecki, & Cohane, 2004). Researchers have begun examining issues related to men’s body image in order to understand the prevalence rate for the male population, to improve the accuracy in clinical diagnosis, and to improve the effectiveness of psychotherapy.

Body Dysmorphic Disorder, With Muscle Dysmorphia (BDD-MD) is a newly recognized form of body image disturbance primarily found in men (Olivardia, 2001; Olivardia, Pope, &
Hudson, 2000; Pope, Gruber, Choi, Olivardia, & Phillips, 1997; Pope, Pope, Menard, Fay, Olivardia, & Phillips, 2005). It is characterized by an intense fear of getting smaller even though an individual may be already very muscular or defined. There is an unrealistic view of body size that causes feelings of inadequacy along with social and occupational dysfunction. Some individuals who are muscle dysmorphic may feel very uncomfortable in situations where their body is exposed to others. There is an extreme preoccupation with body weight and size that frequently leads to excessive and compulsive exercise, particularly weight lifting. Diet control is another characteristic of BDD-MD. Numerous hours are spent in planning and preparation of food.

There are numerous physical and psychological consequences of BDD-MD. Individuals who are struggling with BDD-MD knowingly make choices that place themselves at risk such as dietary choices, abuse of resistive exercise, and use of performance enhancing supplements (Cafri, Thompson, Ricciardelli, McCabe, Smolak & Yesalis, 2005; Middleman, Vasquez, & Durant, 1998; O’Dea & Rawstorne, 2001). As individuals become more anxious about their body size and shape, they will frequently use some type of performance enhancing supplement like ephedrine, muah haung, creatine, and L-argenine. In addition, potentially hazardous performance-enhancing substances, such as anabolic steroids, may also be utilized to increase muscle mass regardless of physiological consequences. Studies have analyzed anabolic steroid use for men in high school and college. These studies reported between 2%-11% of the male participants had used or were currently using steroids at the time of the studies (Johnson Jay, Shoup, & Rickert, 1991; O’Dea and Rawstorne, 2001; Pope, Katz and Champoux, 1988; Scott, Wagner, & Barlow, 1996)
Performance enhancing supplements such as anabolic steroids and ephedrine can lead to short-term and long-term medical issues. Short-term issues include acne, breast enlargement, impotence, testicular shrinkage, and hair loss. Long-term issues include reduction of high density lipoproteins (HDL), athrosclerotic plague formation in the vessel walls, increased risk of prostate cancer, liver damage, and increased potential for brain cancer (Clark & Henderson, 2003; Kouri, Pope, & Oliva, 1996; Pope & Katz, 1988; Pope, Katx, & Champoux, 1988). Men struggling with BDD-MD are more likely to continue with these performance-enhancing supplements even when they are aware of the physiological and psychological side effects. This is one reason why early identification and treatment of body image issues will reduce early morbidity and mortality for men with body image disturbance.

**Help-Seeking Behavior**

Men with body image issues may also be less likely to seek professional help and are probably underrepresented in the prevalence statistics (Andersen, 1992; Olivardia & Pope Jr., 1995). There are significant differences between men and women related to help-seeking attitudes and behaviors (Addis & Mahalik, 2003; Howerton et al., 2007; Judd, Komiti, & Jackson, 2008; Mackenzie, Gekoski, & Knox, 2006). Men hold more negative attitudes toward seeking help from health care providers and are less likely to receive assistance. Men across cultures are also more reluctant to access mental health services (Bourne, 2009; Judd et al., 2008; Mackenzie et al., 2006; Mahalik, Englar-Carlson, & Good, 2003; Mansfield, Syzdek, Green, & Addis, 2008; Möller-Leimkühler, 2003). In a Canadian/United States population based study, negative attitudes toward seeking help were highly correlated low socioeconomic status, younger age, single, and lower education level (Jagdeo, Cox, Stein, & Sareen, 2009).
O’Dea and Abraham reported that 20% of the college men in their study (n=93) displayed eating attitudes and behaviors related to eating disorders (O'Dea & Abraham, 2002). Men in their study had significant worries about their weight and shape, regularly using restrictive eating behaviors. While some of these men believed they had problems with disordered eating, weight control, and binge eating, none had sought treatment for his problem (O'Dea & Abraham, 2002).

Socialization of men may lead them to be less likely to discuss body image concerns. Higher levels of gender role conflict and traditional masculinity ideology have been associated with negative attitudes toward psychological help seeking (Berger, Levant, McMillan, Kelleher, & Sellers, 2005). If men do seek medical assistance, this could be due to secondary issues such as over-use injuries or for dietary counseling from a registered dietician.

Gender role programming and the perception of masculinity can affect the presentation of symptoms/concerns, resources available, and whether men access resources (Levant et al., 1992; Levant, Wimer, Williams, Smalley, & Noronha, 2009; Robertson & Fitzgerald, 1992). Socially influenced attitudes of stoicism and stigma associated with mental health issues have been found to be significantly different between men and women that could limit help-seeking behaviors. Men have reported more stoicism and feeling of being discredited when they access psychological health care (Judd et al., 2008).

Ascribing to traditional masculine norms not only impact health behaviors and psychological issues but also reduces the potential that men will seek help. Traditional masculine scripts have been reported to serve as a barrier to seeking psychological assistance (Mahalik et al., 2003). Men who scored higher on the scales assessing traditional masculinity had significantly increased negative attitudes toward seeking psychological help, suggesting that men who conform to masculine norms have fewer positive attitudes about seeking professional
psychological help (Levant et al., 2009). Studies also examining restricted emotionality reported a strong correlation with decreased psychological health and increased in negative attitudes toward help seeking (Blazina & Watkins Jr, 1996). In a study with 445 college male students (age range=17 to 68 years, M=21.6 years, SD.=6.7, 75.5% Caucasian) masculine attitudes toward success, power, competition, restrictive emotionality, aggressiveness, dominance, and worldliness were negative correlated help-seeking behavior (Robertson & Fitzgerald, 1992).

If men do seek help, their interaction with physicians and psychologists are more passive, where men are less likely to engage in the treatment process (Addis & Mahalik, 2003; Benbassat, Pilpel, & Tidhar, 1998; Gabbard-Alley, 1995; Galdas, Cheater, & Marshall, 2005). Furthermore, socioculturally determined stereotypes (e.g., males do not developed eating disorders) may result in diagnoses being ignored or incorrectly identified when men are seen by health care professionals (Andersen, 1992).

**Questionnaires for Body Image Issues in Men**

In early research examining eating disorder and body image disturbance, questionnaires were developed for females using factor structures and language specific to how women discuss their bodies, food and exercise. These scales often focused on adiposity, body dissatisfaction and a desire to be thin. Stunkard, Sorenson, and Schulsinger (1983) designed some of the earliest adiposity based silhouette measures giving ranges from thin to obese. General measures of body dissatisfaction were developed and include the Body Esteem Scale (Franzoi & Shields, 1984), Body Consciousness Questionnaire (Miller, Murphy, & Buss, 1981), Body Shape Questionnaire (Cooper, Taylor, Cooper, & Fairburn, 1987), Body Image Avoidance Questionnaire (Rosen, Srebnik, Saltzberg, & Wendt, 1991), and the Objectified Consciousness Scale (McKinley & Hyde, 1996). Scales developed to evaluate attitudes about food and self reported disordered
eating behaviors include the Dutch Restrained Eating Scale (Van Strien, Frijters, Staveren, Defares, & Deurenberg, 1986) and the Eating Attitudes Test-26 (Garner, Olmsted, Bohr, & Garfinkel, 1982). These scales were initially developed using the female population and at some later time utilized for assessing the male population. In addition, each of these scales focus only on one aspect of a more complex relationship of symptoms related to body image disturbance.

The Somatomorphic Matrix was later developed for men to assess both levels of leanness and muscularity (Gruber, Pope Jr, Borowiecki, & Cohane, 1999). Individuals can adjust computer contour images through 10 levels of muscularity and 10 levels of fat. Muscularity-oriented body concerns have also been assessed using scales such as the Drive for Muscularity Scale (McCreary & Sasse, 2000), Swansea Muscularity Attitudes Questionnaire (Edwards & Launder, 2000), and the Drive for Muscularity Attitudes Questionnaire (Morrison, Morrison, & Hopkins, 2003). These scales were specifically developed for men but only assess a narrow range of issues related to body image and eating disorders.

The Eating Disorder Inventory (EDI) was the first scale developed to evaluate multiple facets of eating disorders including the Drive for Thinness, Bulimia, Body Dissatisfaction, Ineffectiveness, Perfectionism, Interpersonal Distrust, Interceptive Awareness, and Maturity Fears (Garner, Olmstead, & Polivy, 1983; Stanford & Lemberg, 2012). This self-report measure focused on symptoms frequently related to women struggling with AN or BN. The Eating Disorders Diagnostic Scale is a newer multi factor questionnaire, but it only assesses symptoms for AN, BN, and BED in girls and women (Stice, Fisher, & Martinez, 2004).

Currently there are only a few scales developed specifically to evaluate the continuum of body image issues in the male population. These scales, however, primarily focus on only one area of interest such as adiposity, body dissatisfaction, or drive for muscularity (Cafri &
Thompson, 2004; Cafri & Thompson, 2007). Little work has been done to create a multidimensional questionnaire to assess the continuum of symptoms associated with AN, BN, and MD for men.

**Common Issues for Body Image Disturbance in Men**

To create a multidimensional questionnaire for men it is essential to understand some of the common themes seen in AN, BN, BED, Body Dysmorphic Disorder (BDD), and BDD-MD. Lower prevalence rates for eating disorders in the male population could be due to inadequacies in diagnostic criteria; therefore, it is important to identify the cognitive, affective, and behavioral factors on the continuum body image disturbance in the male population.

**Body Dissatisfaction**

Body dissatisfaction is strongly correlated with diagnosed eating disorders in both men and women and should be a cornerstone of any multidimensional questionnaire (Andersen, 1992, 1993, 1995; Olivardia & Pope Jr., 1995). Thoughts of dissatisfaction can be intrusive, causing marked anxiety or distress due to dissatisfaction with one’s body. Such thoughts have been reported to impair social and occupational function (Olivardia, 2001; Pope Jr., Gruber, Choi, Olivardia, & Phillips, 1997).

Individuals with AN, BN, and BDD-MD may report having intrusive appearance related thoughts for several hours a day about overall body size, body build, and/or musculature (Buhlmann & Wilhelm, 2004; Olivardia, 2001). Men have reported obsessional preoccupation with appearance, unrealistic views about body size, and compulsive behaviors such as mirror checking (Olivardia & Pope Jr., 1995; Olivardia, Pope Jr., Borowiecki III, & Cohane, 2004; Pope Jr. et al., 1997). This dissatisfaction can be specific to events or locations. For examples,
men may feel powerful and content while working out, but then have significant doubts about their size and definition outside of workout periods.

Socialization and gender role conformity play a significant role in body dissatisfaction with men. Conformity to traditional masculine norms can impact how content men are with their bodies. Several subscales in the Conformity to Masculine Norms Inventory (CMNI) are positively correlated with Masculine Body Ideal Distress Scale, a scale assessing body dissatisfaction. Specifically researchers found that CMNI subscales Winning, Playboy, Primacy of Work, Disdain for Homosexuals, and Pursuit of Status were all positively correlated with body dissatisfaction (Kimmel & Mahalik, 2004). Suggesting that as men ascribe more to perceived gender roles they endorse more body dissatisfaction.

**Body Dysmorphia**

Body dysmorphia is defined as an inaccurate view of one’s own body that causes significant anxiety and discomfort. Individuals with AN and BDD-MD view themselves as either too small, fat, or not muscular enough, which then drives unhealthy eating and exercise practices to correct the perceived imperfections. Distorted body perceptions have also been reported in men with disordered eating patterns where they thought they were twice as fat as their actual size (Mangweth et al., 2004). Body dysmorphia has been correlated with low self-esteem, depression, anxiety, and obsessive-compulsive symptoms (Bohne et al., 2002; Buhlmann, Teachman, Gerbershagen, Kikul, & Rief, 2008; Buhlmann, Teachman, Naumann, Fehlinger, & Rief, 2009).

**Drive for Muscularity**

Society has constructed an image of men, where muscularity, larger body size, lean waist, and dominance are critical components of masculinity (Katz, 2003, 2006; Luciano, 2007;
McCreary, Hildebrandt, Heinberg, Boroughs, & Thompson, 2007). Men diagnosed with BDD-MD have been shown to be pathologically preoccupied with muscularity (Pope Jr. et al., 1997; Pope Jr. & Katz, 1994). From a sociocultural perspective, muscular bodies are deemed worthy and powerful (Moller, 2007; Nobis & Sandén, 2008). Within theories about masculine identity development (e.g., Hegemonic Masculinity, Agonic Power) the muscular body creates the perception of power over others, thus elevating more muscular men in the hierarchy.

Men ascribing to more traditional masculine ideals have reported greater drive for muscularity (McCreary, Saucier, & Courtenay, 2005). Men both intentionally and unintentionally use body size to communicate strength, power, status, and separateness from others (Katz, 2003). A feeling that one does not conform to perceived roles assigned to men may stimulate a greater drive for muscularity. Conflict around societal expectations related to success, power, and feelings of competitiveness have been correlated with this conflict (McCreary et al., 2005). Complex ways to negotiate perceived societal expectations have been developed by men. They may perceive that there are social benefits for men with muscular bodies where a muscular body enables them to intimidate and allows for conformity to societal norms (Morrison et al., 2003). These perceptions could then drive behaviors to increase muscularity.

In a study with 200 heterosexual men (mean age=27.0 years, S.D.=6.5), they generally wanted to be leaner (50%), more muscular (83%), have a fuller head of hair, have less hair on their back and buttocks (62%), be taller (48%), and have a larger penis (62%) (Tiggemann, Martins, & Churchett, 2008). Although all body parts are moderately important to self-perceptions of physical attractiveness, muscularity appeared to the most important aspect for attractiveness (Ridgeway & Tylka, 2005; Tiggemann et al., 2008). Researchers are also beginning to see an increase in anabolic-androgenic steroid dependence in the male population.
which could be tied to this increased desire to be more muscular (Kanayama, Brower, Wood, Hudson, & Pope Jr, 2009).

Researchers propose that men’s increase drive for muscularity could be a defensive reactions to feelings of gender role non conformity (Pope Jr & Olivardia, 1999). Men ascribing to more “traditional masculine ideals” have reported greater body dissatisfaction and drive for muscularity (Kimmel & Mahalik, 2004; McCreary et al., 2005). Furthermore, men who do not feel they conform to perceived gender role norms (discrepancy strain) also reported greater body dissatisfaction and unhealthy eating/exercise behaviors (Berger et al., 2005; Strong, Singh, & Randall, 2000; Strong, Williamson, Netemeyer, & Geer, 2000).

**Drive for Leanness**

Thinness is a major component of AN and is thought to be a gender-specific quality for attractiveness. However, a leaner and more muscularly define physique also fits with the traditional masculine body size ideal (McCabe & Ricciardelli, 2004; Mussap, 2008; Olivardia et al., 2004). A growing body of research shows that men not only want to have increased muscularity, they would also like to be lean with “shrink wrap skin”. College men have chosen ideal body sizes for themselves with 25 pounds more muscle and 8 pounds less body fat (Olivardia et al., 2004). They also thought that women wanted them to be more muscular and less fat than what women actually viewed as an attractive body composition. An increased drive for leanness can be associated with excessive concern around dieting, endurance exercise and reduced body fat. Furthermore, the drive for leanness has also been linked with greater body dissatisfaction in a male college population (Drewnowski & Yee, 1987).
**Obsessive Exercise Patterns**

Men have reported that exercise was important for weight loss, increased muscularity, and maintenance of wellbeing. Exercise is a primary factor in weight control for AN, BN, and BDD-MD. O’Dea and Abraham (2002) reported that 48% of the college males surveyed stated that exercise was important for self-esteem and that 34% were distressed when they were not able to exercise. For males exercise behaviors have been found to be a strong negative predictor of body dissatisfaction (Hausenblas & Fallon, 2002). Furthermore, men who have higher anxiety about their physique are more likely to exercise for self-presentation rather than for health and fitness purposes (Grieve, Jackson, Reece, Marklin, & Delaney, 2008).

Exercise patterns can become severe enough to cause marked distress and significant psychosocial impairment, which is associated with a more pathological level of body image disturbance seen in AN and BDD-MD. In some cases, individuals may have a sense of mounting anxiety or guilt if they are unable to exercise. They could have some insight, recognizing that the exercise program was excessive but may be unclear as to the boundary between healthy and compulsive exercise behaviors.

**Interference with Life Functions**

Individuals who struggle with eating disorders and body image disturbance may also have an interruption of important social, occupational, and/or recreational activities. With body image issues there can be significant impairment in daily life activities due to strict weightlifting/exercise program and avoidance of social situations due to body dissatisfaction (Davey & Bishop, 2006; Pope et al., 2005). For some men the rigidity around exercise behaviors can severely interfere with normal routines. Men have reported spending extended hours lifting
weights, planning meals, and evaluating their body size thus interfering with life functions (Olivardia, 2001; Pope Jr. et al., 1997).

**Social Avoidance**

Persistent fears about judgment around body shape and size can cause individuals to avoid social or performance situations. Some individuals will avoid situations in which their body may be exposed to others, or endure intense anxiety to garner complements from others as an external positive reward. For individuals who are dissatisfied with their body size there can be a great deal of anxiety and hypersensitivity to criticism (Davison & McCabe, 2005; Grieve et al., 2008). This fear of negative evaluation has been reported to cause avoidance of social situation and sexual functioning for men and women (Crawford & Eklund, 1994; Davison & McCabe, 2005; Eklund & Crawford, 1994).

**Age and Body Image Disturbance**

Age plays a significant role in how men perceive their bodies, allow media to impact their thoughts about self, and engage in weight changing behaviors. Although there is limited research in this area, it is fair to assume that age will impact how men answer questions about eating disorders and body image disturbance. The paper will now examine the relationship of age and body image.

From a young age children are aware of their bodies and how they fit with perceived gender roles dictated by society (Fisher, Dunn, & Thompson, 2002). Adolescence and young adulthood seem to be the periods of development where males more strongly ascribe to gender-differentiated scripts. During adolescence and young adulthood males reported greater levels of body dissatisfaction, drive for muscularity, and drive for leanness, which potentially stimulates unhealthy eating and exercise practices. Young adulthood has been labeled as the period from
18 to 25 years of age and adulthood as ages greater than 25 years (Arnett, 2000; Cohen, Kasen, Chen, Hartmark, & Gordon, 2003). The transition from adolescence to young adulthood is a distinct period of time which includes changes in status, friendships, school attendance/training, leaving the parental home, financial issues, romantic relationships, marriage, and family formation (Arnett, 2000; Cohen et al., 2003; Roberts, Caspi, & Moffitt, 2003; Roisman, Masten, Coatsworth, & Tellegen, 2004). Higher risk behaviors, such as unprotected sex, multiple sex partners, and substance abuse, are also seen during this period of time and have been attributed to feeling overwhelmed and feeling a mismatch with peer group (Capaldi, Stoolmiller, Clark, & Owen, 2002; Schulenberg & Maggs, 2002). College men who experience gender role conflict around expressing emotions or balancing relationship are more likely to experience body shame (Thompkins & Rando, 2003).

The body (physical self) continues to develop and interact with other aspects of masculine identity (Kimmel & Mahalik, 2004). Most of the studies examining body image issues in this age group for men have been done in young adults because of the convenience in sampling. Younger adult men have reported greater dissatisfaction even though they have lower body mass index (Peat, Peyerl, Ferraro, & Butler, 2011). Green and Pritchard (2003) reported that age has been reported to be a significant predictor of body dissatisfaction for men. In a study with 454 university students (males=231, females=223) completed the Body Shape Questionnaire (BSQ) and the Eating Attitudes Test-26 (EAT-26) (Forney & Ward, 2013). Forney and Ward (2013) reported a strong correlation between body dissatisfaction and disordered eating patterns among college males and females.

Studies examining body dissatisfaction and body size preference in a college age population reported this dual desire to gain muscle mass and reduce adipose tissue. In a study
with 47 undergraduate males (mean age=19.0 years, SD=.86) at Yale, the participants reported exercising to be both thinner and more muscular (Silberstein, Striegel-Moore, Timko, & Rodin, 1988). These results were supported by numerous studies where men generally wanted to be leaner and more muscular (Olivardia et al., 2004; Tiggemann et al., 2008).

As men move into adulthood it appears that they become less concerned with outward presentation of the body for power/dominance and more interested in long-term health issues. There are few studies that examine body image issues across ages in adulthood. A study with 45 men and 94 women, ranging in age from 19 to 68 years (mean age = 42 years, SD = 11.65 years), reported self-esteem and family influence, but not media influence, were strong predictors of body dissatisfaction as individuals get older (Green & Pritchard, 2003). In a study of men and women in the UK between the ages of 35-55 years of age, both sexes reported skepticism about being able to lose weight without considerable personal sacrifice (Ziebland, Robertson, Jay, & Neil, 2002). Most of the respondents associated the need for weight loss with diseases (e.g., coronary heart disease, diabetes, and cancer) and not with body satisfaction.

The strategies for weight and shape management also change across age groups and could impact how men respond to items in the MBID. In a study with 3,720 undergraduate students (46% men, mean age = 18, SD = 0.37), 4-6% of men endorsed behaviors associated with BN and 31-34% of the men in the sample endorsed dietary restriction and overeating (Cain, Epler, Steinley, & Sher, 2012). A study using epidemiological data reported lower rates of symptoms associated BN where 5.1% of college females and 0.4% of college males engaged in binge eating (Keel, Heatherton, Dorfer, Joiner, & Zalta, 2006). In addition, 9.3% of college women and 2.2% of college men engaged in compensatory behavior like purging and fasting
(Keel et al., 2006). Within this college sample 67.6% and 31.3% respectively showed symptoms of body dissatisfaction (Keel et al., 2006).

As mentioned earlier, men use exercise for weight loss, increased musculature, and maintenance of well-being. Tiggemann and Williamson (2000) examined motivation for exercise in both young and mature adults. There were 252 participants in this study between the ages of 16 and 60 years. Four groups were created: young men (n=48, mean age=18.4 years, SD=1.8), young women (n=70, mean age=18.4 years, SD=1.8), mature men (n=61, mean age=36.5 years, SD=11.9), and mature women (n=73, mean age=33.6 years, SD=9.9). Younger men and women indicated they exercised more for attractiveness and enjoyment than mature men and women (Tiggemann & Williamson, 2000). Women scored higher in body dissatisfaction, but younger men and women score lower in self-esteem, which could play a significant role in motivation around exercise (Tiggemann & Williamson, 2000).

Young adults have reported using performance-enhancing supplements for weight and shape management. In a study with college-age male NCAA Division 1 athletes (n=56) and non-athletes (n=43), 37% of the men disclosed using legal supplements at some point in their life (Dodge, Litt, Seitchik, & Bennett, 2008). Approximately 18% of athletes and 21% on non-athletes indicated they were taking legal performance enhancing supplements at the time of the study (Dodge et al., 2008). Very few studies have examined performance enhancing supplement use in adult men. One study assessed anabolic steroid (AAS) users’ attitudes towards physicians but did not evaluate body dissatisfaction. In this study 80 men participated, with 43 AAS users (mean age = 29.7 years, SD = 6.6) and 37 AAS non-users (mean age = 30.6 years, SD = 7.10) recruited from Massachusetts and Florida (Pope Jr., Kanayama, Ionescu-Pioggia, & Hudson, 2004). AAS users thought their physicians were no more reliable than their friends and that 56%
of AAS user never revealed this information to their physician (Pope Jr. et al., 2004). This would suggest that prevalence data collected with the help of physicians would be much lower than actual levels of AAS use.

Differences in gender role stress have also been seen across young adulthood and adulthood. Cournoyer and Mahalik (1995) examined the difference in gender role conflict for college-aged (n=88, mean age=19.81 years, DS=1.35) and middle-aged men (n=89, mean age=40.96 years, DS=2.83). Middle-aged men were less conflicted about issues such as power and competition; however, more conflicted about family and work responsibilities (Cournoyer & Mahalik, 1995). College-aged men worry about being successful and comparing favorably to others, with emerging relationship being very important (Cournoyer & Mahalik, 1995). The body plays a significant role during young adulthood in meeting these masculine ideals around power and competition, which could alter how young adult and adult males answer questions on the MBIDS (Kimmel & Mahalik, 2004).

**Initial Development of the Male Body Image Disturbance Scale**

Four previous studies were used to develop the 25-item, 5-factor MBIDS. With exploratory factor analysis, the questionnaire demonstrated a good fit for the five factor model (Freson, 2011). The paper now reviews these four studies.

**Study 1**

In study one a six-factor model was initially developed to evaluate the most salient components for body image disturbance in the male population. The six factors included Body Dissatisfaction (BDIS), Body Dysmorphia (BDYS), Drive for Muscularity (DMUS), Drive for Leanness (DL), Interference with Life Functions and Responsibilities (IFLR), and Social Avoidance (SA). The initial item pool contained 114 items relevant to AN, BN, Binge Eating
Disorder (BED), and BDD-MD drawn from existing questionnaires and clinical interview questions. There was an expert team that assisted in the selection of items to be included in the initial study and assignment to one of the six subscales identified. A random number generator by Stat Trek (http://stattrek.com/Tables/Random.aspx) was utilized in assigning order to the items in the questionnaire. The items were rated on a 7-point scale (i.e., 1=strongly disagree; 2=moderately disagree; 3=slightly disagree; 4=exactly and precisely neutral; 5=slightly agree 6=moderately agree; 7=strongly agree).

Male college students were recruited from the residence halls during their weekly hall meetings in the first month of the fall 2008 semester for the study. They completed the questionnaire using the paper version. Four hundred and sixteen participants were retained in the analyses. The sample was primarily Caucasian (n = 338, 1.9% missing), heterosexual (n = 390, 93.8%, 1.0% missing), and ranging in age from 17 to 35 years old (mean = 19.00 years, SD = 1.84, 0.7% missing). Through exploratory factor analysis the fit indices supported a 6-factor model where 49-items were retained. The 6 factors included: DMUS (8 items), DL (8 items), Social Physique Anxiety (SPA, 8 items), BDIS (10 items), ILFR (8 items), and Obsessive Exercise Patterns (OEP, 7 items).

**Study 2**

For study two the MBIDS contained 49-items with a 6-factor structure derived from study one. The 49 items were randomly ordered using a number generator by Stat Trek. Items were scored on a 7-point scale ranging from 1 (strongly disagree) to 7 (strongly agree). The three hundred and eighty two participants were recruited through the Washington State University Department of Psychology's Human Subjects Pool during summer and fall of 2008. Participants completed an online version of the MBIDS. The sample was once again primarily Caucasian (n
= 283, 74.1%, 0.8% missing), heterosexual (n = 365, 95.5%, 0.5% missing), and young with age ranging from 17 to 41 years old (mean = 19.58 years, SD = 3.30). Exploratory factor analysis resulted in the five-factor structure with 25-item. The 5 factors included: DMUS (5 items), DL (5 items), BDIS (5 items), ILFR (5 items), and OEP (5 items). Loadings for many of the items within the SPA factor were low on the primary factor (< 0.400) and also loaded on secondary factors. For this reason, items on the Social Physique Anxiety Subscale were eliminated.

**Studies 3 and 4**

The five-factor structure developed in study two was utilized in studies three and four. The 25 items were randomly ordered in study three using a number generator by Stat Trek and the order was retained in study four. Items were scored on a 7-point scale ranging from 1 (strongly disagree) to 7 (strongly agree). The procedures for recruitment and completion of MBIDS for studies 3 and 4 were the same as in study 2 outlined above. Two hundred and ninety eight participants were retained for analysis in study three. The sample for study four was similar to other studies where 73.6% (n=206) were Caucasian, predominantly heterosexual (n = 270, 96.4%), and young (mean = 19.94 years, SD = 2.46).

The 5-factor, 25-item questionnaire was evaluated in study 3 with fit indices suggesting a good fit. The values for CFI (0.966), RMSEA (0.055), and SRMR (0.023) were all in acceptable ranges. Generally, the item loadings were within accepted ranges; however 10 of the items were lower or cross-loaded in a secondary factor. Ten of the items were changed in study 4 to reduce the chances for cross loadings. Items 3 and 22 on the DMUS, items 18 and 24 on the DL, item 12 on the ILFR, and items 1, 2, 14, 20, 23 on the OEP had some change of wording before completing study four.
In study 4 the fit indices for the 5-factor model appeared to be good even though the CFI value dropped slightly to 0.942 and the RMSEA rose to 0.076. The SRMR also remained relatively low in study 4, at a value of 0.025. The item loadings were also stronger in study 4 for the ten questions reworded after study 3. All items were within accepted ranges, with higher scores on primary factors and limited cross loadings on secondary factors.

**Summary of the Four Studies**

Results from the four studies supported a five-factor model with 25 items, 5 items per factor. Four of the six subscales identified *a priori* were retained within the questionnaire including DMUS, DL, BDIS, and ILFR. In addition, the OEP subscale evolved, becoming the fifth factor in the current version of the MBIDS. The questionnaire had consistently good psychometric properties across the studies with a good pattern of model fit, acceptable loadings for items within each factor, and excellent discriminant validity between factors. The internal consistency for each of the factors was also good with Cronbach’s alphas ranging from 0.822 to 0.917.

**Construct Validity of the Male Body Image Disturbance Scale**

**Confirmatory Factor Invariance Analysis Across Time Ratings**

The use of multiple occasions of assessment with the scale allows a more stringent evaluation of the construct validity of MBIDS. The relationship between the observed variables and hypothesized underlying constructs in the MBIDS can be evaluated using confirmatory factor analysis (CFA) (Bollen, 1989, 2002; Borsboom, Mellenbergh, & van Heerden, 2003; Taris, Bok, & Meijer, 1998; Vandenberg & Lance, 2000). Figure 1 shows the baseline model developed *a priori* to be used in testing the invariance, convergent and discriminant validity of
MBIDS across time. There are 10 factors and 50 items total, with 5 factors and 25 items at time 1 and time 2. The model also includes correlated errors across time for the same items.

The CFA allows for evaluation of model fit by constraining parameters in the five-factor model across occasions (Gregorich, 2006; Taris et al., 1998). If there is significant deterioration in fit of the constrained model when compared to the unconstrained model we would conclude that the MBIDS factor structure is not stable across time. Evaluating invariance allows us to determine whether the same factor is being measured in the same way over time. The sequence of steps for evaluating the invariance of the five-factor model is outlined below, where each step increases the constraints for the model in a nested hierarchy.

**Invariance of Form Across Time**

In the initial step assessing stability of the questionnaire, none of the parameters in the model (Figure 1) were constrained equal across time 1 and time 2. The only exception was that one item in each factor was utilized to set the metric of each factor and is often referred to as the marker (or reference) item (Jan-Benedict, Steenkamp, & Baumgartner, 1998). The configural invariance approach represents the weakest form of invariance. Here the simple structure implies that items of the scale exhibit the same configuration of salient and non-salient loadings for same factors across time (Jan-Benedict et al., 1998; Vandenberg & Lance, 2000). Typically, non-salient loadings are constrained to zero in the CFA and salient factor loadings are significantly different from zero.

The correlated residuals for like-items across time were automatically added to the invariance of form model. In across time model, especially those with a short time interval, it is expected that the inclusion of correlated-residuals between like-items is necessary for adequate
model fit (Little, 2013). This model was thus the base line model for the evaluation of the invariance tests of the model parameters.

**Invariance of Like-Item Loadings Across Time**

Factor loadings refer to the correlation between the item and each factor in a factor analysis. The second step examines the condition of like-item loadings across time being statistically equivalent. This (metric invariance) provides a stronger test of invariances by introducing equal metric intervals across time (Jan-Benedict et al., 1998). In this step loadings of identical items at time 1 and time 2 were constrained to be equal. If the identical items (parallel) have equivalent loadings, then the identical items have the same amount of increase between times for the same amount of increase on the latent factor (Vandenberg & Lance, 2000).

**Invariance of Like-Item Intercepts Across Time**

The third step focuses on intercept invariance, where the intercept represents the origin of the scale (Chen, Sousa, & West, 2005). In this step intercepts for identical items were constrained to be equal across the two occasions. Statistically equivalent loadings and intercepts result in the same observed scores on identical items at the same level on the latent factor. This statistical equivalence establishes a common zero point (intercept) on the factor across occasions.

**Invariance of Like-Item Residuals Across Time (Uniqueness)**

The residual is the difference between the observed and predicted values by the model. In the fourth step, residuals for the same items at the two times were constrained equal. Invariance of residuals suggests that the same items have similar amounts of unique variance across time (Vandenberg & Lance, 2000). If like items have invariant loadings (Step 2), intercepts (Step 3) and residuals (Step 4) across time, then measurement parameters of the model are statistically equivalent across time.
**Invariance of Like-Factor Variances Across Time**

In the fifth step, the variances of the same factors across time were evaluated by constraining them to be equal. If this condition holds, then individuals across times have used the same range on the factor continuum to rate their body image issues (Brown, 2006, 2015). Statistically equivalent residuals (Step 4) and factor variances (Step 5) suggest that the same items have equal levels of precision across time (Brown, 2006, 2015).

**Invariance of Like-Factor Covariances Across Time**

Covariance is the measure of joint variance of variables or factors. The sixth step constrained the covariance of like factors equal across the two times (Brown, 2006, 2015; Vandenberg & Lance, 2000). If the same factors have statistically equivalent variances (Step 5) and the same factor covariances are equivalent between times (current step), then correlation between the same factor pairs for time 1 is statistically equivalent to the correlation the same factor pairs at time 2. For example, the BDIS with DMUS correlations for time 1 ratings will be statistically equivalent to the BDIS with DMUS correlations for time 2 ratings.

**Invariance of Like-Factor Means Across Time**

In order to evaluate the factor means across time it is necessary to first show invariance of like-item loadings (Step 2) and intercepts (Step 3) (Chen et al., 2005). This means that the ratings at the two occasions have the same unit of measurement and the same origin. If this condition is met, then it is possible to meaningfully evaluate like factor means across time. In the seventh step, further constraints were placed onto the model where same factor means across time were constrained to be equal (Brown, 2006, 2015; Jan-Benedict et al., 1998). If there is invariance of like-factor means then the factor means are statistically equivalent (i.e., no statistically significant change in the factor means across time).
Convergent and Discriminant Validity of Factors

The final step was to determine convergent and discriminant validity for the five factors in the model. Convergent validity examines the relative stability of the same factor across time. With short intervals between test and retest, correlations for the same factor across time should be substantial ($\geq 0.75$). If the values are significant and substantial for the five factors then convergent validity has been demonstrated for the five factors in the model. Discriminant validity requires that the same factor correlations across time are significantly larger than different factor correlations across time. For example, the correlation of factor 1 at time 1 with factor 1 at time 2 is significantly larger than the correlation of factor 1 at time one with factor 2 at time 2.

Purpose of the Study

The general purpose of the study was to further evaluate the construct validity of the MBIDS. The first goal was to determine whether the five-factor model developed in the university population was the same for an older sample recruited from the general population. It was hypothesized that the items would load higher on the expected factor and low on other factors for MBIDS. An a priori five-factor exploratory analysis was used to test this prediction with the time 1 and time 2 data (i.e., a separate analysis on each assessment). As noted above, the primary purpose was to determine if the 25 items continued to show substantial loadings on their primary factor and low loadings on the other four factors with this older sample. This procedure thus allowed the identification of any poor items prior to the invariance analyses.

The second goal was to test the invariance the five-factor model (e.g., BDIS, DMUS, DL, OEP, and ILFR) between time 1 and time 2 ratings. It was hypothesized that the same items will have statistically equivalent loadings, intercepts, and residuals between the two occasions.
Furthermore, it was hypothesized that the same factors would have statistically equivalent variances, covariance, and means between the two occasions.

The third goal of the study was to test the convergent and discriminant validity of the five factors between the two occasions. It was hypothesized that same factor had a substantial correlation across time with this correlation being significantly larger than the correlations with all other factors across time. This would offer further support for the construct validity of a five-factor model in the MBIDS.
CHAPTER 2

METHODS

Participants

Participants for this study were recruited with the assistance of Qualtrics, a company that specializes in online panel aggregation. They were recruited from actively managed market research panels by matching qualifying demographic information from the potential participant to the needs of this study (males, 18 years of age and older, and residence in the United States). Due to the online system through Qualtrics, we were able to significantly reduce the potential for individuals participating in the study multiple times identified as a different person. This was done in the prescreening process by the company and the monitoring of IP address from which the participants completed both time 1 and time 2 data collection.

Out of the 884 people who entered into the participant pool at Time 1, 626 (71%) were retained for recruitment at time 2. Two hundred and fifty eight were removed from the study at time 1 for one of several reasons including abandoning the study (n=123), failure to give consent (n=21), gender (n=6), and inattention (n=108). The participants’ demographic information was gathered by self-report. Of the six hundred and twenty six participants retained at Time 1 the sample was primarily middle age (n =626, mean = 46.34 years, SD = 12.97, range from 18 to 78 year), Caucasian (n = 626, 78.3%), and heterosexual (n = 626, 80.2%).

At time 2 four hundred and twelve entered the study, which was a 65.8% return rate. Of those participants that returned, 308 were retained for analyses. One hundred and four participants were removed from the study at time 2 for one of several reasons including abandoning the study (n=46), gender (n=1), and inattention (n=57). Of the three hundred and eight participants retained at Time 2, their age ranged from 18 to 76 years old with the mean age
of 46.34 (SD = 12.41). As with Time 1, the sample at time 2 was primarily Caucasian (n = 308, 80.2%), and heterosexual (n = 308, 93.5%). All analyses utilized the sample of 308 men that completed both time 1 and time 2 data collection.

**Measure**

The MBIDS is a multidimensional questionnaire measuring symptoms related to assesses variables seen across AN, BN, and MD including body dissatisfaction, the dual drive for muscularity and leanness, the use of exercise, and it’s interference with daily living (Freson, 2011). The questionnaire has 25 items with a 5-factor structure includes: Drive for Muscularity, Drive for Leanness, Body Dissatisfaction, Interference with Life Functions & Responsibilities, and Obsessive Exercise Pattern. Items are rated on a 7-point scale ranging from 1 (strongly disagree) to 7 (strongly agree). Cronbach’s alphas for the MBIDS factors were between .822 and .917 in a college population (Freson, 2011).

For this study, three quality control items were developed and incorporated into MBIDS with the assistance of staff at Qualitics. The first quality control item was “If you are reading this, select the option ‘Moderately Disagree’”, which was placed into the MBIDS as item 7. The second quality control item was “Answer this question, as ‘exactly and precisely neutral’” and was designated as item 15. The final quality control item was placed in the MBIDS as item 23 stating “If you are reading this, please select the option ‘Strongly Agree’” for item 23. The quality control items assisted in identifying participants who randomly responded to the MBIDS.

An eighth point was also added to the Likert scale as another form of quality. The addition of “choose not to respond” allowed participants to voluntarily not respond to a question while indicating an answer for the item. The addition of the eighth point also allowed for retention in the study as incomplete data was one of the factors evaluated for eliminating
participants. Items were rated on an 8-point scale (i.e., 1=strongly disagree; 2=moderately disagree; 3=slightly disagree; 4=exactly and precisely neutral; 5=slightly agree 6=moderately agree; 7=strongly agree; and 8=choose not to respond).

**Procedures**

As part of an ongoing research project developing a multidimensional questionnaire assessing a broad range of symptoms for body image and eating disorders, Qualtrics was contracted to recruit participants through its panel partners. In previous attempts to complete the test-retest study, recruitment of participants through the WSU Department of Psychology Participant Pool and Amazon MTURK garnered small samples at Time 2. Using Qualtrics assisted in recruiting a larger number of participants at time 1 and retaining a larger percentage of participants that completed time 2 data collection. The sample recruited was also more representative of the general population, thus making the results generalizable to men in Western culture.

Qualtrics invited potential participants from their market research panels to complete the online survey in return for incentives/cash compensation in January 2015. Potential participants were sent an email invitation informing them about the study and honorarium for participation. To avoid self-selection bias, the survey invitation does not include specific details about the contents of the survey. Potential participants had the opportunity to unsubscribe from the study at any time.

If potential participants wanted to learn more about the study they were directed to the informed consent form posted on Qualtrics’ online system (Appendix B). Potential participants then had the opportunity to read the more in-depth description for the study and chose to voluntarily participate in the study. Participants completed the 10-minute questionnaire at time 1
in January 2015. The MBIDS asked questions regarding attitudes and behaviors associated with body image and eating disorders (Appendix F). Upon completion of the questionnaire participants viewed a debriefing form for the study (Appendix C) and were informed Qualtrics would contact them in 4 weeks for time 2. Participants were removed from the study after time 1, if they randomly responded to the MBIDS as identified by the quality control items developed for this study.

Four weeks later the participants were sent an email informing them it is time to participate in time 2 of the study. They had 1.5 weeks to complete the same online questionnaire, which took approximately 10 minutes. Those who had not completed the survey within 3-7 days of receiving the first email were sent a second email reminding them to log back into the system and complete the questionnaire. Upon completion of the questionnaire at time 2, the participants viewed a debriefing form for the study (Appendix E).

The honorarium was paid upon completion of each part of the study. As members of Qualtrics' market research panels, potential participants had already identified their preference in payment for participating in research (e.g., rebate points, gift certificates, aggregated credit, electronic cash, cash) prior to engaging in the current study. Participants received an equivalent of approximately $0.75 for time 1 and equivalent of approximately $1.50 for time 2. The compensation was slightly different for each participant depending on his preferred incentive. The rate for each paid task in this study was taken from recommendations by Qualtrics and other researchers using online data collection (Buhrmester, Kwang, & Gosling, 2011).

**Analytic Strategy**

Mplus (Version 7.3, Muthen & Muthen, 2012) was used to determine the fit of a five-factor model for MBIDS using a robust maximum likelihood estimation procedure. Overall fit
of the model was determined using comparative fit index (CFI; minimum study criterion .90, with approximately .95 being ideal), root mean square error of approximation (RMSEA; minimal study criterion < .08, with < .05 being ideal), root-mean-square residual (SRMR; minimal study criterion < .08, with < .05 being ideal). These criteria were applied to the two a priori exploratory five-factor models as well as the invariance analyses to evaluate the global fit of these measurement models.

**Analyses**

In the first set of analyses, an a priori exploratory five-factor model was applied to assessments one and two separately. Although these two analyses restricted the number of factors to five, these two separate analyses allowed the items to cross-load on the secondary factors. The purpose of these two initial exploratory analyses was to identify any weak items (e.g., items that failed to show good discriminant validity [i.e., items with high cross-loadings] and items that failed to show a substantial loading on any factor) prior to the examination of the invariance of the model across time.

The second set of analyses applied a series of confirmatory factor analyses to evaluate the invariance of the five-factor model across the two time points (i.e., (Analysis 1) invariance of form with correlated residuals between like items across time; (Analysis 2) invariance of like-item loadings; (Analysis 3) invariance of like-item intercepts; (Analysis 4) invariance of like-item residuals; (Analysis 5) invariance of like factor variances; (Analysis 6) invariance of like factor covariances; and (Analysis 7) invariance of like factor means). This series of analyses allowed for the evaluation of the invariance of all the parameters of the five-factor model across the two assessments.
The third set of analyses evaluated the convergent validity of the same factors across the interval. Convergent validity required the stability coefficients to be statistically significant and substantial (i.e., ≥ .70). These analyses also evaluated the discriminant validity of the five-factors across the interval. Discriminant validity required the factor correlations for the same factors (stability coefficients) to be significantly larger factor correlations for different factors across the interval. The M-plus model constraint procedure was used to perform the statistical tests to evaluate the discriminant validity.

**Evaluation of Invariance**

Two procedures were used to evaluate the invariance of the models (i.e., Did the set of constraints hold at a particular step?). The first procedure was the change in the CFI value. If the decrease in the CFI value was less than 0.01, then the set of constraints was considered to hold at the particular invariance step (i.e., the introduction of a set of constraints did not result in a meaningful decrement in fit). The second procedure used the chi-square difference test (i.e., if the test was non-significant, then the invariance constraints were considered to hold at the particular step).
CHAPTER 3

RESULTS

Structural Organization of the Item Ratings for Time 1 and Time 2

Preliminary Item Analysis

In the initial analyses skewness and kurtosis were analyzed for each item to determine if there was enough variability in responses to make meaningful analyses. Table 2 and Table 3 show the means, standard deviations, skewness, and kurtosis for the 25 MBIDS items at times 1 and 2, respectively. Normal distribution for skewness is zero; however, values greater than -3 and less than 3 are within acceptable ranges. For kurtosis, values greater than -10 and less than 10 are within acceptable ranges. Values for skewness and kurtosis at time 1 and time 2 did not exceed acceptable ranges for normal distribution suggesting there was not a restricted range of variance for each of the items in MBIDS; therefore, all items were retained for the EFA.

The fit of an a priori exploratory five-factor model at times 1 and 2 was acceptable, time 1: $\chi^2(185) = 393$, CFI = .953, RMSEA = .061 (90% CI: 0.053-0.069), SRMR = .024; time 2: $\chi^2(185) = 483$, CFI = .935, RMSEA = .072 (90% CI: 0.064-0.080), SRMR = .029 (Table 4). However, an inspection of the primary and secondary loadings for the five-factor model (Tables 5 and 7) at times one and two revealed three problematic items. Items 8 for the DL factor (I need to spend more time doing endurance exercise to achieve a more lean physique.), 11 for the BDIS factor (I am dissatisfied with my body.), and 18 for the DMUS factor (I need to be in the gym lifting weights more often.) loaded poorly on the intended factors and also loaded on secondary factors. These three items were eliminated from the scale prior to the invariance analyses. All the other items showed substantial loadings on the hypothesized factor and low (< 0.30) on the secondary factors.
Invariance of the Five-Factor Model Across the Two Assessments

The 22 items that showed good convergent and discriminant validity from the *a priori* five-factor exploratory analyses were used to evaluate the invariance of the model across the two times. A series of confirmatory factor analyses were used to evaluate the (1) invariance of form with correlated residuals between like-items across time (no constraints), (2) invariance of like-item loadings, (3) invariance of like-item intercepts, (4) invariance of like-item residuals, (5) invariance of like factor variances, (6) like-factor covariances, and (7) like-factor means (i.e., seven sequential analyses).

The invariance of form model resulted in an acceptable fit, $\chi^2(835) = 1699$, CFI = .917, RMSEA = .058 (90% CI: 0.054-0.062) SRMR = .065). There was no significant decrement in model fit across the various models (i.e., (1) invariance of like-item loadings; (2) invariance of like-item intercepts; (3) invariance of like-item residuals; (4) invariance of like-factor variances; (5) invariance of like factor covariances; and (6) invariance of like-factor means). All of these analyses yielded a non-significant $\chi^2$ difference test and the CFI did not decrease any across the sequential invariance tests. Table 7 provides a summary of these analyses. There was thus complete invariance of the model parameters across the one-month interval.

**Invariant Factor Loadings**

Table 8 shows the item-factor loadings for the five-factors. There is only set loadings because like-item loadings are constrained equal across time. As there was invariance in factors loading there was an equality of scaling units where participants rated the same items similarly across the two assessment points. This means that any observed score differences across the two assessments on identical items were due to true differences on the factor means and not the time.
**Invariant Factor Variances**

Factor variances for the five-factors support the idea that participants used the same range on the factor continuum at time 1 and time 2 to rate their thoughts and behaviors around body image issues (Table 9).

**Invariant Factor Correlations**

Table 10 shows the correlations among the five-factors. There is only one set of factor correlations because like item-residuals, like-factor variances, and like-factor correlations were constrained equal across time. This means that correlations between factors, like DMUS and DL, at time 1 equal the correlation between the same two factors (DMUS and DL) at time 2. As there was invariant factor correlations, the factors in MBIDS have specific relationships to one another that are replicated over multiple assessments. Since the factors were not highly correlated with each other, there was a good discriminate validity among the five factors.

**Invariant Factor Means**

Table 11 shows that there were no significant mean differences on the same factors between the two assessments.

**Convergent and Discriminant Validity of the Five-Factors Across Time**

Table 12 shows the convergent and discriminant validity correlations for the five factors across the two assessments. The convergent correlations between identical factors across time were statistically significant ($ps < .001$) and substantial (range = .78 to .88). Each of the convergent correlations was also significantly larger than the four row and four column different correlations across time ($ps < 001$). The five factor thus showed convergent and discriminant validity across the one-month interval.
CHAPTER 4
DISCUSSION

The general purpose of this study was to evaluate the construct validity of the MBIDS across two occasions. The CFA invariance analysis allowed for an evaluation of the invariance of like-item loadings, like-item intercepts, and like-item residuals along with like-factor variances, like-factor covariances, and like-factor means across the one-month interval. This procedure also allowed for an evaluation of the convergent and discriminant validity of the five factors from the MBDIS across the interval.

Structural Organization of the MBIDS

A five-factor model with five items per factor was initially developed in previous studies to evaluate the most salient components for body image disturbance for men. The first two analyses applied an a priori exploratory five-factor model to the time one and time two assessments. The purpose of these two analyses was to determine if any of the 25 items had weak convergent validity (i.e., a low loading on the hypothesized factor) as well as weak discriminant validity (i.e., high cross-loadings on other factors than the hypothesized factor). Given that the participants in this study were so different from the participants in the earlier studies on the psychometric properties of the scale (i.e., older adult males from the general population versus younger adult male college students), it was considered important to use the exploratory factor analytic procedure to first evaluate the quality of the items.

The two analyses were designed to ensure that all the items had good convergent and discriminant validity at assessment one and two separately prior to the evaluation of the invariance of the model parameters along with the convergent and discriminant validity of the five-factors across the one-month interval. The findings from these analyses provided support
for a consistent five-factor model in the MBIDS. Three items were eliminated due to weak loadings on the primary factor and cross loading on other factors. This reduced 22-item scale was then used to test the invariance of the scores from the scale over the one-month interval.

While there are differences in body image issues across ages, the five-factor model was supported in this older sample. It was unclear why the three items were weak in this study; however, they all seem to have an appearance base component to them. As mentioned earlier in this paper, older adulthood men seem to be less concerned with appearance and more interested in long-term health issues (Ziebland et al., 2002). This change in needs for weight loss in the older sample may be the cause for poor loading on the three items.

**Invariance of the Five-Factor Model Between Time 1 and Time 2 Ratings**

The second goal of this study was to test the invariance of the scale across the one-month interval. The test of invariance showed that there were identical factor variances, factor covariances, and factor means between time 1 and time 2 rating for the five factor model. The invariance of loadings and intercepts suggested that any score differences across time on identical items were due to true differences on the factor mean. The invariance for item residual and factor variance, for identical items and factors respectively, indicated that that the same items were equally precise and the participants at time 1 and time 2 used the same range on factor continuum to rate their beliefs about body image issues across a one month period of time. The correlations between identical factor pairs were also invariant across time (e.g., the DMUS and DL correlation at time 1 was statistically equivalent to the DMUS and DL correlation at time 2). There were also no significant mean differences across time for the same factors, when the invariance of identical factors was analyzed. The invariance results indicated a high level of agreement between the two assessments (i.e., the parameters of the measurement model as well
as the parameters of the structural model were statistically equivalent across the one-month interval).

**Convergent and Discriminant Validity of Factors Between Time 1 and Time 2 Ratings**

The third goal of the study was to test the convergent and discriminant validity of the five factors between time 1 and time 2. Strong support was found for the convergent validity of each of the five factors (i.e., substantial stability correlations across the interval). Strong support also occurred for the discriminant validity of the five factors across the interval (i.e., the stability correlations for the same factors were much larger than the correlations between different factors across the interval). The convergent and discriminant validity for MBIDS support the construct validity for the five factor model. Specifically, the five factors assess five different aspects for body image in the male population.

**Limitations**

There are two general limitations that need to be addressed before the MBIDS can be utilized in the general population. First, while the sample utilized in this study was recruited from the general population, it was predominantly Caucasian and heterosexual. Therefore, results for the MBIDS cannot be generalized to all men. In addition, the sample for this study was recruited online and paid for their participation. This sample of convenience utilized for the study may not represent a random sample from the male population. The second limitation was that the findings may be specific only to the MBIDS. It would be important to determine if other scales assessing drive for muscularity, drive for leanness, body dissatisfaction, obsessive exercise practices, and possible interference with daily responsibilities show invariance as well as convergent and discriminant validity across time similar to the MBIDS.
Implications and Future Studies

This study provided additional evidence of the validity for MBIDS and its use for men. Since men frequently do not seek assistance for medical and psychological issues, this questionnaire could potentially be used in research targeting men to better understand the prevalence of body image issues within the general population. For men who do seek medical assistance, this brief questionnaire could be quickly completed and aid the provider with interviewing around eating and exercise pathology.

Future research is needed to ensure that the psychometric properties of MBIDS are stable and adequately evaluate significant aspects of male body image disturbance. Examination of convergent and divergent validity with other scales assessing similar issues as those subscales of MBIDS would be important to make comparisons with other studies. It would also be important to complete studies within different populations of men including, but not limited to, gay/bisexual, those of different race/ethnic background, and military experience. Finally, before the MBIDS can be used in clinical practice a study should examine the relationship between self-report scores for MBIDS and clinical diagnosis by professionals in the field.
Bibliography


Table 1.

Demographics for the Sample

<table>
<thead>
<tr>
<th></th>
<th>Time 1</th>
<th>Time 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total number</td>
<td>626</td>
<td>308</td>
</tr>
<tr>
<td>Age (S.D.)</td>
<td>46.34 (12.97)</td>
<td>46.99 (12.41)</td>
</tr>
<tr>
<td>Caucasian</td>
<td>490 (78.3%)</td>
<td>247 (80.2%)</td>
</tr>
<tr>
<td>Heterosexual</td>
<td>587 (93.7%)</td>
<td>288 (93.5%)</td>
</tr>
<tr>
<td>Body Mass Index</td>
<td>27.87 (7.89)</td>
<td>28.04 (6.17)</td>
</tr>
</tbody>
</table>
Table 2.

Time 1 Normative Data

<table>
<thead>
<tr>
<th>Item</th>
<th>Question</th>
<th>Mean</th>
<th>S.D.</th>
<th>Skew.</th>
<th>Kur.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>I feel upset if my schedule forces me to miss a day of working out.</td>
<td>3.977</td>
<td>4.375</td>
<td>-0.061</td>
<td>-1.308</td>
</tr>
<tr>
<td>2</td>
<td>I feel like I must exercise.</td>
<td>4.947</td>
<td>4.197</td>
<td>-0.791</td>
<td>-0.656</td>
</tr>
<tr>
<td>3</td>
<td>I would like to look stronger.</td>
<td>5.870</td>
<td>1.541</td>
<td>-1.222</td>
<td>2.131</td>
</tr>
<tr>
<td>4</td>
<td>I am late for school/work/social commitments due to working out.</td>
<td>2.169</td>
<td>2.579</td>
<td>1.393</td>
<td>1.226</td>
</tr>
<tr>
<td>5</td>
<td>I am concerned about how I look to other people.</td>
<td>4.721</td>
<td>3.278</td>
<td>-0.535</td>
<td>-0.645</td>
</tr>
<tr>
<td>6</td>
<td>I have to limit my social life in order to meet the demands of my workout schedule.</td>
<td>2.684</td>
<td>3.193</td>
<td>0.781</td>
<td>-0.563</td>
</tr>
<tr>
<td>7</td>
<td>If you are reading this, select the option “Moderately Disagree”.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>I need to spend more time doing endurance exercise to achieve a more lean physique.</td>
<td>4.714</td>
<td>3.480</td>
<td>-0.619</td>
<td>-0.553</td>
</tr>
<tr>
<td>9</td>
<td>I have fat in places on my body that make it unattractive.</td>
<td>4.774</td>
<td>3.710</td>
<td>-0.649</td>
<td>-0.634</td>
</tr>
<tr>
<td>10</td>
<td>I need to be more lean to show my muscle definition.</td>
<td>4.674</td>
<td>3.575</td>
<td>-0.615</td>
<td>-0.716</td>
</tr>
<tr>
<td>11</td>
<td>I am dissatisfied with my body.</td>
<td>4.379</td>
<td>3.750</td>
<td>-0.215</td>
<td>-1.076</td>
</tr>
</tbody>
</table>
Table 2 - continued

Time 1 Normative Data

<table>
<thead>
<tr>
<th>Item</th>
<th>Question</th>
<th>Mean</th>
<th>S.D.</th>
<th>Skew.</th>
<th>Kur.</th>
</tr>
</thead>
<tbody>
<tr>
<td>12</td>
<td>I have missed events due to work out.</td>
<td>2.312</td>
<td>2.753</td>
<td>1.147</td>
<td>0.234</td>
</tr>
<tr>
<td>13</td>
<td>I have trouble keeping my mind on other things because I am thinking about my exercise program.</td>
<td>2.385</td>
<td>2.908</td>
<td>1.056</td>
<td>0.006</td>
</tr>
<tr>
<td>14</td>
<td>I am concerned about how my body looks in comparison to others.</td>
<td>4.246</td>
<td>3.654</td>
<td>-0.290</td>
<td>-1.066</td>
</tr>
<tr>
<td>15</td>
<td>Answer this question, as “exactly and precisely neutral”.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>16</td>
<td>I feel guilty if I miss an exercise session.</td>
<td>3.937</td>
<td>4.504</td>
<td>-0.067</td>
<td>-1.329</td>
</tr>
<tr>
<td>17</td>
<td>I wish I were more muscular.</td>
<td>5.382</td>
<td>2.409</td>
<td>-0.992</td>
<td>0.482</td>
</tr>
<tr>
<td>18</td>
<td>I would like to have better muscle definition.</td>
<td>5.468</td>
<td>2.315</td>
<td>-1.165</td>
<td>1.088</td>
</tr>
<tr>
<td>19</td>
<td>I need to be in the gym lifting weights more often.</td>
<td>4.299</td>
<td>3.957</td>
<td>-0.353</td>
<td>-1.130</td>
</tr>
<tr>
<td>20</td>
<td>I want my body to be leaner.</td>
<td>5.199</td>
<td>2.984</td>
<td>-1.021</td>
<td>0.319</td>
</tr>
<tr>
<td>21</td>
<td>I have limited close relationships because I need to exercise.</td>
<td>2.422</td>
<td>3.108</td>
<td>1.154</td>
<td>0.269</td>
</tr>
<tr>
<td>22</td>
<td>I feel distressed if I don't spend time exercising.</td>
<td>3.452</td>
<td>4.141</td>
<td>0.171</td>
<td>-1.291</td>
</tr>
</tbody>
</table>
Table 2 - continued

Time 1 Normative Data

<table>
<thead>
<tr>
<th>Item</th>
<th>Question</th>
<th>Mean</th>
<th>S.D.</th>
<th>Skew.</th>
<th>Kur.</th>
</tr>
</thead>
<tbody>
<tr>
<td>23</td>
<td>If you are reading this, please select the option “Strongly Agree”.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>24</td>
<td>I am concerned about how people see me in public.</td>
<td>4.472</td>
<td>3.219</td>
<td>-0.415</td>
<td>-0.766</td>
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<tr>
<td>25</td>
<td>I would like to have more muscle mass.</td>
<td>5.299</td>
<td>2.396</td>
<td>-1.028</td>
<td>0.704</td>
</tr>
<tr>
<td>26</td>
<td>I feel upset if I don't work out.</td>
<td>3.807</td>
<td>4.315</td>
<td>0.006</td>
<td>-1.340</td>
</tr>
<tr>
<td>27</td>
<td>I need to be more lean</td>
<td>4.924</td>
<td>3.187</td>
<td>-0.834</td>
<td>-0.080</td>
</tr>
<tr>
<td>28</td>
<td>I worry about how I look many times during the day.</td>
<td>3.801</td>
<td>3.708</td>
<td>0.072</td>
<td>-1.080</td>
</tr>
</tbody>
</table>
Table 3.

Time 2 Normative Data

<table>
<thead>
<tr>
<th>Item</th>
<th>Question</th>
<th>Mean</th>
<th>S.D.</th>
<th>Skew.</th>
<th>Kur.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>I feel upset if my schedule forces me to miss a day of working out.</td>
<td>3.673</td>
<td>4.136</td>
<td>0.087</td>
<td>-1.358</td>
</tr>
<tr>
<td>2</td>
<td>I feel like I must exercise.</td>
<td>4.913</td>
<td>3.517</td>
<td>-0.668</td>
<td>-0.661</td>
</tr>
<tr>
<td>3</td>
<td>I would like to look stronger.</td>
<td>5.812</td>
<td>1.576</td>
<td>-1.272</td>
<td>1.692</td>
</tr>
<tr>
<td>4</td>
<td>I am late for school/work/social commitments due to working out.</td>
<td>1.783</td>
<td>1.730</td>
<td>2.111</td>
<td>4.508</td>
</tr>
<tr>
<td>5</td>
<td>I am concerned about how I look to other people.</td>
<td>4.482</td>
<td>3.130</td>
<td>-0.425</td>
<td>-0.810</td>
</tr>
<tr>
<td>6</td>
<td>I have to limit my social life in order to meet the demands of my workout schedule.</td>
<td>2.249</td>
<td>2.692</td>
<td>1.329</td>
<td>0.881</td>
</tr>
<tr>
<td>7</td>
<td>If you are reading this, select the option “Moderately Disagree”.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>I need to spend more time doing endurance exercise to achieve a more lean physique.</td>
<td>4.644</td>
<td>3.291</td>
<td>-0.619</td>
<td>-0.524</td>
</tr>
<tr>
<td>9</td>
<td>I have fat in places on my body that make it unattractive.</td>
<td>4.906</td>
<td>3.703</td>
<td>-0.725</td>
<td>-0.560</td>
</tr>
<tr>
<td>10</td>
<td>I need to be more lean to show my muscle definition.</td>
<td>4.867</td>
<td>2.924</td>
<td>-0.589</td>
<td>-0.463</td>
</tr>
<tr>
<td>11</td>
<td>I am dissatisfied with my body.</td>
<td>4.314</td>
<td>3.380</td>
<td>-0.264</td>
<td>-1.043</td>
</tr>
</tbody>
</table>
Table 3 - continued

Time 2 Normative Data

<table>
<thead>
<tr>
<th>Item</th>
<th>Question</th>
<th>Mean</th>
<th>S.D.</th>
<th>Skew.</th>
<th>Kur.</th>
</tr>
</thead>
<tbody>
<tr>
<td>12</td>
<td>I have missed events due to work out.</td>
<td>1.958</td>
<td>2.196</td>
<td>1.636</td>
<td>1.858</td>
</tr>
<tr>
<td>13</td>
<td>I have trouble keeping my mind on other things because I am thinking about my exercise program.</td>
<td>2.003</td>
<td>2.294</td>
<td>1.648</td>
<td>1.892</td>
</tr>
<tr>
<td>14</td>
<td>I am concerned about how my body looks in comparison to others.</td>
<td>4.084</td>
<td>3.779</td>
<td>-0.177</td>
<td>-0.144</td>
</tr>
<tr>
<td>15</td>
<td>Answer this question, as “exactly and precisely neutral”.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>16</td>
<td>I feel guilty if I miss an exercise session.</td>
<td>3.634</td>
<td>4.090</td>
<td>0.091</td>
<td>-1.328</td>
</tr>
<tr>
<td>17</td>
<td>I wish I were more muscular.</td>
<td>5.472</td>
<td>1.867</td>
<td>-1.107</td>
<td>1.361</td>
</tr>
<tr>
<td>18</td>
<td>I would like to have better muscle definition.</td>
<td>5.576</td>
<td>1.739</td>
<td>-1.075</td>
<td>1.616</td>
</tr>
<tr>
<td>19</td>
<td>I need to be in the gym lifting weights more often.</td>
<td>4.074</td>
<td>3.855</td>
<td>-0.196</td>
<td>-1.125</td>
</tr>
<tr>
<td>20</td>
<td>I want my body to be leaner.</td>
<td>5.236</td>
<td>2.530</td>
<td>-1.003</td>
<td>0.616</td>
</tr>
<tr>
<td>21</td>
<td>I have limited close relationships because I need to exercise.</td>
<td>2.071</td>
<td>2.681</td>
<td>1.673</td>
<td>2.042</td>
</tr>
<tr>
<td>22</td>
<td>I feel distressed if I don't spend time exercising.</td>
<td>3.136</td>
<td>3.787</td>
<td>0.467</td>
<td>-1.021</td>
</tr>
</tbody>
</table>
Table 3 - continued

Time 2 Normative Data

<table>
<thead>
<tr>
<th>Item</th>
<th>Question</th>
<th>Mean</th>
<th>S.D.</th>
<th>Skew.</th>
<th>Kur.</th>
</tr>
</thead>
<tbody>
<tr>
<td>23</td>
<td>If you are reading this, please select the option “Strongly Agree”.</td>
<td>4.197</td>
<td>3.472</td>
<td>-0.304</td>
<td>-1.047</td>
</tr>
<tr>
<td>24</td>
<td>I am concerned about how people see me in public.</td>
<td>5.294</td>
<td>2.124</td>
<td>-1.021</td>
<td>1.048</td>
</tr>
<tr>
<td>25</td>
<td>I would like to have more muscle mass.</td>
<td>3.424</td>
<td>4.063</td>
<td>0.253</td>
<td>-1.264</td>
</tr>
<tr>
<td>26</td>
<td>I feel upset if I don’t work out.</td>
<td>5.010</td>
<td>2.579</td>
<td>-0.930</td>
<td>0.405</td>
</tr>
<tr>
<td>27</td>
<td>I need to be more lean</td>
<td>3.453</td>
<td>3.626</td>
<td>0.233</td>
<td>-1.182</td>
</tr>
<tr>
<td>28</td>
<td>I worry about how I look many times during the day.</td>
<td>3.424</td>
<td>4.063</td>
<td>0.253</td>
<td>-1.264</td>
</tr>
</tbody>
</table>
Table 4.

Initial Exploratory Factor Analysis-Goodness of Fit, 25 Items

<table>
<thead>
<tr>
<th>Time</th>
<th>$\chi^2$</th>
<th>df</th>
<th>P</th>
<th>CFI</th>
<th>RMSEA</th>
<th>SRMR</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Time 1</td>
<td>392.956</td>
<td>185</td>
<td>0.0000</td>
<td>0.953</td>
<td>0.061</td>
<td>0.024</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>(0.053, 0.069)</td>
<td></td>
</tr>
<tr>
<td>Time 2</td>
<td>483.398</td>
<td>185</td>
<td>0.0000</td>
<td>0.935</td>
<td>0.072</td>
<td>0.029</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>(0.064, 0.080)</td>
<td></td>
</tr>
</tbody>
</table>

$\chi^2$ = Chi Square; df = degrees of freedom; P = probability value; CFI = comparative fit index; RMSEA = root mean square error of approximation; C.I. = confidence interval; SRMR = standardized root mean square residual
Table 5.

Time 1 Exploratory Factor Analysis, 5-Factor Geomin Rotated Loadings, 25 Items

<table>
<thead>
<tr>
<th>Item</th>
<th>DMUS</th>
<th>DL</th>
<th>BDIS</th>
<th>OEP</th>
<th>ILFR</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>0.786</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td></td>
<td>0.752</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>0.604</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td>4</td>
<td></td>
<td></td>
<td>0.854</td>
<td></td>
<td>0.848</td>
</tr>
<tr>
<td>5</td>
<td></td>
<td></td>
<td></td>
<td>0.328</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td></td>
<td></td>
<td></td>
<td>0.795</td>
<td>0.736</td>
</tr>
<tr>
<td>8</td>
<td>0.375</td>
<td>0.328</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>0.795</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>0.598</td>
<td></td>
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Table 5 - continued.

Time 1 Exploratory Factor Analysis, 5-Factor Geomin Rotated Loadings, 25 Items

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DMUS, Drive for Muscularity; DL, Drive for Leanness; BDIS, Body Dissatisfaction; OEP, Obsessive Exercise Patterns; ILFR, Interference with Life Functions & Responsibilities

Study 2 Exploratory Factor Analysis, 5-Factor Quartimin Rotated Loadings, 25 Items
Table 6.

Time 2 Exploratory Factor Analysis, 5-Factor Geomin Rotated Loadings, 25 Items

<table>
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Table 6 - continued.

Time 2 Exploratory Factor Analysis, 5-Factor Geomin Rotated Loadings, 25 Items

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DMUS, Drive for Muscularity; DL, Drive for Leanness; BDIS, Body Dissatisfaction; OEP, Obsessive Exercise Patterns; ILFR, Interference with Life Functions & Responsibilities
Table 7.

Invariance Tests for DMUS, OEP, ILFR, BDIS, and DL Factors Between Time 1 and Time 2 Ratings

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<th>MLR $\chi^2$</th>
<th>CFI</th>
<th>SRMR</th>
<th>RMSEA</th>
<th>Model Comparison</th>
<th>$\Delta df$</th>
<th>$\Delta \chi^2$</th>
<th>$\Delta CFI$</th>
<th>$\Delta SRMR$</th>
<th>$\Delta RMSEA$</th>
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<tbody>
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<td>1. Invariant form</td>
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<td>1699</td>
<td>.917</td>
<td>.065</td>
<td>.058</td>
<td></td>
<td></td>
<td></td>
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<td>2. Invariant loadings</td>
<td>852</td>
<td>1713</td>
<td>.917</td>
<td>.066</td>
<td>.057</td>
<td>2 vs. 1</td>
<td>17</td>
<td>12.37$^{**}$</td>
<td>.000</td>
<td>.001</td>
<td>.001</td>
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<tr>
<td>3. Invariant intercepts</td>
<td>869</td>
<td>1732</td>
<td>.917</td>
<td>.066</td>
<td>.057</td>
<td>3 vs. 2</td>
<td>17</td>
<td>17.76$^{**}$</td>
<td>.000</td>
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<td>4. Invariant residuals</td>
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<td>1747</td>
<td>.918</td>
<td>.067</td>
<td>.056</td>
<td>4 vs. 3</td>
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<td>7.44$^{*}$</td>
<td>.001</td>
<td>.001</td>
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<td>5. Invariant factor covariance</td>
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<td>1752</td>
<td>.918</td>
<td>.068</td>
<td>.056</td>
<td>5 vs. 4</td>
<td>5</td>
<td>4.00$^{**}$</td>
<td>.000</td>
<td>.001</td>
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<td>6. Invariant factor covariances</td>
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<td>.069</td>
<td>.055</td>
<td>6 vs. 5</td>
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<td>9.49$^{**}$</td>
<td>.000</td>
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<td>.001</td>
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<td>7. Invariant factors means</td>
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<td>1770</td>
<td>.917</td>
<td>.069</td>
<td>.055</td>
<td>7 vs. 6</td>
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<td>8.06$^{**}$</td>
<td>.001</td>
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DMUS, Drive for Muscularity; DL, Drive for Leanness; BDIS, Body Dissatisfaction; OEP, Obsessive Exercise Patterns; ILFR, Interference with Life Functions & Responsibilities; $\chi^2$, Chi Square; df, degrees of freedom; $\Delta \chi^2$, Scaled Difference in MLR Chi Square; P, probability value; CFI, comparative fit index; RMSEA, root mean square error of approximation; C.I., confidence interval; SRMR, standardized root mean square residual.
Table 8.
Invariant Factor Loadings, 22 Items

<table>
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<tr>
<th>Items</th>
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Table 8 - continued.

Invariant Factor Loadings, 22 Items

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DMUS, Drive for Muscularity; DL, Drive for Leanness; BDIS, Body Dissatisfaction; OEP, Obsessive Exercise Patterns; ILFR, Interference with Life Functions & Responsibilities
Table 9.

Invariant Factor Variances, 22 Items

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DMUS, Drive for Muscularity; DL, Drive for Leanness; BDIS, Body Dissatisfaction; OEP, Obsessive Exercise Patterns; ILFR, Interference with Life Functions & Responsibilities.
Table 10.

Invariant Factor Correlations, 22 Items

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<th>ILFR</th>
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DMUS, Drive for Muscularity; DL, Drive for Leanness; BDIS, Body Dissatisfaction; OEP, Obsessive Exercise Patterns; ILFR, Interference with Life Functions & Responsibilities.
Table 11.

Invariant Factor Means, 22 Items

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DMUS, Drive for Muscularity; DL, Drive for Leanness; BDIS, Body Dissatisfaction; OEP, Obsessive Exercise Patterns; ILFR, Interference with Life Functions & Responsibilities.
Table 12.

Convergent and Discriminant Validity Correlations for DMUS, DL, BDIS, OEP, and ILFR Factors Between Time 1 and Time 2 Ratings, 22 Items

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DMUS, Drive for Muscularity; DL, Drive for Leanness; BDIS, Body Dissatisfaction; OEP, Obsessive Exercise Patterns; ILFR, Interference with Life Functions & Responsibilities. All correlations were significant at a p < .001. Convergent correlations are boldface type on the diagonal. Each of the five convergent correlations was significantly larger (ps < .00001) than its eight discriminant correlations (four in the row and four in the column).
Figure 1. Baseline model to be used for the confirmatory analytic invariance analysis between time 1 and time 2 ratings of Drive for Muscularity (DM), Drive for Leanness (DL), Body Dissatisfaction (BD), Obsessive Exercise Patterns (OE), and Interference with Life Functions & Responsibilities (ILF). E = residuals.
## Appendix A

### Abbreviations

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Description</th>
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<td>Body Dysmorphic Disorder</td>
</tr>
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<td>BDD-MD</td>
<td>Body Dysmorphic Disorder, Muscle Dysmorphia Type</td>
</tr>
<tr>
<td>BDIS</td>
<td>Body Dissatisfaction Factor</td>
</tr>
<tr>
<td>BED</td>
<td>Binge Eating Disorder</td>
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<td>Bulimia Nervosa</td>
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<td>Comparative Fit Index</td>
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<td>ILFR</td>
<td>Interference with Life Functions &amp; Responsibilities Factor</td>
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<td>MBIDS</td>
<td>Male Body Image Disturbance Scale</td>
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<td>MLM</td>
<td>Maximum Likelihood Estimation</td>
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<td>OEP</td>
<td>Obsessive Exercise Patterns Factor</td>
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<tr>
<td>RMSEA</td>
<td>Root Mean Square Error of Approximation</td>
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<tr>
<td>SRMR</td>
<td>Standardized Root-Mean-Square Residual</td>
</tr>
</tbody>
</table>
Appendix B

WASHINGTON STATE UNIVERSITY
Department of Psychology

QUALTRICS
Time 1 Consent Form

What is this HIT about?
The purpose of this research is to examine men’s thoughts about exercise and food. The study consists of two 5-10 minute sessions, four weeks apart. It is important that individuals complete both sessions. If you think you can not complete both sessions please do not participate in this study.

Who should participate in this session?
Men, 18 years of age and older, living in the United States.

Risk:
There are no known risks to your health by participating; however, if the questions raise concerns we encourage you to contact the researcher.

Compensation:
Participants will receive compensation in line with your payment preference and will be equivalent to approximately $0.75 for time 1 and approximately $1.50 for time 2. The compensation can be slightly different depending on how you choose to be paid. You can choose to aggregate credit towards a gift card or other forms of e-currency, receive cash, or put allocated money towards sweepstakes.

Confidentiality:
Your participation in the study will be confidential and the data for this study will be anonymous.

Further Information:
If you have questions about this study or the information in this form, please contact Tim Freson at freson@wsu.edu. If you have questions about your rights as a research participant, or would like to report a concern or complaint about this study, please contact the Washington State University Department of Psychology at (509) 335-2632, or at Johnson Tower 233.

What are my rights as a research study volunteer?
Your participation in this research study is completely voluntary. You may withdraw from the study at any time without penalty; however, you will not receive payment for the study.
Statement of Consent

I understand the information in this form and voluntarily give my consent to take part in the research. If I have any questions about the research, I know I can contact Tim Freson at freson@wsu.edu. I believe I understand the research study with the potential benefits and risks that are involved. If I were not interested in participating in this study I would exit from the description for the study.
Appendix C

WASHINGTON STATE UNIVERSITY
Department of Psychology

QUALTRICS
Time 1 Written Debriefing

The session is over now, and we thank you for your participation in the study. You have just completed the first of two sessions and will receive your appropriate compensation.

In four weeks you will receive an email prompting you to log back onto the system and complete the Time 2 survey.

Thank you.
Welcome back to the study.

**What is this study about?**
The purpose of this research is to examine men’s thoughts about exercise and food. In this session you will complete a survey taking approximately 5-10 minutes.

**Who should participate in this session?**
Men, 18 years of age and older, living in the United States

**Risk:**
There are no known risks to your health by participating; however, if the questions raise concerns we encourage you to contact the researcher.

**Compensation:**
Participants will receive compensation in line with your payment preference and will be equivalent to approximately $1.50 for time 2. The compensation can be slightly different depending on how you choose to be paid. You can choose to aggregate credit towards a gift card or other forms of e-currency, receive cash, or put allocated money towards sweepstakes.

**Confidentiality:**
Your participation in the study will be confidential and the data for this study will be anonymous.

**Further Information:**
If you have questions about this study or the information in this form, please contact Tim Freson at freson@wsu.edu. If you have questions about your rights as a research participant, or would like to report a concern or complaint about this study, please contact the Washington State University Department of Psychology at (509) 335-2632, or at Johnson Tower 233.

**What are my rights as a research study volunteer?**
Your participation in this research study is completely voluntary. You may withdraw from the study at any time without penalty; however, you will not receive payment for the study.
Statement of Consent

I understand the information in this form and voluntarily give my consent to take part in the research. If I have any questions about the research, I know I can contact Tim Freson at freson@wsu.edu. I believe I understand the research study with the potential benefits and risks that are involved. If I were not interested in participating in this study I would exit from the description for the study.
Appendix E

WASHINGTON STATE UNIVERSITY
Department of Psychology

QUALTRICS
Time 2 Written Debriefing

The session is over now, and we thank you for your participation in the study. You have just completed the first of two sessions and will receive your appropriate compensation.

This study is part of the process in developing a multidimensional survey, which assesses behaviors related to food, body weight, and exercise in the male population. Your participation has assisted us in determining whether results from the survey are consistent and reproducible.

If you have additional questions about the study, please contact the investigator.

Thank you.
Appendix F

MBIDS
Scale for Study

Study Title: Assessment of Body Image in the Male Population II
IRB #: Time 1/Time 2 using Qualtrics

Researchers:
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MBIDS

This survey is part of an investigation examining body image within our society. You will probably find that you agree with some of the statements and disagree with others, to varying extents. Please indicate your reaction to each statement by selecting the appropriate response.

Note: There is an embedded attention check in the survey. Workers who do not pass the attention check will not be paid for this study. Please read all questions and instructions carefully.
1 = Strongly disagree 
2 = Moderately disagree 
3 = Slightly disagree 
4 = Exactly and precisely neutral 
5 = Slightly agree 
6 = Moderately agree 
7 = Strongly agree 
8 = Choose not to respond 

1. I feel upset if my schedule forces me to miss a day of working out. 
2. I feel like I must exercise. 
3. I would like to be stronger. 
4. I am late for school/work/social commitments due to working out. 
5. I am concerned about how I look to other people. 
6. I have to limit my social life in order to meet the demands of my workout schedule. 
7. If you are reading this, select the option “Moderately Disagree”. 
8. I need to spend more time doing endurance exercise to achieve a more lean physique. 
9. I have fat in places on my body that make it unattractive. 
10. I need to be more lean to show my muscle definition. 
11. I am dissatisfied with my body. 
12. I have missed events due to my work out. 
13. I have trouble keeping my mind on other things because I am thinking about my exercise program. 
14. I am concerned about how my body looks in comparison to others. 
15. Answer this question, as “exactly and precisely neutral”. 
16. I feel guilty if I miss an exercise session. 
17. I wish I were more muscular. 
18. I would like to have better muscle definition. 
19. I need to be in the gym lifting weights more often. 
20. I want my body to be leaner. 
21. I have limited close relationships because I need to exercise. 
22. I feel distressed if I don’t spend time exercising. 
23. If you are reading this, please select the option “Strongly Agree”. 
24. I am concerned about how people see me in public. 
25. I would like to have more muscle mass. 
26. I feel upset if I don’t work out. 
27. I need to be more lean. 
28. I worry about how I look many times during the day.
Appendix G

Demographic Information

My age is: _______

Gender:

_____ Male
_____ Female
_____ Other

Ethnic Group: (please choose one):

_____ Caucasian
_____ African American
_____ Hispanic/Latino
_____ Asian/Pacific Islander
_____ Native American
_____ Other (specify): _________________________

Current Sexual Orientation (please choose one):

_____ Heterosexual
_____ Gay
_____ Bisexual
_____ Other (specify): _________________________

My height is: _____ ft. _____ inches.

What is your current weight? _____ lbs.