Examining the role of ethnicity in the nature and assessment of body image in men

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EXAMINING THE ROLE OF ETHNICITY
IN THE NATURE AND ASSESSMENT OF BODY IMAGE IN MEN

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Abstract

Although body image research has historically focused on dissatisfaction among women, studies within the past decade have begun to focus on body dissatisfaction among men, revealing important gender differences in the nature, conceptualization, and assessment of this construct. Despite recent advances in the research literature in this area, few studies have examined ethnic differences in male body image, and no information is available on the psychometric properties of many of the most widely used body image measures for samples of ethnic minority men. The purpose of the present research was to evaluate the psychometric properties of the Drive for Muscularity Scale (DMS), the Muscle Dysmorphic Disorder Inventory (MDDI), and the Bodybuilder Image Grid-Original (BIG-O) among Caucasian (n = 461) and African American undergraduate men (n = 151). Measurement invariance and differential item functioning analyses supported cross-ethnic similarities for the MDDI, but less support was found for the DMS. Additional psychometric analyses mostly supported the test-retest reliability, internal consistency, and construct validity of the three primary body image measures, though some subscales evidenced weaker support. Second, mediational analyses were conducted to examine the relationship between ethnic identity, sociocultural appearance attitudes, and body image and disordered eating in African American men. Finally, cross-ethnic comparisons revealed some differences in body image, disordered eating, sociocultural attitudes, and diet/exercise behaviors. Results are discussed in terms of the measurement of male body image in multiethnic samples and ethnic differences in body image and related constructs.
Introduction

Body image research has historically focused on dissatisfaction among women, typically characterized by the pursuit of the sociocultural thin ideal that pervades western societies. Body dissatisfaction among women has been well documented and research suggests that it is normative for women to report negative self-evaluations with respect to their bodies, as well as to endorse an extremely thin body type as their ideal (Rodin, Silberstein, & Striegal-Moore, 1985). Prospective studies have shown that body dissatisfaction among adolescent girls and women predicts subsequent increases in dieting and eating disorder symptoms, as well as maintenance of bulimic symptoms (Stice, 2002; Stice & Agras, 1998; Stice & Shaw, 2002). Furthermore, body dissatisfaction in women is associated with lower self-esteem, depression, and eating disorders (see Thompson, Heinberg, Altabe, & Tantleff-Dunn, 1999 for a review).

In an effort to identify factors that contribute to the etiology and maintenance of both body dissatisfaction and disordered eating in women, a substantial body of literature has focused on the role of sociocultural pressures to conform to the thin ideal (Levine, Smolak, & Hayden, 1994; Thompson, Coover, & Stormer, 1999). Tiggeman (2002) suggests that the current societal standards of beauty for women emphasize thinness to a degree that is virtually impossible to obtain via healthy means. These unrealistic and sometimes unhealthy depictions of the female body are present in numerous forms of media. For example, images of Miss American Pageant winners and models shown in Playboy centerfolds since the 1980s have dropped to a body mass index (BMI) that is considered underweight and that is associated with serious health consequences (Spitzer, Henderson, & Zivian, 1999). Furthermore, findings from a recent meta-analysis of 25
experimental studies revealed that women tend to experience greater increases in body dissatisfaction after viewing idealized images of the female body than after viewing images of average size models, plus size models, or inanimate objects (Groesz, Levine, & Murnen, 2002). Correlational research with female samples also links the frequency of exposure to idealized media images with problematic behavioral and psychological concerns including reduced self-esteem, weight concerns, and disordered eating (Harrison & Cantor, 1997; Stice, Schupak-Neuberg, Shaw, & Stein, 1994; Wilcox & Laird, 2000).

Given that a substantial proportion of the studies that comprise the existing body image literature have focused on examining body image concerns as correlates and/or risk factors for eating disorder psychopathology, it is no surprise that researchers traditionally operated under the assumption that men were less likely than women to experience body dissatisfaction (Smolak & Stein, 2006). However, within the last decade, research has begun to more fully address the unique body image concerns and related behaviors that occur among men and it is now clear that many men exhibit body dissatisfaction to varying degrees and in ways that are often unique from the traditionally conceptualized body weight and shape concerns among women.

Body Image in Men

The earliest studies reporting on body image in men most often included participants of both genders and conceptualized body dissatisfaction among men and women similarly (i.e., as focused on the drive for thinness or the desire to lose weight). A number of these early studies utilized silhouette scales (also referred to as figure rating scales) varying only in degree of body fat to assess the extent to which men were
dissatisfied with their body weight and shape (Fallon & Rozin, 1985; Zellner, Harner, & Adler, 1989). These scales have been widely used in the body image literature and require participants to select the silhouette figures (e.g., body shapes) that most closely resemble the individual’s current body type, the individual’s preferred/desired body type, and in many studies, which figure the individual believes represents what the opposite sex would rate as the ideal body type for that individual’s sex. Numerical values are assigned to each of the silhouette figures (e.g., 1 to 9 if there are nine figures, with smaller numbers assigned to silhouettes representing thinner body types) and then a difference score is calculated by subtracting the desired body type from the current body type. Larger discrepancies between the ideal and current body types are interpreted as being indicative of greater body dissatisfaction. The way the difference score is calculated (i.e., subtracting preferred from current body type) is consistent with body dissatisfaction in women as characterized by a drive for thinness, in which an individual would likely rate a higher numbered silhouette as her current body type and a lower numbered silhouette as her ideal, producing a positive difference score that suggests a desire to lose weight. In contrast, negative difference scores would represent dissatisfaction in the form of desiring a larger body type.

Several of the earliest studies utilizing silhouette scales to assess male body dissatisfaction revealed that, contrary to the fairly consistent results most commonly found among women (i.e., a normative level of body dissatisfaction), men were comparatively satisfied with their bodies. For instance, Fallon and Rozin (1985) examined body image perceptions among 248 male undergraduates from an Ivy League university (no demographic information was reported), with each participant endorsing
the figure corresponding to their current and ideal body type. The authors found that on
average, the men in their sample exhibited low body dissatisfaction, with each of the
responses corresponding to approximately equivalent figures. Similarly, Zellner and
colleagues (1989) found that the 33 male college students in their sample provided
comparable ratings for their current body figure, their ideal body figure, and the figure
that they believed women would find most attractive. In contrast, other studies using
similar silhouette measures found two distinct groups of men who exhibited body
dissatisfaction. Specifically, one group exhibited a desire for a larger body type while the
other group exhibited the more traditionally conceptualized desire for a smaller/thinner
body type (Cohn & Adler, 1992; Raudenbush & Zellner, 1997). For example, Cohn and
Adler (1992) assessed current and ideal body types, as well as perceptions of opposite-
sex and same-sex peer preferences for body type, in a sample of 118 mostly Caucasian
college men using both a silhouette scale and a single item question to assess body
weight dissatisfaction [e.g., “I wish I was… (a) a little thinner, (b) a lot thinner, (c) no
different, (d) a little heavier, (e) a lot heavier”]. Cohn and Adler found that the men in
their sample were approximately equally split between a desire for a larger (36%) and
smaller (34%) body size as assessed by the silhouette scales, and similar results were
found using the single item weight question, with 41.5% of men reporting a desire to be a
little or a lot thinner and 38% of men reporting a desire to be a little or a lot heavier.
Consistent with these findings, several studies have found that a substantial proportion of
young men report a desire to gain weight (e.g., Drewnowski & Yee, 1987; Furnham &
Calnan, 1998). For instance, in one study, Drewnowski, Kurth, & Krahn (1995) examined
body image and related behaviors in a sample of 2,088 incoming male college freshmen
at a large Midwestern university [mean age = 17.8 (0.6), BMI = 22.2 (2.9); data on ethnicity not reported]. The authors found that in their sample, 46% of men endorsed a desire to gain weight, while 32% endorsed a desire to lose weight.

Given the social stigma associated with overweight and obesity, it is unlikely that the men in these studies who reported a desire to gain weight wish to do so in the form of increasing body fat. Accordingly, researchers proposed that the large percentage of men endorsing desires for weight gain was likely a reflection of the desire to increase muscle mass (Drewnowski & Yee, 1987; Drewnowski et al., 1995). The findings of these studies and the conclusions about desires for greater muscularity among men spawned a new body of research focused on identifying the unique manifestations, correlates, and consequences of the multiple dimensions of male body dissatisfaction.

Recent advances in the understanding and conceptualization of body image among men support the notion that using traditional assessment measures that assess only body fat are insufficient to capture the multidimensional nature of male body image. Specifically, relying solely on the dimension of body fat neglects the important dimension of muscularity, which most researchers now recognize as fundamental to the sociocultural ideal male body in Western societies (Cafri & Thompson, 2004). In response to these limitations, other studies adapted traditional silhouette scales to assess body image using figures that vary in degree of muscularity as opposed to body fat (e.g., Thompson & Tantleff, 1992; Lynch & Zellner, 1999). For instance, Lynch and Zellner (1999) utilized a muscularity-based silhouette scale to examine body image in multiple samples, including a sample of 43 primarily Caucasian undergraduate men (mean age = 19.6, mean BMI = 23.4). The authors found that the undergraduate men exhibited body
dissatisfaction in the form of desiring a body that was substantially more muscular than their current body type. Overall, results from studies using silhouette scales based on muscularity versus body fat lend further support to the hypothesis that a substantial proportion of men desire a larger body size, specifically in the form of increased muscularity. While it is therefore clear that assessing muscularity-related concerns is vital when studying male body image, neglecting the body fat dimension also is problematic, particularly given that research suggests that the ideal male body in Western societies is characterized by a combination of leanness (i.e., low body fat) and high muscularity (Cafri & Thompson, 2007; Pope, Phillips & Olivardia, 2000). Consequently, researchers have argued that unidimensional silhouette scales that vary only along the individual dimensions of body fat or muscularity do not adequately assess the multidimensional construct of male body image (Cafri & Thompson, 2004).

The majority of the earliest studies of male body image, including those studies discussed above, have suffered from one or more major methodological limitations including small sample sizes, utilizing body image measures designed for and validated on primarily female samples, and a unidimensional focus on either body fat or muscularity. However, the considerable increase in male body image research within the last decade has produced significant improvements in the conceptualization and assessment of this construct. Contrary to findings from earlier studies suggesting that body image concerns were fairly uncommon among men, recent research has shown that a substantial proportion of men do experience body dissatisfaction, and there is evidence that the prevalence of these concerns is on the rise (Garner, 1997; Pope et al., 2000). Furthermore, research has clarified important gender differences in the nature and
experience of body dissatisfaction (Cafri & Thompson, 2007). Unlike the unidirectional body dissatisfaction most commonly endorsed by women (i.e., the drive for thinness), many men report simultaneous desires to reduce body fat (i.e., increase leanness) and increase muscle mass (i.e., the drive for muscularity). Men also differ from women in terms of their perceptions of overall body shape and composition, as well as the specific body areas of concern (Cafri & Thompson, 2004). For example, men are more likely than women to express a desire for weight gain in the form of increased muscle mass, particularly in the upper body (Cafri & Thompson, 2004; Vartanian, Giant, & Passino, 2001). Consistent with these findings, researchers now assert that the modern standard of attractiveness for men in Western societies is a lean and muscular build characterized by a well-developed upper torso (particularly chest and arms) and a slim lower torso (i.e., well defined abdominal muscles; Cafri & Thompson, 2007; Pope, Olivardia, Gruber, & Borowiecki, 1999).

Why is Body Dissatisfaction among Men on the Rise?

As noted above, some researchers have suggested that body dissatisfaction among men has been becoming more prevalent in recent years. However, one alternative theory is that this apparent increase is merely a function of the greater recognition and understanding of male body dissatisfaction. For example, as researchers have developed a more accurate conceptualization of the construct of body image in men, more appropriate assessment measures have been created and subsequently administered in recent studies. Therefore, any observed increase may actually be the result of more recent research accurately capturing body image concerns in men that previously went unnoticed. However, numerous studies point to apparent changes in the male body ideal over the
past few decades, as well as increases in exposure to this ideal in multiple media formats, both of which lend support to the notion that body image concerns may truly be becoming more common among men.

Changes in the Male Body Ideal

Some of the earliest studies to recognize the apparent shift in the sociocultural male body ideal, particularly with regards to the distinction between body weight and body shape, revealed that men’s magazines published significantly more articles and advertisements about changing body shape than about weight loss, pointing to the importance of overall physique versus just body fat among men (e.g., Andersen & DiDomenico, 1992). Since then, numerous studies have sought to examine changes in the male body ideal, providing evidence suggesting that the ideal has shifted over time to a substantially more muscular and lean body shape. For example, one study sought to examine whether cultural ideals of the male body have changed over the past 25 years by examining centerfold models in Playgirl magazines from 1973 to 1997 (Leit, Pope, & Gray, 2001). The results indicated that the male centerfold models have become increasingly lean and muscular over the past few decades, with this change particularly notable in images from the 1990s.

Other studies of this shift in the male body ideal have examined changes in the body types represented by childhood action figures. In one study, Pope and colleagues (1999) compared contemporary versions of G.I. Joe and Star Wars (Han Solo and Luke Skywalker) action figures to their counterparts that were originally produced in the late 1970s/1980s. Based on both visual inspection and anthropomorphic measurements, the authors found that the contemporary action figures were much more lean and muscular.
than their original counterparts, with many of the modern versions reflecting physiques consistent with or even beyond the bodies of advanced bodybuilders. Further, the authors concluded that, when extrapolated to a height of 70 inches, modern versions of the action figures exhibit muscular dimensions beyond the limits of the human body. In a similar, more recent study, Baghurst, Hollander, Nardella, and Haff (2006) compared five modern action figures (Batman, G.I. Joe, Hulk, Spiderman, and Superman) to their original counterparts from the 1970s, and with the exception of the waist, the circumference of the body parts (i.e., neck, arms, chest, thigh, and calves) were significantly larger when compared to the original designs. Finally, recent studies examining the current content of magazines that are targeted at a primarily male readership have revealed that the vast majority of male body images presented in these publications are characterized by low body fat (96%) and high muscularity (82%), with the content of the articles and advertisements focused more on appearance than on physical performance or overall fitness (e.g., Labre, 2005).

In sum, the literature suggests that the sociocultural male body ideal has become increasingly muscular and lean, such that media representations of the male body often reflect body types that would be difficult if not impossible for most men to achieve. However, studies also suggest that the frequency of exposure to media depictions of the ideal male body are increasing, thereby creating an environment in which men are frequently exposed to a body ideal that for many is unattainable. These repeated exposures could therefore result in body dissatisfaction resulting from the perceived discrepancy between one’s current body type and the desired ideal body type.
Changes in Frequency of Exposure to the Male Body Ideal

In addition to changes in the sociocultural male body ideal itself, researchers have proposed that the apparent increase in body dissatisfaction among men may be a function of exposure to ideal male bodies in various forms of popular culture and media having become more frequent over time (Morrison & Morrison, 2003; Pope et al., 2000). For instance, one study found that between 1980 and 1991, men’s fashion magazines printed an increasing number of articles on men’s weight and health concerns (Nemeroff, Stein, Diehl, & Smilack, 1994). The mechanism proposed to underlie this hypothesized relationship is based on the theory of social comparison, which posits that humans evaluate characteristics of personal or social importance by comparing themselves to others (Festinger, 1954). With regard to understanding influences on body dissatisfaction, in societies characterized by an emphasis on physical appearance and frequent exposure to idealized images of the male body (e.g., the United States and other Western cultures), men are frequently presented with opportunities to compare their bodies to the male bodies depicted in the media (Blond, 2008). In particular, when men make upward social comparisons to these media depictions of ideal bodies, they may evaluate themselves as less attractive than the ideal and experience a subsequent increase in body dissatisfaction (Blond, 2008; Lorenzen, Grieve, & Thomas, 2004).

In addition to body image evaluation, Morrison, Kalin, and Morrison (2004) have also noted the importance of body image investment, which refers to the extent to which an individual places value on his appearance, as well as the behaviors the individuals engages in to enhance his appearance. Specifically, the researchers have proposed that (a) various forms of media influence men’s perceptions of the ideal male body, (b) the media
emphasis on idealized bodies promotes the tendency for men to objectify their bodies (i.e., focus primarily on the aesthetic value of various body parts/areas), and (c) the discrepancy that men perceive between their current body type and the ideal promoted by the media is automatically equated to being unattractive. The theoretical and empirical literature therefore suggest that men’s bodies are being increasingly objectified in various forms of media, which promote the perception among men that their bodies are small, underdeveloped, or inadequate regardless of their true body shape (Johnson, McCreary, & Mills, 2007; Luciano, 2001)

As it is apparent that men are increasingly subjected to objectified and idealized male body images in multiple forms of media (e.g., television, movies, magazines), numerous studies have sought to utilize experimental methodologies to examine the extent to which exposure to these idealized media images produces changes in body image among men (e.g., Arbour & Martin-Ginis, 2006; Baird & Grieve, 2006; Stanford & McCabe, 2005). In one study, Lorenzen and colleagues (2004) sought to examine changes in body satisfaction among men in response to exposure to images of male bodies. Their sample included 104 primarily Caucasian male undergraduates [mean age = 20.2 (2.6)] from a mid-south university. Participants were randomly assigned to view magazine advertisements that depicted average male bodies or muscular male models, and results revealed that viewing normal male bodies produced no change in body image, while viewing muscular male model images produced an increase in body dissatisfaction. In a similar study, Baird and Grieve (2006) examined the effect of exposure to images of male models on body satisfaction in a sample of 173 primarily Caucasian undergraduate men [mean age = 19.6 (2.3)]. Participants were randomly assigned to view
advertisements collected from popular men's magazines (e.g., *FHM, Maxim, and Sports Illustrated*) that either portrayed muscular male models or neutral products (cologne or clothing with no images of the male body). The authors found that men who viewed advertisements with muscular male models exhibited an increase in body dissatisfaction, while no change was found among men who viewed the neutral product advertisements. More recently, Blond (2008) conducted a review and meta-analysis of fifteen experimental male body image exposure studies. Results of the meta-analysis revealed that across studies, men who were exposed to images of idealized male bodies in various formats (i.e., pictures, print advertisements, commercials) tended to exhibit a statistically significant decrease in body satisfaction. These findings mirror those found among women and support the hypothesis that sociocultural pressures to conform to gender-specific body ideals play a pivotal role in the nature and etiology/maintenance of body dissatisfaction.

**Correlates and Potential Consequences of Male Body Dissatisfaction**

Given that the prevalence of male body dissatisfaction appears to be increasing and that the male body ideal has shifted to a body type that is much more difficult to attain through normal means, numerous studies have sought to examine the psychological, social, and behavioral correlates and potential outcomes associated with male body dissatisfaction. Much of this research has mirrored the literature on female body dissatisfaction, which has implicated body image concerns as a risk factor for negative consequences including poor self-esteem, disordered eating, extreme dieting, and depression (e.g., Stice, 2002; Thompson et al., 1999). Studies suggest that similar associations are found among men. For instance, male body dissatisfaction may be
associated with some behaviors that are similar to those found among females with body dissatisfaction (e.g., excessive exercise), though others appear to be more unique to men (e.g., use of anabolic steroids).

**Psychological Correlates/Consequences**

The relationships between body dissatisfaction and various aspects of psychological functioning have been examined extensively among both men and women. Many studies have focused on the relationship between male body dissatisfaction and the specific variables of self-esteem and negative affect. For example, in a sample of 154 primarily Caucasian college men, Olivardia, Pope, Borowiecki, & Cohane (2004) found that self-esteem was negatively correlated with several facets of body dissatisfaction. Self-esteem was found to be more highly correlated with muscularity variables, suggesting that self-esteem in men may be more highly influenced by muscularity satisfaction than by body fat satisfaction. Consistent with this hypothesis, Tantleff-Dunn and Thompson (2000) also found that upper body muscularity dissatisfaction was associated with lower self-esteem in a sample of 68 primarily Caucasian college men. Additionally, studies suggest that there is an association between body dissatisfaction and negative affect in men. For example, in a sample of 368 primarily Caucasian undergraduate men, Bergeron and Tylka (2007) found a significant positive association between depressive symptoms and drive for muscularity in men. Similarly, Walker, Anderson, and Hildebrandt (2009) found that negative affect was positively associated with both muscularity dissatisfaction and associated body checking behaviors in a sample of 550 mostly Caucasian male undergraduates. In sum, although the cross-sectional nature of the majority of the studies that have been conducted make it difficult to evaluate
the causal relationships among these variables, research suggests that psychological variables such as self-esteem and negative affect are associated with body image, and it is likely that these variables function as both risk factors for and consequences of body dissatisfaction among men.

**Social Correlates/Consequences**

A large body of literature has examined sociocultural variables as risk factors for body dissatisfaction, but only a small number of studies have sought to examine the impact of body dissatisfaction on social functioning. For example, in a sample of 58 college men, Nezlak (1999) found that self-perceptions of body attractiveness were positively associated with the level of perceived intimacy in interpersonal interactions. More recently, Davison and McCabe (2005) examined the relationships between body image and various facets of psychosocial functioning among young men [mean BMI = 23.2 (3.6)], middle-aged men [mean BMI = 25.8 (3.8)], and older men [mean BMI = 26.8 (3.3)]. Results revealed that body image disturbance was related to problematic social and sexual functioning, but only in the sample of middle-aged men. In another study, Davison and McCabe (2006) sought to examine the relationship between body dissatisfaction and psychosocial functioning in adolescents. Among a sample of 245 adolescent boys between the ages of 12 and 15 years [mean BMI = 20.23 (2.9)], those who exhibited greater body dissatisfaction were found to report poorer opposite-sex interactions than were their more satisfied peers. In sum, although the literature on the social impacts of body dissatisfaction in men remains limited, evidence suggests that body image concerns are associated with some difficulties with interpersonal functioning.
Behavioral Correlates/Consequences

Perhaps one of the most widely studied topics in the male body image literature is the area of behavioral correlates of body dissatisfaction among men. As noted previously, body dissatisfaction in men may be associated both with potentially unhealthy muscle-gain behaviors (e.g., rigid workout schedules and anabolic steroid use) and more traditional disordered eating behaviors (e.g., excessive exercise and rigid dieting). Given that body image concerns among men appears to be on the rise, some researchers have suggested that there will be an associated increase in the negative consequences and potentially unhealthy behaviors associated with body dissatisfaction. For instance, Olivardia and colleagues (2004) have argued that a greater number of men may begin seeking cosmetic surgery, develop physical (i.e., skeletomuscular) problems resulting from excessive exercise and weightlifting, require treatment for disordered eating behaviors, and turn to the use of anabolic steroids or related precursors in their efforts to pursue increased muscularity.

Research also suggests that these unhealthy behaviors may be prevalent in boys as well as men. For example, studies have shown a weak to moderate relationship between body dissatisfaction and disordered eating behaviors among adolescent boys (Johnson, Grieve, Adams, & Sandy, 1999; Keel, Fulkerson, & Leon, 1997; McCabe, & Ricciardelli, 2006; Moore, 1990). Further, research suggests that the rates of anabolic steroid use among middle school students may be as high as 7.6-11.4% (Irving, Wall, Neumark-Sztainer, & Story, 2002; Smolak, Murnen, & Thompson, 2005). Similar results have been found in samples of young adult men. For instance, one study of young college men found that 27% had used bodybuilding supplements (e.g., ephedrine and creatine) or...
illicit substances to either gain muscle or lose fat (Olivardia et al., 2004). Research with samples of weightlifters and bodybuilders has revealed even higher rates, with one study reporting anabolic steroid use in 44.2% of their sample (Blouin & Goldfield, 1995).

**Muscle Dysmorphia**

As the prevalence of male body dissatisfaction focused on musculature concerns has become more widely recognized over the past two decades, researchers have begun to study the subset of men who exhibit extreme levels of musculature dissatisfaction, ultimately resulting in the identification of a proposed subtype of body dysmorphic disorder (BDD) called muscle dysmorphia (Pope, Gruber, Choi, Olivardia, & Phillips, 1997; Pope, Katz, & Hudson, 1993). Individuals diagnosed with BDD present as excessively concerned and preoccupied with a perceived defect in some aspect of his or her body or appearance. Similar concerns and preoccupations are seen in muscle dysmorphia, however the concerns are focused on an individual’s perceived lack of leanness or musculature. More specifically, muscle dysmorphia is characterized by attitudes (e.g., dissatisfaction with current body shape and a strong drive for musculature) and behaviors (e.g., excessive weight lifting, eating large quantities of high-protein foods, use of weight gain supplements, and use of anabolic steroids) associated with an extreme desire to develop a much more muscular body shape (Grieve, 2007). Although formal diagnostic criteria for muscle dysmorphia are still being developed, conceptualizations of the disorder require the presence of three criteria: (a) preoccupation with the perception that one’s body is not sufficiently lean and muscular, (b) the preoccupation causes clinically significant distress or impairment in social, occupational, or other important areas of functioning, and (c) the focus of the preoccupation and associated pathological
behaviors is on being too small or inadequately muscular and not on being overweight or fat (Olivardia, 2001; Pope et al., 2000).

A substantial proportion of men who exhibit the symptoms of muscle dysmorphia endorse avoiding people, places, and activities because of their perceived body defect (Olivardia, Pope, & Hudson, 2000). In particular, men with muscle dysmorphia report avoiding locations and situations where others might see their bodies, such as beaches and locker rooms. Many of these men may also engage in impairing behaviors including mirror checking (i.e., constantly looking in a mirror to assess a perceived defect in appearance) and reassurance-seeking behaviors (Pope et al., 1997). In one study, 24 male weight lifters with muscle dysmorphia were compared to 30 male weight lifters without muscle dysmorphia (Olivardia et al., 2000). The two samples were primarily Caucasian and differed only in terms of fat-free mass index (FFMI; an objective measure of an individual’s degree of muscularity), with the muscle dysmorphia sample exhibiting a significantly larger FFMI. Results revealed that men with muscle dysmorphia were more dissatisfied with their bodies, spent more time obsessing about muscularity, more frequently sacrificed social and work events in order to maintain their work-out schedule, more frequently concealed their appearance, and more frequently used anabolic steroids. Further, differences were found in the rates of co-occurring disorders. Specifically, men with muscle dysmorphia were found to have significantly higher rates of current and past mood, anxiety, and eating disorders.

Eating Disorders
In addition to muscle dysmorphia, numerous studies have sought to examine the nature and prevalence of eating disorders [i.e., bulimia nervosa (BN) and anorexia
nervosa (AN)] among men. Although full-threshold eating disorders occur less frequently in men than in women, research suggests that men comprise up to 5-10% of individuals with AN and 10-15% of individuals with BN, and the prevalence of clinically significant symptoms diagnosed as eating disorder not otherwise specified among men may be even higher (Carlat & Camargo, 1991; Carlat, Camargo, & Herzog, 1997; Weltzin et al., 2005). Studies also have revealed that men with eating disorders exhibit high levels of body dissatisfaction, comparable to the levels found among samples of women with BN (Olivardia, Pope, Mangweth, & Hudson, 1995).

Given that the nature of the differences between the male and female body ideals are associated with some different behaviors (i.e., behaviors directed at the drive for thinness in women and behaviors direct at both fat loss and gaining muscularity in men), studies have also sought to examine disordered eating at the symptom versus diagnostic level. For instance, O’Dea and Abraham (2002) found significant weight concerns and restrictive eating behaviors in approximately one quarter of their sample of 93 primarily Caucasian or Asian (57% and 30%, respectively) undergraduate men, with approximately one third reporting that they would be significantly distressed if unable to exercise as frequently as they desired. In another study, Whiteside and colleagues (2007) found that 8% of their sample of 284 college men from a large northwestern university reported experiencing an average of at least one eating binge per week during the previous three months. Most recently, Lavender, De Young, and Anderson (2010) examined the prevalence of traditional eating disorder behaviors in a sample of 404 primarily Caucasian (68%) undergraduate men [mean age = 19.0 (1.4), BMI = 25.3 (4.2)]. With respect to their behavior within the past month, 8% endorsed binge eating on average
once per week, 5% endorsed engaging in dietary restraint (i.e., going 8 hours without eating to influence weight or shape) on at least 13 days, and 4.5% endorsed engaging in excessive/compulsive exercise on at least 20 days.

Studies therefore suggest that young men may exhibit a variety of behaviors associated both with male specific dimensions of body dissatisfaction and eating disorder symptoms, including weight/muscle gain behaviors such as excessive weightlifting, the use of anabolic steroids, and the use of other licit or illicit appearance/performance enhancing drugs, as well as traditional disordered eating behaviors such as excessive exercise, rigid dieting for fat loss, and binge eating. Given that the mean age of onset for both muscle dysmorphia (Olivardia et al., 2000) and eating disorders (Braun, Sunday, Huang, & Halmi, 1999; Carlat et al., 1997) among men appears to be around the age of 19-20 years, college-aged men may be particularly at-risk for these issues, therefore emphasizing the need for further research on body dissatisfaction and related behaviors in this population.

Etiological Models of the Pursuit of Muscularity

Researchers have developed several conceptual models in an effort to elucidate the factors that contribute to the etiology and maintenance of disordered eating and body dissatisfaction in males across the lifespan. For example, Ricciardelli and McCabe (2004) have proposed a biopsychosocial model based on correlates and risk factors associated with disordered eating and the pursuit of muscularity among adolescent males. The model posits that a variety of risk factors and processes are associated with the etiology and/or maintenance of both outcomes. For example, biological variables including BMI and pubertal timing are conceptualized as potential risk factors associated with both
disordered eating and drive for muscularity behaviors. Similarly, psychological variables including negative affect, perfectionism, and low self-esteem are included as risk factors in models for both outcomes. Sociocultural risk factors included in both models include pressures to conform to the male body ideal from parents, peers, and the media, which is consistent with research noted previously suggesting the importance of body image investment as related to body dissatisfaction (Morrison et al., 2004). Similarly, Cafri and colleagues (2005) proposed a related model that integrates the physical and psychological consequences and risk factors associated with the pursuit of the muscular ideal. The majority of the risk factors mirror the biological, social, and psychological variables included in the model proposed by Ricciardelli and McCabe, although body dissatisfaction associated with both muscularity and body fat is conceptualized more prominently as a direct and indirect risk factor for potentially unhealthy behaviors associated with the drive for muscularity. Specifically, these health risk behaviors include use of anabolic steroids or related precursors and dieting for weight loss, weight gain, or to increase muscularity.

More recently, Grieve (2007) developed a conceptual model specifically designed to address the etiology of muscle dysmorphia. The proposed model integrates biological (e.g., body mass), behavioral (e.g., sport participation), social (e.g., media pressure), and psychological (e.g., negative affect, low self-esteem, perfectionism) factors. Body image concerns are viewed as a key mediator in this etiological model. Specifically, body dissatisfaction is conceptualized as being influenced by a variety of psychosocial variables and as indirectly affecting the symptoms of muscle dysmorphia via the related
variables of low self-esteem and body image distortion (i.e., an individual perceiving that they are smaller than they appear in reality).

In sum, research therefore suggests that body dissatisfaction among men is associated with a variety of negative physical, psychological, and social variables and functions as a risk factor for both disordered eating and potentially unhealthy behaviors associated with the drive for muscularity. Given the rates of exposure to images depicting the highly muscular and lean sociocultural male body ideal, many young men may be at substantial risk for engaging in a variety of unhealthy behaviors in an effort to attain this often unrealistic ideal. Therefore, additional studies are needed to investigate the nature and etiology of male body dissatisfaction and related behaviors in order to provide information that can be used in applied research focused on prevention and intervention efforts to address these issues.

Body Image in African American Men

As noted previously, the majority of studies that have examined body dissatisfaction among men have included samples of primarily Caucasian young men, such that few studies have had adequate sample sizes to allow comparisons of body dissatisfaction across ethnicities. However, due to the more extensive literature on body dissatisfaction among women, a larger number of studies have examined ethnic difference in female body image and the related construct of disordered eating. Further, numerous reviews of the nature of disordered eating and body dissatisfaction among women of different ethnicities have been completed (Crago, Shisslak, & Estes, 1996; Dounchis, Hayden, & Wilfley, 2001; Keel & Klump, 2003; Miller & Pumariega, 2001; Wildes, Emery, & Simons, 2001). For instance, Crago and colleagues (1996) concluded
that eating disturbances were less frequent among Caucasian females than among African American females and Wildes and colleagues (2001) concluded that Caucasian women experience greater body dissatisfaction and disordered eating than their non-white counterparts. These reviews therefore suggested that Caucasian females appeared to be at greater risk for both body image concerns and disordered eating behaviors. More recently, however, Shaw, Ramirez, Trost, Randall, and Stice (2004) have provided evidence suggesting that body image concerns and eating disturbance among women of different ethnicities may be more equivalent than previously believed. Additional studies are therefore needed to clarify the role of ethnicity in body dissatisfaction and eating pathology among women.

Although the body of literature on ethnic differences in male body dissatisfaction is smaller than the female literature, some studies have sought to examine ethnic differences in body dissatisfaction among men, particularly between Caucasians and African Americans. For instance, as part of a comprehensive health behavior survey administered to public school students in grades 7 through 12, Story, French, Resnick, and Blum (1995) examined ethnic differences in body image perceptions among adolescent males (n = 16,852) and females (n = 17,575). African American boys (8% of the male sample) were found to be more satisfied with their weight and proud of their body compared to Caucasian boys (85% of the male sample). However, a major limitation of the study was that both weight satisfaction and overall body pride were each measured using a single item (e.g., “At this time, how satisfied are you with your weight?”). More recently, Miller and colleagues (2000) examined body image among 120 African American, Caucasian, and Hispanic American male and female undergraduate
students (n = 20 for each group) recruited at a northeastern or southwestern university. Consistent with the findings from the Story and colleagues study, results revealed that African American men exhibited greater body satisfaction [as measured by two subscales of the Multidimensional Body-Self Relations Questionnaire (MBSRQ; Brown, Cash, & Mikulka, 1990) and the Body Esteem Scale total score (BES; Franzoi & Shields, 1984)] compared to both Caucasian and Hispanic men. In contrast, Chandler, Abood, Lee, Cleveland, and Daly (1994) found no differences in self-reported body dissatisfaction [as measured by the Body Dissatisfaction scale of the Eating Disorder Inventory (EDI; Garner, Olmstead, & Polivy, 1983)] among Caucasian men (n = 96) from a large public university in the southeast and African American (n = 65) men from a historically black college in the southeast. However, the EDI was originally developed for use with women. Though the measure has been validated for use with men (Spillane, Boerner, Anderson, & Smith, 2004), the Body Dissatisfaction scale does not assess the unique aspects of male body dissatisfaction (i.e., concerns related to muscularity or perceptions of being too small), focusing instead on traditionally female concerns that are more focused on body fat (i.e., concerns that hips, thighs, or buttocks are too large).

As part of a prospective epidemiologic study of cardiovascular risk factors among young adults, Smith, Thompson, Raczynski, & Hilner (1999) examined body image in a large sample of men and women recruited from cities around the United States (Birmingham, AL; Chicago, IL; Minneapolis, MN; Oakland, CA). During the 7th year of the study, body image was assessed using a traditional silhouette figure rating scale (figures varying in body fat) and two subscales (appearance evaluation and appearance orientation) of the MBSRQ (Brown et al., 1990). Results indicated that African
American men [n = 831, mean age = 32.5 (3.4), mean BMI = 26.0 (4.2)] were significantly more invested in physical appearance than Caucasian men (n = 1,007, mean age = 31.4 (3.7), mean BMI = 27.0 (5.3)], yet also exhibited greater body satisfaction. In another study that utilized a traditional figure rating scale, Demarest and Allen (2000) examined body image among 120 African American, Caucasian, and Hispanic American undergraduate men and women (n = 20 for each group). The researchers found no ethnic differences in body dissatisfaction among the male participants, with men from each ethnic group reporting relatively low levels of body dissatisfaction. In a third study using a figure rating scale based on body fat, Cachelin, Rebeck, Chung, and Pelayo (2002) examined body dissatisfaction in a large sample of men and women recruited from colleges, community organizations, churches, and various places of employment in the urban Los Angeles area. Results revealed that there were no differences in body dissatisfaction among Asian [n = 99, mean age = 24.1 (8.1), mean BMI = 23.6 (4.0)], African American [n = 76, mean age = 33.2 (11.5), mean BMI = 27.5 (6.8)], Caucasian [n = 84, mean age = 31.0 (12.0), mean BMI = 26.8 (4.4)], or Hispanic [n = 169, mean age = 22.2 (5.5), mean BMI = 26.9 (4.9)] men in the sample.

In sum, only a small number studies have sought to examine ethnic differences in body dissatisfaction among men. Of the studies that have addressed this topic, the majority have suffered from one or more major limitations including small sample size, use of inappropriate or inadequate measures, and failure to address the multiple dimensions of male body dissatisfaction. Consequently, findings regarding ethnic differences in body dissatisfaction among men have been mixed. Recently, Ricciardelli, McCabe, Williams, and Thompson (2007) sought to review the role of ethnicity and
culture in body image and disordered eating among males. The authors concluded that overall, existing research evidence suggests that African American males exhibit greater body satisfaction than Caucasian males. However, consistent with the limitations of the male body literature in general, the authors noted that the primary assessment instruments used in most of the older research studies were likely inadequate in terms of capturing the complex nature of male body image.

Ethnic Identity

Ethnic identity (EI) is viewed as being one component of social identity, referring specifically to the extent to which individuals perceive themselves to be part of and aligned with a particular ethnic group (Smith & Silva, 2011; Tajfel & Turner, 1986). This construct is conceptualized as a positive personal trait, with researchers arguing that an accurate self-identity should ideally incorporate an individual’s ethnic background (Smith & Silva, 2011). While much of the existing research has focused on EI among minority populations, ethnic identity is not unique to any one group and occurs in individuals from a variety of racial/ethnic backgrounds. However, EI is often viewed as a more important characteristic among individuals who are members of an ethnic minority group due to their greater experience of differentiation and discrimination (Smith & Silva, 2011; Tajfel & Turner, 1986). Given that ethnic identity is conceptualized as developing in response to interactions between two or more sociocultural groups over an extended period of time, this construct is particularly relevant among populations from ethnically diverse nations such as the United States (Phinney, 1990; Stojek, Fischer, & Collins, 2010).

Researchers have found that ethnic identity is positively correlated with psychological constructs including self-esteem, mastery, and coping, and a recent meta-
analysis of the association between EI and personal well-being (variables such self-esteem, coping ability, etc.) revealed a modest, but significant positive relationship, with a stronger relationship found among adolescents and young adults than older adults (Martinez & Dukes, 1997; Phinney, Cantu, & Kurtz, 1997; Roberts et al., 1999; Smith & Silva, 2011). Studies also suggest that EI is negatively correlated with facets of psychological distress. For example, depression and loneliness have been found to be negatively correlated with ethnic identity in a sample of African American (n = 1,237) and European American (n = 755) male and female adolescents (Roberts et al., 1999).

Overall, findings therefore suggest that individuals who identify more strongly with their ethnic group may exhibit increased resilience to various emotional, psychological, and behavioral difficulties.

*Ethnic Identity and Body Image*

Only a small body of literature has examined the relationship between ethnic identity and body image or the related construct of disordered eating, and the studies have primarily assessed this relationship among females. For example, Wood and Petrie (2010) examined the relationship between body dissatisfaction, internalization of the thin ideal, and ethnic identity in a sample of 322 African American female undergraduates [mean age = 20.2 (1.9), mean BMI = 26.1 (5.9)] recruited from five colleges and universities including two predominately Caucasian public universities, and three historically black universities/colleges. Results indicated that ethnic identity was positively associated with a measure of satisfaction with distinct body parts and negatively associated with internalization of the sociocultural thin beauty ideal. In another study, Stojek and colleagues (2010) examined a model in which positive
expectancies about restricting food and being thin mediated the relationship between ethnic identity and bulimic symptoms. The sample (N = 493) was composed of women from a variety of ethnic backgrounds, with Caucasians (n = 339) and African Americans (n = 47) representing the two largest groups. The hypothesized mediation was supported, with the significant negative association between EI and bulimic symptoms becoming non-significant after accounting for thinness and restricting expectancies. Thus, research supports the idea that EI is associated with body dissatisfaction and disordered eating in women, but evidence suggests that this association may be mediated by variables associated with sociocultural ideals and expectations regarding body image ideals.

To date, no studies have examined the associations between ethnic identity and body image among men. Given findings regarding the associations between ethnic identity and body image among women, as well as between ethnic identity and other positive and negative variables among men (e.g., positive associations with self-esteem and negative associations with depression), it is reasonable to theorize that ethnic identity would exhibit similar associations with body image and related variables among men. However, it may also be that ethnic identity is less relevant in the context of body image among men, particularly given that the ethnic differences in ideal body types among women (i.e., African American women endorsing a larger ideal body size than Caucasian women) may not be relevant for the male body ideal. Further research is therefore needed to examine ethnic differences in various dimensions of male body image, as well as potential ethnic differences in what is perceived as the ideal male body.
Male Body Image Assessment

The recognition of muscularity concerns as a major component of body dissatisfaction in men has promoted the development of numerous measures specifically designed to assess this construct. The most widely adopted measure to date is the Drive for Muscularity Scale (DMS; McCreary & Sasse, 2000), which contains two subscales measuring behaviors and attitudes associated with the desire to increase muscularity. Other available measures that have received less attention and use in the literature include the Swansea Muscularity Attitudes Questionnaire (SMAQ; Edwards & Launder, 2000) and the Drive for Muscularity Attitudes Questionnaire (DMAQ, Morrison, Morrison, Hopkins, & Rowan, 2004). While the specific focus of each of these measures varies somewhat, each addresses attitudes related to the pursuit of the muscular body ideal. However, other measures have been developed to assess the perceptual (versus attitudinal) aspects of male body image. For example, Hildebrandt, Langenbucher, and Schlundt (2004) developed the Bodybuilder Image Grid (BIG), which is a figure rating scale based on the traditional silhouette measures of body image. However, unlike the unidimensional scales previously used (i.e., presenting figures that varied either in degree of muscularity or degree of body fat), the BIG includes two dimensions, presenting figures that vary along both muscularity and body fat.

Other measures that address body image have been developed to specifically assess the symptoms associated with muscle dysmorphia. Examples of these measures include the Muscle Dysmorphic Disorder Inventory (MDDI; Hildebrandt et al., 2004), the Muscle Dysmorphia Inventory (MDI; Rhea, Lantz, & Cornelius, 2004), and the Muscle Appearance Satisfaction Scale (MASS; Mayville, Williamson, White, Netemeyer, &
Drab, 2002). Of these measures, the MDDI has been one of the most widely adopted and has been used in a variety of studies with clinical samples, as well as non-clinical community and undergraduate samples (e.g., Cafri, Olivardia, & Thompson, 2008; Hildebrandt, Schlundt, Langenbuchar, & Chung, 2006; Walker et al., 2009).

Although the assessment of body image in men has greatly improved during the last decade due to the development of these new measures, some limitations remain. One of the primary limitations is the lack information regarding the psychometric validity of the newer measures in ethnic minority samples. Each of the most widely used measures noted above were originally validated on primarily Caucasian male samples, and the majority of the studies that have utilized the measures have also had samples with only a small percentage of ethnic minority men. Therefore, the question of whether the psychometric properties of these measures are adequate in ethnic minority male samples and consistent with what have been found in primarily Caucasian samples requires empirical attention.

Current Study

Evaluating Measurement Invariance and Differential Item Functioning in Male Body Image Measures

The first purpose of the current study was to evaluate measurement invariance across African American and Caucasian undergraduate men for two measures of body image-related constructs: the DMS and MDDI. These measures have been used in previous studies in which African American men represented only a small or unknown percentage of the overall male sample, and though they have been widely used in the literature, no studies have examined their psychometric properties in African American
men or assessed for measurement invariance based on ethnicity. Measurement invariance refers to “whether or not, under different conditions of observing and studying phenomena, measurement operations yield measures of the same attribute” (Horn & McArdle, 1992, p. 117). Testing for measurement invariance allows for a determination of whether a given measure, which functions as an indicator of a particular latent variable, actually assesses the same construct across groups. More specifically, the measurements should relate to the underlying construct equivalently across the groups being tested, which is a requirement for valid and meaningful group comparisons to be made (Millsap & Kwok, 2004). When this requirement is not met, group comparisons become difficult if not impossible to interpret due to the fact that differences in the observed variable (e.g., score on a given body image measure) may be due to a true difference in the underlying construct (e.g., body image) or due to differences in how the observed variable relates to or assesses the underlying construct across the groups (Cheung & Rensvold, 2002).

A series of analyses were conducted as part of a multi-group confirmatory factor analysis (CFA) model to examine measurement invariance across Caucasian men and African American men for the two measures. First, confirmatory factor analyses were conducted separately to assess fit with the hypothesized measurement models for the two measures in each sample. Then, a series of CFAs were conducted to test for measurement invariance at three increasingly restrictive levels: configural (factor structure), metric (item factor loadings), and scalar (item intercepts). Specifically, the factors structures tested were those that had been previously determined via exploratory factor analyses in studies with primarily Caucasian samples: a two-factor structure (muscularity attitudes
and muscularity behaviors) for the DMS and a three-factor structure (drive to increase body size, intolerance of appearance, and impairment due to preoccupation with weight training) for the MDDI. It was hypothesized that the factor structures would be invariant at the configural level across the ethnic groups. However, given the difficulty in maintaining invariance at the more restrictive levels of item factor loadings and intercepts, no a priori hypotheses were made regarding invariance at these levels.

Second, differential item functioning (DIF) analyses were conducted to determine whether any of the items on the two measures exhibited a bias based on ethnic group membership. Caucasians were specified as the reference group, while African Americans were specified as the focal group (group where bias might be expected). A stepped approach was used to evaluate differential item functioning using several approaches that allowed for a test of both uniform and non-uniform DIF. However, given the lack of any substantial theory to suggest which particular items may exhibit ethnic bias, no a priori hypotheses were made about which items would exhibit DIF.

Examining the Relationship between Ethnic Identity, Sociocultural Appearance Attitudes, and Body Image/Disordered Eating in African American Men

A third goal of the research was to examine two models incorporating ethnic identity, sociocultural attitudes about appearance, disordered eating, and body image among African American men. Based on conceptual models proposed for and tested in multiethnic samples of women (e.g., Wood & Petrie, 2010), two separate mediation models were examined using structural equation modeling. Specifically, it was hypothesized that sociocultural appearance attitudes would mediate the relationships (a)
between ethnic identity and body satisfaction and (b) between ethnic identity and eating disorder symptoms among African American men.

Evaluating other Psychometric Properties of Male Body Image Measures

In addition to the DIF and measurement invariance analyses for the DMS and MDDI, another goal was to examine the basic psychometric properties for these two measures in both ethnic samples, including internal consistency, test-retest reliability, and construct validity for both ethnic samples. Further, the psychometric properties of a third male body image measure that has received limited use in studies with ethnically diverse samples, the Bodybuilder Image Grid-Original (BIG-O), were also assessed. The BIG-O is a perceptual measure of body image that was developed based on traditional unidimensional silhouette scales, but differs in that it provides a rating of both current and ideal body fat and muscularity, which are then used to calculate discrepancy indices. Specifically, the goal was to examine the test-retest reliability and construct validity of BIG-O in both ethnic samples.

Comparing Body Image and Related Constructs across African American and Caucasian Men

A secondary goal of the research was to compare the experience of body dissatisfaction (assessed by measures with validated psychometric properties in African Americans and Caucasians), disordered eating, sociocultural attitudes, and related behaviors (e.g., exercise, dieting, use of appearance/performance enhancing substances) among Caucasian and African American undergraduate men. No studies have assessed ethnic differences in muscle-gain strategies in men and few studies have examined ethnic differences in disordered eating behaviors (e.g., binge eating). Further, while several of
the previously discussed studies have examined differences in male body image across ethnicities, the current study extends the existing literature by using multi-dimensional measures of body image to examine differences across African American and Caucasian male undergraduates. Based on prior research, it was hypothesized that African American men would exhibit greater body satisfaction than Caucasian men as assessed by several measures, including a perceptual measure of satisfaction with body fat and muscularity, as well as measures of satisfaction with distinct body areas and overall appearance. Given the limited theoretical and empirical research on these topics, there were no a priori hypotheses regarding ethnic differences for the additional related behaviors.

Method

Participants

Participants (N = 612) were African American and Caucasian undergraduate/college men recruited from three sites in different geographical locations in the United States: the University at Albany, SUNY (SUNY Albany; Albany, NY), the University of South Florida (USF; Tampa, FL), and Jackson State University (JSU; Jackson, MS). SUNY Albany and USF are both large public universities with primarily Caucasian undergraduate populations, while JSU is a small public historically black college. Both African American and Caucasian men were recruited from SUNY Albany and USF, while only African American men were recruited from JSU. The final sample consisted of 151 African American men (n=61 from UA, n=19 from USF, n=71 from JSU) and 461 Caucasian men (n=337 from UA and n=124 from USF). Demographics for the total sample and each ethnic group are shown in Table 1. Further, a small subset of
participants (n = 10 African Americans and n = 12 Caucasians) completed a second assessment two weeks after their first assessment.

Measures

*Demographics and Exercise/Diet Habits.* The following demographic data was collected from participants: age, ethnicity, and height/weight. Additionally, exercise habits (including average weekly amount of aerobic exercise and weightlifting), dieting habits (including information on the purpose of dieting, including to lose weight and gain muscularity), and use of appearance and performance enhancing substances (APEDs; e.g., whey protein, creatine, etc.) were assessed.

*Drive for Muscularity Scale (DMS; McCreary & Sasse, 2000).* The DMS is a fourteen-item questionnaire that contains a seven-item muscularity-oriented body image subscale and a seven-item muscularity behaviors subscale (see Appendix). Each item is rated on a 6-point Likert-type scale from (1) always to (6) never, and all items are reverse scored. Total and subscale scores are calculated by averaging the respective items, with higher scores indicating a greater drive for muscularity. Previous research has shown the DMS to have good construct, convergent, and discriminant validity, as well as high internal consistency (McCreary & Sasse, 2000; McCreary, Sasse, Saucier, & Dorsch, 2004). The DMS has been the most widely used measure of muscularity attitudes and behaviors in both men and women. It was selected for the present investigation because of its wide use in the literature and because it includes items assessing both attitudes and behaviors associated with pursuit of the muscular ideal.

*Muscle Dysmorphic Disorder Inventory (MDDI; Hildebrandt et al., 2004).* This thirteen-item measure assesses symptoms and behaviors consistent with muscle
dysmorphia (see Appendix). The measure contains three subscales: drive to increase body size (five items), intolerance of appearance (four items), and impairment in daily activities due to preoccupation with weight training (four items). Items are rated on a 5-point Likert-type scale ranging from 0 (never) to 4 (always). Total and subscale scores are calculated by summing the respective items, with higher scores reflecting greater muscle dysmorphia symptoms. The MDDI has shown good test-retest reliability and good internal consistency (Hildebrandt et al., 2004; Hildebrandt et al., 2006). Although the MDDI is not specifically a measure of body image, it was selected because it includes subscales assessing both body dissatisfaction as well as the behavioral consequences associated with these appearance concerns.

*Bodybuilder Image Grid-Original (BIG-O; Hildebrandt et al., 2004).* The BIG-O is a silhouette scale designed to measure perceptual disturbances in body image among men. Thirty male figures are presented in front and profile view on a 6x5 grid that systematically varies body fat (left to right) and muscularity (top to bottom). Body fat is rated from 1 to 6 and muscle mass from 1 to 5. Scores represent the direction and magnitude of desired change (Desired-Current) in body image along a dimension of fat (Desired Fat) and a dimension of muscularity (Desired Muscle). Men were instructed to rate the following: (1) the figure that best represents their current body type and (2) the figure that best represents their ideal body type. The BIG-O has been shown to exhibit good test-retest reliability, convergent validity, and discriminant validity (Hildebrandt et al., 2004). The BIG-O was selected because it is a perceptual measure of body image that provides data regarding the extent to which one’s current body differs from one’s preferred/desired body in terms of both body fat and muscularity dimensions. Although
only limited psychometric analyses can be conducted with this measure (e.g., test-retest reliability and construct validity analyses), the inclusion of this perceptual measure allowed for a more thorough assessment of the multidimensional construct of male body image.

_Multidimensional Body-Self Relations Questionnaire-Appearance Scale_ (MBSRQ; Brown et al., 1990). This 34-item measure assesses body image as a multidimensional construct. Three subscales from this measure were utilized in the present investigation: (1) the nine-item Body Area Satisfaction Scale (BASS) that assesses satisfaction with specific body areas; (2) the seven-item Appearance Evaluation subscale that measures overall satisfaction with one's appearance; and (3) the twelve-item Appearance Orientation subscale that measures investment in appearance. Each item is rated on a 5-point Likert-type scale from (1) definitely disagree to (5) definitely agree, and scores for each scale are calculated by summing the respective items. The measure has evidenced good psychometric properties and has been used in studies with ethnically diverse samples of men and women (e.g., Giovannelli, Cash, Henson, & Engle, 2008; Miller et al., 2000; Rucker & Cash, 1992; Smith et al., 1999). The MBSRQ is one of the few appearance-related measures that was originally validated on a large and ethnically diverse sample of both men and women (Cash & Winstead 1985; 1986), and it has been the most widely used multidimensional measure in studies of body image among ethnic minority men. This measure was selected to assess the construct validity of the primary measures and was also utilized in the cross-ethnic comparison analyses.

_Eating Disorder Examination-Questionnaire (EDE-Q; Fairburn & Beglin, 1994)._ The EDE-Q is a 28-item self-report questionnaire that assesses eating disordered attitudes
(e.g., fear of gaining weight, desire to be thin, dissatisfaction with body shape) and behaviors (e.g., binge eating, purging, and fasting), and is the most widely used self-report measure of disordered eating. Derived from the gold standard Eating Disorder Examination (EDE) interview, the EDE-Q provides a global score, as well as subscale scores related to various aspects of eating pathology (dietary restraint, eating concerns, shape concerns, and weight concerns). Items are rated on a seven-point Likert-type scale from 0 to 6 (anchors vary depending on the item) and higher scores reflect greater eating-related pathology. The EDE-Q has received psychometric support for both reliability and validity, has been used in a variety of studies with ethnically diverse samples, and psychometric data and norms are available specifically for male undergraduates (e.g., Lavender et al., 2010; Peterson et al., 2007; Reas, Grilo, & Masheb, 2006). This measure was included in order to have a measure of eating disorder pathology for the meditational analyses and the ethnic comparison analyses, and was selected due to its wide use in the literature among samples of both men and women.

*Eating Disorder Inventory-2* (EDI-2; Garner, 1991). Three subscales of the EDI-2 were used in the present investigation: Drive for Thinness (7 items; assessed the desire to become thinner), Body Dissatisfaction (9 items; assesses dissatisfaction with the body, particularly in reference to body fat), and Bulimia (6 items; assesses attitudes and behaviors consistent with BN). Each item is rated on a six-point scale from (1) never to (6) always, and the raw scores are recoded such that “always” is scored as a 3, “usually” is scored as a 2, and “often” is scored as a 1, with the remaining response options coded as 0. Scores for each of the subscales are calculated by summing the recoded items, and larger scores are indicative of greater eating-related pathology. Although originally
developed for and validated on samples of women, the EDI-2 has been found to be comparable across gender and is thus considered to be a valid measure in men (Spillane et al., 2004). This measure was included as a reference measure for the construct validity of the primary measures, was included in the cross-ethnic comparison analyses, and was selected because of its wide use in prior studies with multi-ethnic samples of men and women.

_Sociocultural Attitudes Towards Appearance Questionnaire-3 (SATAQ-3; Thompson, van den Berg, Roehrig, Guarda, & Heinberg, 2004)._ The SATAQ-3 is a 30-item self-report questionnaire that assesses various dimensions of media influences on body image and has four subscales: the 9-item Information subscale that assesses the importance of obtaining information about being attractive from various forms of media; the 7-item Pressures subscale that assesses feeling pressured by media to strive for physical appearance ideals; the 9-item Internalization-General subscale that assesses acceptance and endorsement of messages about unrealistic ideal images presented by media; and the 5-item Internalization-Athletic scale that assesses acceptance and endorsement of an athletic body ideal. Each item is rated on a 5-point Likert-type scale from (1) definitely disagree to (5) definitely agree, and subscale scores are calculated by summing the respective items. The three versions of the SATAQ have evidenced good psychometric properties in numerous studies, including with diverse groups of college men and women (Cash, Melnyk, & Hrabosky, 2004; Cashel, Cunningham, Landeros, Cokley, & Muhammad, 2003). A version of the SATAQ-3 that has been previously modified and has evidenced good psychometric properties in male samples was utilized in the present investigation (e.g., items reworded to focus on muscularity versus thinness;
Smolak, Levine, & Thompson, 2001). The measure was selected to include in the meditational analyses examining the relationship between ethnic identity, appearance attitudes, and the variables of body dissatisfaction and disordered eating in African American men. The measure was also included in the cross-ethnic comparison analyses.

*Multigroup Ethnic Identity Measure* (MEIM; Phinney, 1992). The 14-item Ethnic Identity scale of the MEIM assesses affirmation and belonging (e.g., “I have strong sense of belonging to my own ethnic group”), ethnic identity achievement (e.g., “I have spent time trying to find out more about my own ethnic group, such as its history, traditions, and customs”), and ethnic behaviors (e.g., I am active in organizations or social groups that include mostly members of my own ethnic group”). Items are rated on a four-point scale ranging from (0) strongly disagree to (3) strongly agree. Scores for the EI scale are calculated by summing the items, and higher scores reflect a stronger ethnic identity. Studies support the psychometric properties of this measure in multiethnic samples, and a review of twelve studies utilizing the MEIM-EI scale reported a mean Cronbach’s alpha coefficient of .85 for the measure (e.g., Ponterotto, Gretchen, Utsey, Stracuzzi & Saya, 2003; Roberts et al., 1999). The measure was selected for use in the mediation analyses examining the relationship between ethnic identity, sociocultural appearance attitudes, and the variables of body dissatisfaction and disordered eating.

**Procedure**

Participants completed measures either in a small classroom setting, in a laboratory setting, or online via the survey collection website survey-monkey.com, and the order of the primary body image measures was counterbalanced to control for order effects. Recruitment methods varied across the three sites. At SUNY Albany, participants
were recruited through the psychology department research pool and through flyers
posted around the campus. At USF, participants were recruited through the psychology
research pool, and at JSU, participants were recruited in psychology and history courses.
As compensation, participants received either credit towards a research requirement for
their major, extra credit in a specific course, or $5. Further, the subset of participants who
completed the second assessment received $5 as compensation.

Data Analytic Approach

*Measurement Invariance.* In the current study, Mplus version 4.21 (Muthen &
Muthen, 2007) was utilized to conduct a series of analyses as part of a multi-group
confirmatory factor analysis (CFA) model to examine measurement invariance across
Caucasian men and African American men for the Drive for Muscularity Scale and the
Muscle Dysmorphic Disorder Inventory (e.g., Byrne, Shavelson, & Muthen, 1989;
Cheung & Rensvold, 1999; Horn & McCardle, 1992; Hoyle & Smith, 1994). However,
before proceeding with the measurement invariance analyses, CFA was used to test
whether the hypothesized factor structures for the primary measures fit the data for the
two separate groups of Caucasian and African American men. CFAs were also conducted
to examine the fit of a more parsimonious one-factor solution for each measure, the
results of which were then compared to the model fit of the hypothesized factor
structures. Measurement invariance can be tested at several levels, and in the current
study, three specific forms of invariance were examined: configural invariance (weak
factorial invariance), as well as metric invariance and scalar invariance (strong factorial
invariance; Horn & McCardle, 1992; Vandenberg & Lance, 2000). Each of these
measurement invariance tests is more restrictive than the test conducted in the previous
The first level of measurement invariance assessed was the configural invariance, which tests whether the measurement model has the same form for the two groups, such that items should load on the same factors for both groups if invariance is supported (Vandenberg & Lance, 2000). Change in fit from the baseline model to the configural model was examined to assess for invariance. At the second level, metric invariance was assessed to determine whether the factor loadings of the items were invariant across the two groups. This was accomplished by constraining the factor loadings to be equal across groups, and then assessing change in model fit compared to the configural model. If the model is found to fit the data well with the factor loadings constrained and does not exhibit a significant decline in fit compared to the configural model, then metric invariance is supported. Finally, the third level of measurement invariance assessed in the current study was scalar invariance, which tested for invariance of the item intercepts by constraining the intercepts to be equal. Change in fit from the baseline model was then examined to determine whether invariance was supported at the scalar level.

Because assessments of metric and scalar invariance establish invariance of the factor loadings and intercepts in addition to verifying an invariant factor structure, they are considered tests of strong factorial invariance (Hofmans et al., 2009; Horn & McArdle, 1992; Vandenberg & Lance, 2000). The stepwise approach described above requires support for invariance at a given level before proceeding to the next level (i.e., conducting metric invariance tests requires support for invariance of the individual sample models and the configural invariance model). Various recommendations have been made about how to proceed with a measure that does not exhibit both weak and
strong factorial invariance. The most conservative approach that has been suggested is to not use the measure at all to make cross-group comparisons. However, researchers have noted that it is rare for all items to exhibit measurement invariance at each level, particularly in the context of cross-ethnic and cross-cultural measurement invariance research (Cheung & Rensvold, 1999). A lack of support for invariance at the configural level is the most problematic, as it suggests that the measure may be assessing different latent constructs in the two groups and therefore precludes the possibility of making valid and meaningful group comparisons on the measure subscales. A lack of strong factorial invariance (metric and scalar) can also be problematic, as it suggests that the meaning of the items may vary across groups and that the way the items related to the underlying construct are different between the groups. This is conceptually similar to differential item functioning, in that the latent variable (total score) may be equivalent across groups, while scores on a non-invariant item would differ. In such situations, the decision can be made to not make groups comparisons on the measure, to simply identify and delete non-invariant items from the scale, or to proceed with the non-invariant items and assess for partial invariance. Partial measurement invariance tests can be utilized when the lack of invariance at a given level is due to one or more specific items, versus all items being invariant across the groups (Byrne et al., 1989; Cheung & Rensvold, 1999). For instance, if the results of a metric invariance test suggest a lack of invariance of the factor loadings across groups, it is possible that the result of this omnibus test is related to just some of the factor loadings exhibiting group differences. Therefore, support for partial measurement invariance is found when some item parameters are found to be invariant across groups and others are not.
Robust maximum likelihood estimation was used for all of the confirmatory factor analyses, and model fit was evaluated via the Comparative Fit Index (CFI), the Root Mean Square Error of Approximation (RMSEA), and the Standardized Root Mean Square Residual (SRMR). Cut-offs for adequate fit included the following: CFI > .90, RMSEA < .08, SRMR < .08, with CFI < .90, RMSEA > .10, and SRMR > .10 suggesting poor fit. Change in model fit between levels of measurement invariance was assessed using a $\chi^2$ difference test and the $\Delta$CFI (with <.01 indicating a non-significant reduction in model fit; Cheung & Rensvold, 2002). Numerous options are available to assess model fit in the multi-group CFA framework, including the $\chi^2$ difference test and the $\Delta$CFI utilized in the present study. Rather than relying on only one fit index, these two indices were selected to provide a more robust test of invariance. For example, although the $\chi^2$ test is one of the most commonly used CFA fit indices, it is highly influenced by sample size and may therefore be overly conservative. Therefore, the $\Delta$CFI was also assessed in the current study. Finally, modification indices were examined to identify any localized areas of strain in the initial measurement models. Full information maximum likelihood estimation was used to handle missing data, and overall, less than 0.002% of data for the measurement invariance analyses was missing.

**Differential Item Functioning.** Broadly defined, DIF refers to the situation in which a particular group (e.g., gender, ethnicity, etc) is found to exhibit differential responses to an item after matching the target (focal) and reference groups’ scores on the overall construct the item is supposed to measure. DIF can take two forms, including uniform and non-uniform. Items that exhibit uniform DIF are biased against one group across the entire range of total scale scores (e.g., Caucasian men being more likely than
African American men to endorse a higher response option on the weightlifting to build muscle item on the DMS, even when their total DMS scores are equal). In contrast, items that exhibit non-uniform DIF are not equally biased against one group across the full range of total scores (e.g., Caucasian men being more likely than African American men to endorse a higher response option on the weightlifting to build muscle item on the DMS, but only when their DMS total scores are high).

The decision was made to conduct DIF analyses in addition to the measurement invariance analyses in order to provide a further test of measure consistency across the two ethnic groups. In the measurement invariance approach described above, invariance across groups is not supported for a particular item when the factor loadings (metric invariance level) or item intercepts (scalar invariance level) for that item are substantially different in the groups being compared. In contrast, the DIF analyses examine whether the score on a given item is found to differ between groups after accounting for the total score. For instance, if group membership (uniform DIF) or the group membership X total score interaction (non-uniform DIF) terms contribute variance above and beyond total score, then that item is said to function differentially for the two groups. Therefore, while both the DIF analyses and the multi-group CFA approach are broadly similar in that they are both used to assess for consistency in item performance across groups, the underlying assumptions and specific analytic approaches are distinct.

Analyses to detect DIF can be applied to measures with binary response options (dichotomous items) or Likert-type response options (polytomous items), and numerous statistical approaches are available to detect both types of DIF. For example, some researchers have noted the benefits of approaches based on item response theory (IRT;
e.g., de Ayala, 2009), which can be used to examine the relationship between an individual’s score on a latent trait and the likelihood of endorsing a given response option. Other techniques are based on classical test theory (CTT), such as those used in the current study, including the Mantel Chi-Square (Mazor, Clauser, & Hambleton, 1992), the Liu-Agresti Cumulative Common Log-Odds Ratio (L-A LOR; Liu & Agresti, 1996), Cox’s Noncentrality Parameter Estimator (Cox’s B; Penfield, 2007b), and logistic regression. The Mantel chi-square, an extension of the Mantel-Haenszel chi-square (MH; Mantel & Haenszel, 1959) used for dichotomous items, is distributed as a chi-square with one degree of freedom. The L-A LOR statistic assesses the log odds ratio of one group endorsing a response option relative to the other group, with negative values suggesting DIF favoring the focal group positive values suggesting DIF favoring the reference group. The log-odds ratio is asymptotically normally distributed. Additionally, Cox’s B is similar to the MH chi-square approach, but instead utilizes the hypergeometric mean and is distributed approximately as standard normal (Penfield, 2007b). Similar to the L-A LOR statistic, negative Cox’s B values favor the focal group while positive values favor the reference group. Although the three CTT approaches noted above can be useful in detecting uniform DIF, they are limited in their ability to detect nonuniform DIF. Therefore, the fourth approach utilized in the current study was logistic regression, which is based on the idea that group membership term (which tests uniform DIF) and the group membership x total score interaction term (which tests nonuniform DIF) should not contribute unique variance in predicting a given item score after accounting for the total score on the measure of interest.
In the current study, a stepped approach was followed, such that the Mantel chi-square was first used to identify items with potential DIF, and among those items, the additional statistics were examined to provide further evidence for the presence of DIF. The analyses were conducted using Penfield’s Differential Item Functioning Analysis System program (DIFAS 5.0; Penfield, 2007) and PASW Statistics 18 (used to conduct logistic regression analyses). The Caucasian sample was designated as the reference group, with the African American sample designated as the focal group. Because of the number of items being examined, an alpha value of p<.001 was selected to evaluate significance in the DIF analyses, corresponding to the following cut-offs: Mantel $\chi^2 = 10.83$, L-A LOR $> |0.64|$, and Cox’s B $\geq |0.40|$.

Mediation Analyses. The two hypothesized mediation models were tested with a bootstrapping analytic approach in structural equation modeling using Mplus version 4.21 (Muthen & Muthen, 2007). SEM was selected in place of regression due to its advantages with respect to modeling and examining meditated effects (i.e., accounting for measurement error), and the bootstrapping analysis was utilized in order to obtain more accurate confidence intervals of the direct and indirect effects. The latent Ethnic Identity (EI) and latent Sociocultural Appearance Attitudes (SAA) constructs were specified as predictors of (a) latent Eating Disorder Symptoms (ED) in the first model and (b) latent Body Satisfaction (BS) in the second model. A two-step approach was used to examine the two mediational models, with confirmatory factor analyses first conducted to identify a good-fitting measurement model for the three constructs in each mediational model (Anderson & Gerbing, 1988). The variance of each factor was fixed to 1.00 to provide a metric for the three latent constructs (Byrne, 1989). The MEIM-EI subscales of
affirmation and belonging, ethnic identity achievement, and ethnic behaviors were selected as indictors for latent Ethnic Identity; the SATAQ-3 subscales of information, pressures, internalization-general, and internalization-athletic were selected as indictors for latent Sociocultural Appearance Attitudes; the EDE-Q subscales of restraint, eating concern, weight concern, and shape concern were selected as indicators for latent Eating Disorder Symptoms; and the MBSRQ-AS subscales of appearance evaluation and BASS were selected as indicators for latent Body Satisfaction.

Robust maximum likelihood estimation was used for all CFA and SEM analyses, and model fit was evaluated based on CFI (> .90), RMSEA (< .08), and SRMR (< .08). Modification indices were examined to identify any localized areas of strain in the measurement model, and adjustments to the model were made as necessary. Full information maximum likelihood estimation was used to handle missing data, and only approximately 0.01% of the data were missing for the mediation analyses. Next, in order to examine the indirect effect of sociocultural appearance attitudes as a mediator between EI and the eating disorder symptom and body satisfaction variables in the two models, bootstrapping mediation analyses were conducted to obtain confidence intervals of the indirect effect. Specifically, the bias-corrected bootstrapping method (5000 resampling iterations) was used to assess whether the indirect effect was significantly different from zero. This approach is a non-parametric resampling method that is useful for testing the mediated effect because the large number of bootstrapped samples yields more accurate confidence intervals (Efron, 1987).

Additional Psychometric Analyses. Internal consistency, test-retest reliability, and construct validity was examined for the DMS and MDDI total and subscale scores using
zero-order correlations for both ethnic samples. Zero-order correlations were also used to examine the test-retest reliability and the construct validity of the BIG-O, including the four variables of current body fat rating, current muscularity rating, and the body fat and muscularity discrepancy indices. The measures and variables used to assess construct validity included the MBSRQ-AS BASS and appearance evaluation subscales, the EDI bulimia, body dissatisfaction, and drive for thinness subscales, and the average weekly hours of aerobic exercise and weight lifting.

**Ethnic Comparisons.** Further analyses were conducted to compare body image, disordered eating, sociocultural variables, and dieting/exercise variables between the samples of African American and Caucasian undergraduate men. Specifically, a series of independent samples t-tests were conducted to compare the two groups on the MBSRQ-AS subscales, the EDE-Q total and subscale scores, the EDI subscales, the SATAQ-3 subscales, and weekly hours of aerobic exercise and weightlifting. Additionally, \( \chi^2 \) analyses were conducted to determine whether there were group differences in (a) following an exercise routine to alter body weight/shape, (b) following a specific diet to alter body weight/shape, and (c) current use of appearance and performance enhancing substances. Given the number of comparisons, a Bonferroni corrected value of \( p < .00125 \) \((.05/40)\) was used to evaluate significance.

**Results**

**Measurement Invariance**

**Multivariate Normality.** Given the assumption of multivariate normality in Structural Equation Modeling (SEM) analyses, data for the DMS and MDDI were first examined to determine whether this assumption was met. Multivariate normality was
tested using the SPSS macro developed by DeCarlo (1997), and results of the omnibus test for multivariate normality based on Small’s statistic revealed that the distributions for the DMS among African Americans $[\chi^2(28) = 174.82, \ p<.001]$ and Caucasians $[\chi^2(28) = 891.81, \ p<.001]$, as well as the MDDI among African Americans $[\chi^2(26) = 526.18, \ p<.001]$ and Caucasians $[\chi^2(26) = 552.47, \ p<.001]$, were multivariate non-normal. Models were therefore fitted using robust maximum likelihood estimation, which is recommended when multivariate normality is not supported.

*Drive for Muscularity Scale.* A series of analyses were conducted as part of a multi-group confirmatory factor analysis (CFA) model to examine measurement invariance across Caucasian men and African American men for the Drive for Muscularity Scale. In the first analysis, two CFAs were conducted to assess whether the DMS factor structure fit the data for each ethnic group separately. The first analyses revealed questionable fit for both the African American (CFI = .86, RMSEA = .11, SRMR = .08) and Caucasian (CFI = .87, RMSEA = .11, SRMR = .09) samples. However, an examination of the modification indices suggested correlated error terms for DMS items 3 and 4 (behaviors subscale), and DMS items 13 and 14 (attitudes subscale). Given that the content of these items are similar, with items 3 and 4 (behaviors subscale) both referring to the use of protein (i.e., DMS3 = “I use protein or energy supplements” and DMS4 = “I drink weight gain or protein shakes and items”) and items 13 and 14 (attitudes subscale) both referring to upper body muscularity (i.e., DMS13 = “I think that my arms are not muscular enough” and DMS14 = “I think that my chest is not muscular enough”), this is conceptually consist. The model therefore was respecified with the correlated error terms for these two sets of items, resulting in an adequate fit for both
groups (see Table 2). Further, in order to compare the hypothesized two-factor structure with a more parsimonious one-factor solution, two additional CFAs were conducted to compare the one-factor (which also included the correlated error terms noted above) and two-factor solutions. For both Caucasians (CFI = .71, RMSEA = .17, SRMR = .15) and African Americans (CFI = .83, RMSEA = .12, SRMR = .10), the one-factor solution resulted in a substantially poorer fit than the two-factor solution.

Next, the first multi-group CFA was conducted to assess for configural invariance (i.e., factor structure equality across groups). This first multi-group model then served as a baseline model against which the subsequent models testing metric and scalar invariance were evaluated. As hypothesized, results indicated adequate support for the presence of configural invariance (CFI = .93, RMSEA = .08, SRMR = .06), therefore providing evidence for equal form (factor structure) for both African American and Caucasian men. A second multi-group CFA was then conducted to determine whether the factor loadings were invariant across the two groups. In this model, factor loadings were constrained to be equal across the two ethnic groups and then change in model fit was assessed. Small (or non-significant) decreases in model fit are interpreted as supporting metric invariance. Specifically, because the only change from the baseline model is the constraint of factor loadings being equal, a significant decrease in model fit would suggest that the factor loadings are not equal across the groups. Results were mixed, with the $\chi^2$ difference test suggesting a significant decline in fit, while the $\Delta$CFI was below .01. Given the conflicting findings, and taking a more conservative approach, partial invariance analyses were conducted using an iterative approach in which the factor loading for each item was constrained individually to determine whether the presence of
metric invariance was the result of only a few items. This approach identified three items (DMS3, DMS7, DMS11), and when the factor loadings of these three items were allowed to vary between the two groups, the partial metric invariance model was supported, with a non-significant $\chi^2$ difference test and $\Delta$CFI < .01 (see Table 2).

Finally, a third multi-group CFA was conducted to determine whether the item intercepts were invariant across the two groups. In this model, the item intercepts were constrained to be equal across the two ethnic groups and then the change in model fit was assessed. Results of this analysis did not support scalar invariance, with both the $\chi^2$ difference test and the $\Delta$CFI suggesting a significant decline in fit. Partial scalar invariance analyses were then conducted following the same iterative approach described above (i.e., constraining one item intercept at a time), and the results were mixed based on the criterion used to assess change in model fit. Based on the $\chi^2$ difference test, only four items were invariant based on p<.05 (6 items based on p<.01). However, $\Delta$CFI for all items was < .01. Taken together, the results of these measurement invariance analyses therefore suggest mixed support for the invariance of the DMS across ethnicity, with configural variance supported, partial metric invariance supported, and no support for scalar invariance (with very limited or no support for partial scalar invariance).

**Muscle Dysmorphic Disorder Inventory.** The same steps as outlined above for the DMS were followed to assess measurement invariance for the MDDI. Two CFAs conducted to assess whether the MDDI factor structure fit the data for each ethnic group separately again revealed questionable fit for both the African American (CFI = .89, RMSEA = .09, SRMR = .07) and Caucasian (CFI = .91, RMSEA = .09, SRMR = .07) samples. However, an examination of the modification indices suggested correlated error
terms for MDDI items 1 and 4 (drive for size subscale), items 10 and 12 (impairment subscale), and items 11 and 13 (impairment subscale). Given that the content of these items are highly similar, with items 1 and 4 referring to wanting to be bigger (i.e., MDDI1 = “I wish I could get bigger” and MDDI4 = “I wish my arms were bigger”), items 10 and 12 referring to experiencing negative affect in response to missing a workout day (i.e., MDDI10 = “I feel depressed when I miss one or more workout days” and MDDI12 = “I feel anxious when I miss one or more workout days”), and items 11 and 13 referring to passing on social opportunities due to a workout schedule (i.e., MDDI11 = “I pass up chances to meet new people because of my workout schedule” and DMS 13 = “I pass up social activities … with friends because of my workout schedule”), this was conceptually consistent. The model therefore was respecified based with the correlated error terms for these three sets of items, resulting in an adequate fit for both groups (see Table 3). As with the DMS, in order to compare the hypothesized three-factor structure of the MDDI with a more parsimonious one-factor solution, two additional CFAs were conducted to compare the one-factor (which also included the correlated error terms noted above) and three-factor solutions. For both Caucasians (CFI = .64, RMSEA = .19, SRMR = .15) and African Americans (CFI = .58, RMSEA = .18, SRMR = .18), the one-factor solution resulted in a substantially poorer fit than the two-factor solution.

The first multi-group CFA to assess for configural invariance was then conducted, and as hypothesized, results indicated adequate support for the presence of configural invariance (CFI = .93, RMSEA = .08, SRMR = .06). The second multi-group CFA was then conducted to assess for equality of factor loadings across the two groups. Results supported metric invariance (see Table 3), with no significant decline in model fit.
observed. Finally, a third multi-group CFA was conducted to examine equality of the item intercepts across the two groups. Results of this scalar invariance analysis were mixed based on the criterion selected to assess change in model fit, with a significant $\chi^2$ difference test but a $\Delta$CFI of .006. Partial scalar invariance analyses were then conducted. Results were again mixed based on the criterion used to assess change in model fit, with MDDI item 1 exhibiting non-invariance based on a marginally significant $\chi^2$ difference test ($p = .06$) but not based on the $\Delta$CFI of .004. Overall, these analyses therefore suggest good support for the invariance of the MDDI across ethnicity, with configural variance supported, metric invariance supported, and adequate support for scalar invariance. Further, results clearly indicated that the invariance of the MDDI was more strongly supported than invariance for the DMS. These results are also consistent with the findings of the differential item functioning analyses, in which DIF was found for some DMS items, but not for any MDDI items (see below).

**Differential Item Functioning**

*Drive for Muscularity Scale.* Based on a $p<.001$ criterion, the Mantel chi-square test of all 14 DMS items revealed DIF for item 2 ($\chi^2 = 15.4; \text{“I lift weights to build up muscle”}$) and item 8 ($\chi^2 = 14.9; \text{“Other people think I work out with weights too often”}$). DIF was subsequently confirmed for item 2 based on both the L-A LOR (-0.79) and Cox’s B statistics (-0.90), while only Cox’s B statistic suggested DIF for item 8 (-0.44). Both of the items were found to display DIF in favor of African American men, and both are included in the behaviors subscale. In order to provide another test of DIF, as well as to extend the test to evaluate for the presence of nonuniform DIF, a logistic regression analysis was conducted with the DMS items identified by the Mantel chi-square (i.e.,
items 2 and 8). Consistent with results based on the other DIF statistics, support was
found for the presence of uniform DIF, with results of these analyses revealing that
ethnicity was a significant unique predictor for both item 2 (OR = 2.10, CI_{95\%} = 1.48 –
3.01, p<.001) and item 8 (OR = 2.05, CI_{95\%} = 1.38 – 3.03, p<.001) after accounting for
the total score. However, the interaction term was not a significant predictor of variance
for either item 2 (OR = 0.94, CI_{95\%} = 0.66 – 1.34, p>.05) or 8 (OR = 1.01, CI_{95\%} = 0.69 –
1.47, p>.05), thus the presence of nonuniform DIF was not supported.

**Impact of DIF Item Removal on DMS.** Among African Americans, removing item
2 did not alter the total scale internal consistency (α = .92 with and without the item) and
only minimally decreased the internal consistency of the behaviors subscale (α = .88 with
and .87 without the item). Similarly, among Caucasians, removing item 2 only minimally
decreased the total scale internal consistency (α = .91 with and .90 without the item) and
the behaviors subscale internal consistency (α = .90 with and .88 without the item).
Consistent with the differences found using the original total scale and behaviors
subscale, significant differences were found across the two ethnic groups for the total
scale but not for the behaviors scale after removing item 8. Next, among African
Americans, removing item 8 also did not alter the total scale internal consistency (α = .92
with and without the item) and only minimally decreased the internal consistency of the
behaviors subscale (α = .88 with and .87 without the item). Similarly, among Caucasians,
removing item 8 did not alter the total scale internal consistency (α = .91 with and
without the item) and only minimally reduced the behaviors subscale internal consistency
(α = .90 with and .89 without the item). Again, consistent with the differences found with
the original total scale and behaviors subscale, significant differences were found across
the two ethnic groups for the total scale. However, removal of this item produced a marginally significant difference (t=2.00, p<.05; not significant at the Bonferroni corrected level) between African American and Caucasian men on the behaviors subscale that was not seen originally.

Finally, among African Americans, removing both item 2 and item 8 also did not alter the total scale internal consistency (α = .92 with and without the items) and only minimally decreased the internal consistency of the behaviors subscale (α = .88 with and .87 without the items). Similarly, among Caucasians, removing the two items only minimally reduced the total scale internal consistency (α = .91 with and .90 without the items) and only minimally reduced the behaviors subscale internal consistency (α = .90 with and .87 without the items). As before, and consistent with the differences found with the original total scale and behaviors subscale, significant differences were found across the two ethnic groups for the total scale. Also, removal of the two items produced a marginally significant difference (t=2.56, p<.05; not significant at the Bonferroni corrected level) between African American and Caucasian American men on the behaviors subscale that was not seen originally.

Muscle Dysmorphic Disorder Inventory. In contrast to the findings with the DMS, and based on a p<.001 criterion, the Mantel chi-square test of all 13 MDDI items revealed no items that appeared to exhibit DIF. Further, although the first criterion (i.e., a significant Mantel chi-square) was not met, an additional examination of the L-A LOR and Cox’s B statistics also did not suggest the presence of DIF for any of the items. Taken together, these results therefore suggest that none of the items on the MDDI
appear to exhibit DIF. These findings are also consistent with the stronger support found for the measurement invariance of the MDDI compared to the DMS.

Mediation Analyses

Measurement Models. Two CFAs were conducted to assess the two measurement models (one for each of the mediation models in the African American sample). The measurement models positing three covarying latent factors [(Ethnic Identity, Sociocultural Appearance Attitudes, and Body Satisfaction) or (Ethnic Identity, Sociocultural Appearance Attitudes, and Eating Disorder Symptoms)] are shown in Figures 1 and 3. For the Body Satisfaction measurement model in African American men, results revealed an adequate fit to the data (CFI = .96; RMSEA = .077, SRMR = .056). Similarly, for the Eating Disorder Symptom measurement model in African Americans, results revealed good fit to the data (CFI = .97; RMSEA = .06, SRMR = .05).

Body Satisfaction Mediation Model in African American Men. An SEM bootstrapping analysis was conducted to examine the hypothesized mediational model, and the results did not support the hypothesized mediation (see Figure 2). No significant association between latent Ethnic Identity and Sociocultural Appearance Attitudes was found, though Ethnic Identity was significantly positively associated with Body Satisfaction and Sociocultural Appearance Attitudes was significantly negatively associated with Body Satisfaction. Further, the bias-corrected bootstrapped confidence interval of the estimated indirect effect (0.02) based on 5000 bootstrapped samples included zero [95% CI = -0.09 - 0.16], and the direct effect of Ethnic Identity on Body Satisfaction remained significant [0.40; 95% CI = 0.11 – 0.73]. Thus, while Ethnic Identity appears to be positively associated with Body Satisfaction in African American
Men, this relationship does not appear to be mediated by Sociocultural Appearance Attitudes.

_Eating Disorder Symptoms Mediation Model in African American Men._ A second SEM bootstrapping analysis was conducted, and the results again did not support the hypothesized mediation (see Figure 4). As before, there was no significant association between latent Ethnic Identity and latent Sociocultural Appearance Attitudes. Ethnic Identity also was not significantly associated with Eating Disorder Symptoms, though Sociocultural Appearance Attitudes was significantly positively associated with Eating Disorder Symptoms. Further, the bias-corrected bootstrapped confidence interval of the estimated indirect effect (-0.03) based on 5000 bootstrapped samples included zero [95% CI = -0.17 – 0.11] and the direct effect of Ethnic Identity on Eating Disorder Symptoms was also nonsignificant (-0.14; 95%CI = -0.36 – 0.06). Thus, while Sociocultural Appearance Attitudes appears to be positively associated with Eating Disorder Symptoms in African American Men, there does not appear to be a relationship between Ethnic Identity and Eating Disorder Symptoms.

**Additional Psychometric Analyses**

_Internal Consistency and 2-Week Test-Retest Reliability of the DMS and MDDI._

The internal consistency reliability of the primary measure and their subscales was calculated for both ethnic samples (see Table 4). For the DMS among African Americans, internal consistency was good for the total score ($\alpha=.92$), the behaviors subscale ($\alpha=.88$), and the attitudes subscale ($\alpha=.92$). For the DMS among Caucasians, internal consistency was also good for the total score ($\alpha=.91$), the behaviors subscale ($\alpha=.90$), and the attitudes subscale ($\alpha=.91$). Further, the test-retest reliability of the DMS
total scale and subscales overall was supported for both African Americans and Caucasians, although the behaviors subscale for Caucasians exhibited a test-retest reliability of only .63 (with the range of other correlations between .77 and .92 for the two groups). For the MDDI among African Americans, internal consistency was good for the total score (α=.81), the drive to increase body size subscale (α=.85), the intolerance of appearance subscale (α=.86), and adequate for the impairment subscale (α=.70). For the MDDI among Caucasians, internal consistency was also good for the total score (α=.81), the drive to increase body size subscale (α=.85), the intolerance of appearance subscale (α=.86), and the impairment subscale (α=.89). Further, the test-retest reliabilities for the MDDI total scale and subscales were supported overall for both African Americans and Caucasians, however the impairment subscale was questionable for both ethnic groups (.58 for African Americans and .59 for Caucasians, while the rest of the reliabilities ranged from .71-.93). These test-retest reliabilities are slightly lower than those found in the original primarily Caucasian validation sample (Hildebrandt et al., 2004), although that study assessed test-retest reliability using only a one-week interval. However, the impairment test-retest reliability was substantially lower in the current samples. Taken together, these findings mostly support the test-rest and internal consistency reliability of both the DMS and MDDI for men of both ethnicities, although it is notable that the MDDI functional impairment subscale exhibited questionable test-retest reliability for both samples, and a comparatively low internal consistency among African American men.

**Construct Validity of the DMS and MDDI.** Next, zero-order correlations between the DMS and MDDI total and subscale scores and the measures selected to provide
evidence for construct validity were examined in the African American sample. As anticipated, the DMS total score was significantly negatively associated with body areas satisfaction and significantly positively associated with the EDI bulimia subscale and the reported average weekly hours of weightlifting (see Table 5). As evidence of discriminant validity, the DMS total score was not associated with reported average weekly hours of aerobic exercise among African Americans. Unexpectedly, the DMS total score was also significantly positively associated with the EDI drive for thinness scale, although this is consistent with a male body ideal characterized by a desire for both muscul arity and leanness. Similar results were found for the DMS attitudes subscale, although the behaviors subscale was only significantly positively associated with the EDI bulimia subscale and average weekly hours of weightlifting. Further, the discriminant validity of the subscales is supported by the lack of a significant association with weekly hours of aerobic exercise. With regards to the MDDI, as anticipated, the MDDI total score was significantly negatively associated with body areas satisfaction and appearance evaluation and significantly positively associated with the EDI bulimia and body dissatisfaction subscales (see Table 6). As evidence of discriminant validity, the MDDI total score was not associated with average weekly hours of aerobic exercise among African Americans. Similar to the DMS, MDDI total score was found to be significantly positively associated with the EDI drive for thinness scale. Unexpectedly, the MDDI total score (and subscale scores) were not significantly associated with average weekly hours of weightlifting. Approximately similar results were found for the MDDI subscales, although the drive to increase body size was not significantly associated with the EDI bulimia subscale or appearance evaluation and the functional impairment subscale was
not associated with body satisfaction. Support for the discriminant validity of the subscales was found based on the lack of an association between the subscales and average weekly hours of aerobic exercise, as well as a lack of an association between the drive for size subscale and the EDI drive for thinness subscale. Thus overall, the construct validity of both measures in the African American sample was mostly supported.

Zero-order correlations between the DMS and MDDI total and subscale scores and the convergent and discriminant validity measures were then examined in the Caucasian sample. The primary differences for the DMS were related to associations with appearance evaluation, with the DMS total associated with appearance evaluation only among African Americans and the behaviors subscale associated with appearance evaluation only with Caucasians. For the MDDI, the primary difference was that the total and subscale scores were associated with average weekly hours of weightlifting, while this was not the case for African Americans. Thus, compared to the African American sample, mostly similar results were found, providing support for construct validity of the DMS among Caucasians that had been validated in previous research. For the MDDI, similar results were again found for the construct validity in the Caucasian sample compared to the African American sample. The primary difference was that, as anticipated, the MDDI total score and subscale scores were significantly positively associated with average weekly hours of weightlifting.

2-Week Test-Retest Reliability and Construct Validity of the BIG-O. Zero-order correlations were examined between the time 1 and time 2 scores for the four BIG-O variables in the current study: rating of current body fat, rating of current musculature,
discrepancy index for body fat (calculated as current fat – ideal fat), and discrepancy index for muscularity (calculated as ideal muscularity – current muscularity; see Table 4). Results revealed mixed findings. Good test-retest reliability was found for the current fat rating and fat discrepancy among African Americans, while the reliability for the muscle discrepancy index was somewhat lower, and the reliability for current muscle was poor. Among Caucasians, the reliability for current muscle and fat ratings was questionable, and the reliability for the two discrepancy values was questionable to poor. These values are substantially lower than those reported in the initial validation sample (.84-.93), although the greater test-retest interval and small time 2 sample size in the current study may explain these differing results. Next, zero-order correlations between the construct validity measures and the four BIG-O variables were examined (see Table 7). Among African Americans, rating of current body fat was found to be significantly negatively associated with body areas satisfaction and appearance evaluation and significantly positively associated with the EDI body dissatisfaction and drive for thinness subscales. Interestingly, current body fat rating was negative associated with weekly hours of weightlifting but not associated with weekly hours of aerobic exercise. In contrast, rating of current muscle was found to significantly positively associated with weekly hours of weightlifting, but exhibited no other significant associations. The body fat discrepancy index exhibited almost identical results to the rating of current body fat, except that the discrepancy index was not associated with weekly hours of weight lifting. Finally, the muscularity discrepancy index was found to be negatively associated with body areas satisfaction, weekly hours of weightlifting, and weekly hours of aerobic exercise. However, this is theoretically consistent, given that individuals who are regularly
engaging in weightlifting are more likely to have a more muscular build, and therefore endorse a lower muscularity discrepancy.

Zero-order correlations between the BIG-O variables and the construct validity measures among Caucasian men were then examined. Similar to African Americans, current body fat rating was significantly negatively associated with body areas satisfaction, appearance evaluation, and weekly hours of weightlifting, while it was significantly positively associated with the EDI body dissatisfaction and drive for thinness subscales. However, in contrast to the African Americans, a small but significant negative correlation was also found between current body fat rating and weekly hours of aerobic exercise. Rating of current muscle was also found to be significantly positively associated with weekly hours of weightlifting, but in contrast to African Americans, was also significantly positively associated with body areas satisfaction and appearance evaluation. The body fat discrepancy index exhibited similar results to the current body fat rating, except that the discrepancy index, as with the African American sample, was not associated with weekly hours of weight lifting. Finally, consistent with the African American sample, the muscularity discrepancy index was found to be negatively associated with body areas satisfaction and weekly hours of weightlifting.

**Ethnic Comparison Analyses**

A series of independent samples t-tests were conducted, comparing African American and Caucasian men on the DMS total and subscale scores, the MDDI total and subscale scores, the four BIG-O variables, the three MBSRQ-AS subscales, the EDE-Q global and subscale scores, the three EDI subscales, the four SATAQ-3 subscales, and the variables of average weekly hours of aerobic exercise and average weekly hours of
weightlifting (see Table 4). Of the comparisons, eight significant differences were found with a Bonferroni corrected significance cutoff of $p<.001$. Specifically, compared to Caucasian men, African American men were found to exhibit higher appearance evaluation, body areas satisfaction, and appearance investment based on the three MBSRQ subscales. In contrast, Caucasians scored significantly higher on the DMS total score and attitudes subscale, the MDDI total and drive for size subscale, and the SATAQ-3 internalization of the ideal athletic body scale. Finally, results of the $\chi^2$ analyses revealed no ethnic differences in the variables of following a diet to alter body weight/shape or following an exercise routine to alter body weight/shape ($\chi^2 = .83$ and $.30$, respectively, $p s >.05$). However, there was a significant ethnic difference in the endorsement of APED use, with Caucasian men reporting a significantly greater frequency ($\chi^2 = 17.81$, $p <.001$). Interestingly, despite African American men exhibiting a significantly greater BMI compared to Caucasian men, there were no significant differences on any of the BIG-O variables, including the current body fat and muscularity ratings and the discrepancy indices.

Discussion

Although the male body image literature has grown substantially and rapidly during the past decade, only a small number of studies have sought to examine ethnic differences in body image and disordered eating among men, and of those, many have suffered from methodological limitations associated with assessment or small sample sizes. The current study sought to address some of the limitations in the literature based on three broad goals: (a) to examine the psychometric validity of widely used body image-related measures in African American and Caucasian men by assessing for
measurement invariance, differential item functioning, internal consistency, test-retest reliability, and construct validity; (b) to test two hypothesized mediational models in which sociocultural appearance attitudes mediated the relationships between ethnic identity and body satisfaction, as well as between ethnic identity and eating disorder symptoms in African American men; and (c) to compare African American and Caucasian men on several body image variables, disordered eating variables, sociocultural variables, and exercise/dieting behaviors. This study is the first to examine the psychometric properties of the Drive for Muscularity Scale, the Muscle Dysmorphic Disorder Inventory, and the Bodybuilder Image Grid-Original in a large sample of African American men that also allowed for the ethnic comparisons noted above. Further, this is the first study to assess the validity of well established body image measures that have previously been used with mostly Caucasian samples in a sample of young African American men.

Overall, the results of the measurement invariance analyses were consistent with the hypotheses. Specifically, configural invariance was supported for both measures. In contrast, metric invariance was supported only for the MDDI, with the DMS exhibiting partial metric invariance. Further, the MDDI was found to exhibit partial scalar invariance, while even the partial scalar invariance of the DMS was questionable. Taken together, these findings suggest that the two measures are consistent in terms of broad factor structure, but exhibit some ethnic differences in item consistency at the more restrictive levels of factor loadings (for the DMS) and item intercepts (for the DMS and to a lesser extent, the MDDI). For example, the DMS partial metric invariance was supported by allowing the factor loadings of three items to vary across the groups. Two
of these items, DMS7 (“I think I would feel more confident if I had more muscle mass”) and DMS11 (“I think that I would feel stronger if I gained a little more muscle mass”) are part of the attitudes subscale, while the third item, DMS3 (“I use protein or energy supplements”), is part of the behaviors subscale. For the DMS7 and DMS11, the factor loadings were higher in African Americans, suggesting that these items may be more salient to the drive for muscularity among African Americans. In contrast, the factor loading was larger for Caucasians for DMS3, suggesting that the use of protein/energy supplements may be more salient for Caucasians, which is supported by the significantly higher rates of APED use reported by Caucasians compared to African Americans. At the more restrictive level of scalar invariance for the DMS, results were less clear. Though mixed, results suggest than more than half of the items exhibited non-invariant item intercepts, which is as part of strong factorial invariance is conceptually similar to differential item functioning, suggesting that numerous items may exhibit an ethnic bias that could limit the interpretation of cross-ethnic comparisons. However, results suggest that use of the total scale score, which is how the measure is frequently used in the literature, appears appropriate for both ethnic groups.

In contrast, the measurement invariance of the MDDI appeared to receive greater support, including at the configural and metric invariance levels. Although full scalar invariance was not entirely supported, only one item was found to marginally reduce the model fit when constrained, suggesting that this item may be somewhat biased based on ethnicity. It is possible that this item, “I wish I could get bigger,” is interpreted differently between groups. For example, given that the term bigger is broad and potentially unclear (i.e., it could refer to gaining muscle or gaining fat), it is possible that the groups interpret
the item differently. For instance, one group might endorse a higher response option on average due to interpreting the item as indicating becoming more muscular, while the other group may interpret the item as referring to body fat. It should be noted, however, that the full scalar invariance of the MDDI was only marginally not supported, suggesting that overall, this measure appears to assess the construct of muscle dysmorphia symptoms similarly across ethnicity. However, given the general difficulty in finding support for both weak and strong factorial invariance in cross-ethnic research, the apparent equivalence of the MDDI among Caucasians and African Americans (along with the additional support provided by the lack of DIF, as discussed below) suggests that the MDDI may be a particularly useful measure for multi-ethnic samples. Further, the results of the current study are the first to provide evidence that almost completely supports full measurement invariance of a body-image related measure across ethnic groups.

With regards to the DIF analyses, results revealed DIF among two items on the DMS, while no items were identified on the MDDI. Both DMS items (i.e., item 2 = “I lift weights to build up muscle” and item 8 = “Other people think I work out with weights too often”) were part of the behaviors subscale, and both items were found to exhibit a uniform bias against African American men. This suggests that, regardless of the total DMS score, African American men are more likely to endorse higher response options on those two items. For item 2, it may be that African American men engage in weightlifting for additional reasons that are not included in the drive for muscularity, and it is possible that these reasons could be more salient for African American men. Thus, their score on that item would be inflated compared to Caucasian men because African American men are endorsing higher response options based on a high frequency of weightlifting.
motivated by reasons that are not directly included in the drive for muscularity construct, such as the desire to increase leanness or enhancing performance. Additional analyses revealed that removal of this item produced no substantial declines in the internal consistency of the total scale or behaviors subscale, and the pattern of ethnic differences found originally remained the same after removing item 2. Interpreting the apparent DIF for item 8 is more complicated, particularly given that the item requires the participant to endorse his belief about how others perceive his behavior. Consistent with the hypothesis for item 2, if African American men are engaging in weightlifting more frequently than Caucasian men for reasons not directly linked with the drive for muscularity, then their score on the item would be comparatively inflated, regardless of the DMS score. For example, if a larger percentage of African American than Caucasian men engage in weightlifting to increase athletic performance (or even as part of training for a sport), then they might score higher on item 8, independent of the overall drive for muscularity score. Future studies should examine differences in the frequency and type of exercise and weightlifting among Caucasian and African American men, as well as assesses differences in the motivations (e.g., for health, athletic performance, or appearance reasons) for these behaviors. Additional analyses revealed that removal of this item produced no substantial declines in the internal consistency of the total scale or behaviors subscale, and the pattern of ethnic differences found originally remained the same for the total scale, although an ethnic difference emerged for the behaviors subscale that had not previously been observed, with Caucasians scoring marginally significantly higher on the behaviors subscale score than African American men.
Overall, these DIF findings suggest that the majority of the items on the DMS, particularly those on the attitudes subscale, appear to function similarly for African American and Caucasian men. The two items with suspected DIF were both identified with multiple DIF statistics, and given that the removal of these items appears to have little impact on internal consistency, reducing the scale to the remaining 13 items would produce a reliable and theoretically more valid measure of the drive for muscularity for both African American and Caucasian men. However, the DIF findings for the DMS are in contrast to the scalar invariance findings, where over half of the items on the measure were found to exhibit non-invariance. Therefore, future studies should attempt to replicate these findings, particularly in larger samples, to ensure that the DIF findings were not unique to this sample or a function of the sample size.

The next set of analyses focused on testing two hypothesized mediational models in the sample of African American men: sociocultural appearance attitudes mediating the relationship between (a) ethnic identity and body satisfaction and (b) ethnic identity and eating disorder symptoms. Unfortunately, results did not support either mediational model. Although appearance attitudes were significantly negatively associated with body satisfaction and ethnic identity was significantly positively associated with body satisfaction, no relationship was found between ethnic identity and appearance attitudes. This finding supports the notion that ethnic identity may function as a protective factor against body dissatisfaction among African Americans, which has also been found in samples of African American women (e.g., Molloy & Herzberger, 1998; Wood & Petrie, 2010). Further, this finding suggests that, although African American men internalize sociocultural body ideals less than Caucasian men (see below), there is still a strong
negative association, such that higher sociocultural appearance attitudes are associated with lower body satisfaction among African American men. The second mediational model among African American men was also not supported, and although appearance attitudes were significantly positively associated with eating disorder symptoms, ethnic identity was not associated with eating disorder symptoms. Therefore, this suggests that while ethnic identity among African American men may be protective in terms of body satisfaction, it may be less important in the context of eating disorder symptoms.

Although ethnic identity was not associated with appearance attitudes as expected, it should be noted that the construct of ethnic identity in the current study was assessed using a single measure, the MEIM. Although this measure is widely used and well-validated for multi-ethnic samples, the aspects of ethnic identity that the measure assesses, including affirmation and belonging (e.g., having pride in one’s ethnic group affiliation), ethnic identity achievement (i.e., seeking information and meaning about one’s ethnic group affiliation), and ethnic behaviors (e.g., I am active in organizations or social groups that include mostly members of my own ethnic group”), may not capture the facets of ethnic identity that are most relevant to attitudes about appearance. For instance, feeling proud of one’s ethnicity and learning about one’s ethnic background may not be directly related to more specific facets of ethnic identity (e.g., identifying with the body/attractiveness ideals or athletic/fitness ideals of one’s ethnic group) that could be more relevant in the context of appearance attitudes and the related constructs of body image and disordered eating. Future research on the relevance of various facets of ethnic identity in context of theses constructs among men, as well as women, is therefore recommended.
In addition to the DIF and measurement invariance analyses for the DMS and MDDI, other psychometric properties were examined, including internal consistency, test-retest reliability, and construct validity for both ethnic samples. Overall, the results supported the psychometric validity of both measures for the Caucasian and African American samples. The internal consistency reliability of all total scales and subscale were adequate to good, and the 2-week test-retest reliabilities were mostly good for both groups, with the exception of the DMS behaviors subscale for Caucasians and MDDI impairment subscale for both groups. The construct validity of the two measures was mostly supported based on associations with related constructs (e.g., disordered eating, other measures of body dissatisfaction, and actual reported weekly hours of weightlifting and aerobic exercise). The primary limitation found for both the DMS and the MDDI was a lack of discriminant validity with regards to the associations between desire for masculinity variables and desire for low body fat variables. However, given that the sociocultural male body ideal is characterized both by masculinity and low body fat, it is not surprising that these two would be correlated, even if the constructs of drive for masculinity and drive for leanness themselves are theoretically distinct. Another limitation of the MDDI among African Americans in particular was a lack of significant associations between weekly hours of weightlifting and the total and subscales scores, whereas significant correlations were found in the Caucasian sample. This may suggest that the MDDI and its subscales are a better measure of masculinity-related attitudes than behaviors for African American men.

Additionally, psychometric properties (i.e., test-retest reliability and construct validity) were assessed for the BIG-O, a perceptual measure of body image based on
traditional unidimensional figure rating scales that differs in that it assesses dimensions of both body fat and muscularity. Overall, ratings of current muscularity and body fat, as well as discrepancy indices for muscularity and body fat, were found to exhibit good construct validity for both ethnic samples. For instance, larger greater discrepancy scores were associated with lower body areas satisfaction, current muscularity was positively associated with weekly hours of weight lifting, and current body fat was significantly negatively associated with body satisfaction and significantly positively associated with measures of drive for thinness and body dissatisfaction in both samples. These findings are consistent with those found in the original validation study, which utilized primarily Caucasian samples for the scale development and validation (Hildebrandt et al., 2004). However, in contrast to the original validation sample, the test-retest reliabilities of several of the current rating and discrepancy variables were questionable for both ethnic groups. However, the small time 2 sample size likely impacted this finding.

Finally, African American and Caucasian men were compared across numerous body image, disordered eating, sociocultural, and dieting/exercise variables. With regards to body image, African American men were more satisfied with their overall appearance and distinct body areas than Caucasian men, and also exhibited a higher appearance investment. This is consistent with prior studies which have shown that despite being more invested in appearance, which could theoretically be associated with a greater risk for body dissatisfaction, African American men are still more satisfied with their appearance than Caucasian men (e.g., Miller et al., 2000, Smith et al., 1999). This is particularly notable given that in the current sample, the average BMI for African American men was in the overweight range compared to the normal weight range for
Caucasian men. However, BMI does not account for muscularity, thus this variable could also reflect greater muscularity in the African American sample. Although the ethnic difference in the means for the BIG-O ratings of current muscularity did not achieve statistical significance, the raw mean for current muscularity was higher among African Americans, providing some support that the BMI difference could at least in part associated with muscularity. Ethnic differences were also found for one of the sociocultural appearance attitudes subscales. Specifically, Caucasians were found to score higher on the ideal athletic body internalization subscale, and though non-significant at the Bonferroni corrected level, Caucasians also exhibited a marginally higher score on the general internalization subscale. These findings therefore suggest that Caucasian men may more strongly internalize the sociocultural male body ideal that pervades western societies. Finally, Caucasians in the sample were far more likely than African Americans to report the use of APEDs, with the most common being whey protein/protein supplements and creatine. This result is consistent with the finding that Caucasians scored higher than African Americans on the internalization scales, suggesting that the fact that Caucasian men more strongly internalize the male body ideal may increase the likelihood that they engage in more extreme behaviors (i.e., APED use) to attain this ideal.

Limitations and Future Directions

There are several limitations to the present research that should be noted. First, the current sample was composed entirely of undergraduates. Although research has suggested that the average age of onset for eating disorders and muscle dysmorphia is around the ages of 19-20 (Braun et al., 1999; Carlat et al., 1997; Olivardia et al., 2000),
suggesting the need for research with college-aged samples, the current results may not be generalizable to other populations (e.g., older adult men). Future studies should attempt to replicate the current findings with samples of both younger and older males, as well as with relevant clinical samples (e.g., men with eating disorders or muscle dysmorphia). Second, although recruiting participants from geographically diverse regions of the United States may have improved the generalizability of the results, the fact that the Caucasian and African American samples were composed of participants from various regions could have been a confounding factor. Third, although the goal of the study was to examine body image and the psychometric properties of body image measures in African American and Caucasian men, additional studies are needed with other ethnic minority groups (e.g., Asian American and Latino American men). Fourth, with respect to the DIF analyses, the current study utilized CTT-based approaches. Future studies may want to assess for DIF in the body image measures using IRT-based analyses. Also, although the sample sizes were adequate for the DIF analyses, the smaller sample size for African Americans in particular likely resulted in reduced power. Therefore, larger sample sizes would be preferred for future studies. Finally, although support for the various levels of either full or partial measurement invariance was found for all tests except the scalar invariance level of the DMS, several of the fit indices for the models was only adequate. Given that the comparatively small sample size of African Americans could have contributed to this finding, future research is needed to replicate the current results for the DMS and MDDI.

Conclusions

Given the apparent increase in the prevalence of body dissatisfaction in young
men, which is associated with a variety of problematic and potentially unhealthy behaviors (e.g., disordered eating behavior, anabolic steroid use, etc.), the need for measures that are psychometrically valid for ethnically diverse groups of men is particularly salient. To date, only a handful of studies have sought to examine differences in body dissatisfaction and the related construct of disordered eating between African American and Caucasian men, and the existing literature is conflicting, in part due to the use of measures that were inadequate to capture the complex nature of male body dissatisfaction. Further, while newer body image measures have been validated for males and have received wide use in the literature, no studies have sought to validate these measures in ethnically diverse samples of men. The present study therefore sought to address this gap in the literature by examining the psychometric properties of two body image-related measures (i.e., the Drive for Muscularity Scale and the Muscle Dysmorphic Disorder Inventory) in both African American and Caucasian men by assessing for measurement invariance at multiple levels, differential item functioning, internal consistency reliability, test-retest reliability, and construct validity. Further, the construct validity and test-retest reliability of a perceptual-based bidimensional (i.e., body fat and muscularity) figure rating scale was assessed for both ethnic groups. Secondary goals of the current research were to compare body image, disordered eating, sociocultural variables, and exercise/dieting/APED use behaviors across ethnicity, as well as to explore the relationship between ethnic identity, sociocultural appearance attitudes, body image, and disordered eating in African American men.

The results of the current study contribute to a growing literature on male body dissatisfaction, addressing the ongoing need for research with ethnically diverse samples.
This study was the first to provide support for a body image-related measure (i.e., MDDI) that exhibits measurement invariance and no DIF across African American and Caucasian men, and the results provide further information regarding ethnic differences in various dimensions of body image, disordered eating, and related constructs. Specifically, in order to ensure that studies of body image among men of various ethnic backgrounds are accurately and validly assessing body image, psychometric analyses such as those conducted in the current research are necessary. Although the current findings contribute to the existing literature, several questions remain to be answered in future research. Specifically, it is still unclear to what extent the current results would generalize to males across the lifespan and to men who exhibit relevant forms of psychopathology, such as eating disorders or muscle dysmorphia. Additionally, measurement invariance and the other psychometric analyses conducted in the present study were specific to this sample, and therefore may not be the same in other samples. Future studies will need to replicate the current findings and expand to examine these topics in larger, multiethnic samples of men.
References


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Appendix

1) Drive for Muscularity Scale (DMS)

2) Muscle Dysmorphic Disorder Inventory (MDDI)

3) Bodybuilder Image Grid (BIG-O)

4) Table 1. Demographics and Body Change Behaviors

5) Table 2. Results of Metric Invariance Analyses for the DMS

6) Table 3. Results of Metric Invariance Analyses for the MDDI

7) Table 4. Intercorrelations between the DMS (total and subscales) and measures/variables used to assess construct validity.

8) Table 5. Intercorrelations between the MDDI (total and subscales) and measures/variables used to assess construct validity.

9) Table 6. Intercorrelations between the BIG-O (current ratings and discrepancy indices) and measures/variables used to assess construct validity.

10) Table 7. Comparisons of Body Image, Disordered Eating, and Appearance Attitudes among African American and Caucasian Men

11) Figure 1. Measurement Model for Ethnic Identity, Sociocultural Attitudes, and Body Satisfaction

12) Figure 2. Ethnic Identity, Sociocultural Attitudes, and Body Satisfaction Mediational Model

13) Figure 3. Measurement Model for Ethnic Identity, Sociocultural Attitudes, and Eating Disorder Symptoms

14) Figure 4. Ethnic Identity, Sociocultural Attitudes, and Eating Disorder Symptoms Mediational Model
Drive for Muscularity Scale (DMS)

Please read each item carefully then, for each one, circle the number that best applies to you.

| 1. | I wish that I were more muscular. | Always (1) | Very Often (2) | Often (3) | Sometimes (4) | Rarely (5) | Never (6) |
| 2. | I lift weights to build up muscle. | Always (1) | Very Often (2) | Often (3) | Sometimes (4) | Rarely (5) | Never (6) |
| 3. | I use protein or energy supplements. | Always (1) | Very Often (2) | Often (3) | Sometimes (4) | Rarely (5) | Never (6) |
| 4. | I drink weight gain or protein shakes. | Always (1) | Very Often (2) | Often (3) | Sometimes (4) | Rarely (5) | Never (6) |
| 5. | I try to consume as many calories as I can in a day. | Always (1) | Very Often (2) | Often (3) | Sometimes (4) | Rarely (5) | Never (6) |
| 6. | I feel guilty if I miss a weight training session. | Always (1) | Very Often (2) | Often (3) | Sometimes (4) | Rarely (5) | Never (6) |
| 7. | I think I would feel more confident if I had more muscle mass. | Always (1) | Very Often (2) | Often (3) | Sometimes (4) | Rarely (5) | Never (6) |
| 8. | Other people think I work out with weights too often. | Always (1) | Very Often (2) | Often (3) | Sometimes (4) | Rarely (5) | Never (6) |
| 9. | I think that I would look better if I gained 10 pounds in bulk. | Always (1) | Very Often (2) | Often (3) | Sometimes (4) | Rarely (5) | Never (6) |
| 10. | I think that I would feel stronger if I gained a little more muscle mass. | Always (1) | Very Often (2) | Often (3) | Sometimes (4) | Rarely (5) | Never (6) |
| 11. | I think that my weight training schedule interferes with other aspects of my life. | Always (1) | Very Often (2) | Often (3) | Sometimes (4) | Rarely (5) | Never (6) |
| 12. | I think that my arms are not muscular enough. | Always (1) | Very Often (2) | Often (3) | Sometimes (4) | Rarely (5) | Never (6) |
| 13. | I think that my chest is not muscular enough. | Always (1) | Very Often (2) | Often (3) | Sometimes (4) | Rarely (5) | Never (6) |
| 14. | I think that my legs are not muscular enough. | Always (1) | Very Often (2) | Often (3) | Sometimes (4) | Rarely (5) | Never (6) |

Hypothesized Factor Structure: 2 factors

Factor 1 – Attitudes: Items 1, 7, 9, 10, 12, 13, 14
Factor 2 – Behaviors: Items 2, 3, 4, 5, 6, 8, 11
Muscle Dysmorphic Disorder Inventory (MDDI)

DIRECTIONS: Please indicate how often the following statements apply to you by writing the appropriate number from the scale below on the line beside each item.

<table>
<thead>
<tr>
<th></th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Never</td>
<td>Rarely</td>
<td>Sometimes</td>
<td>Often</td>
<td>Always</td>
</tr>
</tbody>
</table>

_____ 1) I wish I could get bigger.
_____ 2) I think my body is too small.
_____ 3) I think my chest is too small.
_____ 4) I wish my arms were bigger.
_____ 5) I think my legs are too thin.
_____ 6) I am very shy about letting people see me with my shirt off.
_____ 7) I wear loose clothing so that people cannot see my body.
_____ 8) I feel like I have too much body fat.
_____ 9) I hate my body.
_____ 10) I pass up chances to meet new people because of my workout schedule.
_____ 11) I feel depressed when I miss one or more workout days.
_____ 12) I pass up social activities (e.g., watching football games, eating dinner, going to see a movie, etc.) with friends because of my workout schedule.
_____ 13) I feel anxious when I miss one or more workout days.

Hypothesized Factor Structure: 3 factors

Factor 1 – Drive for Size: Items 1, 2, 3, 4, 5
Factor 2 – Appearance Intolerance: Items 6, 7, 8, 9
Factor 3 – Functional Impairment: Items 10, 11, 12, 13
1) Which figure best represents your *current* body type?

2) Which figure best represents your *ideal* body type?
Table 1. Demographics and Body Change Behaviors in the Total Sample and Two Ethnic Groups

<table>
<thead>
<tr>
<th>Variable</th>
<th>Total Sample</th>
<th>African Americans</th>
<th>Caucasians</th>
<th>t</th>
<th>χ²</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>19.61 (2.1)</td>
<td>20.28 (2.3)</td>
<td>19.39 (2.0)</td>
<td>-4.26</td>
<td></td>
<td>&lt;.001</td>
</tr>
<tr>
<td>Body Mass Index</td>
<td>24.86 (4.4)</td>
<td>26.23 (5.9)</td>
<td>24.42 (3.7)</td>
<td>-3.54</td>
<td></td>
<td>&lt;.001</td>
</tr>
<tr>
<td>Aerobic Exercise</td>
<td>4.28 (4.3)</td>
<td>4.26 (4.2)</td>
<td>4.27 (4.3)</td>
<td>0.03</td>
<td></td>
<td>ns</td>
</tr>
<tr>
<td>Weightlifting</td>
<td>4.00 (3.5)</td>
<td>3.64 (3.2)</td>
<td>4.12 (3.6)</td>
<td>1.42</td>
<td></td>
<td>ns</td>
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<tr>
<td>Diet Routine</td>
<td>28.4%</td>
<td>25.2%</td>
<td>29.5%</td>
<td>-</td>
<td>0.83</td>
<td>ns</td>
</tr>
<tr>
<td>Exercise Routine</td>
<td>66.2%</td>
<td>63.6%</td>
<td>67.0%</td>
<td>-</td>
<td>0.30</td>
<td>ns</td>
</tr>
<tr>
<td>APED Use</td>
<td>39.9%</td>
<td>24.5%</td>
<td>44.9%</td>
<td>-</td>
<td>17.81</td>
<td>&lt;.001</td>
</tr>
</tbody>
</table>

Note. Aerobic Exercise = Average weekly hours of exercise; Weightlifting = Average weekly hours of weightlifting; Diet Routine = Following a specific diet to alter body weight or shape; Exercise Routine = Following a specific exercise routine to alter body weight or shape; APED = Appearance and Performance Enhancing Substances.
Table 2. Results of Measurement Invariance Analyses for the Drive for Muscularity Scale

<table>
<thead>
<tr>
<th>2-Factor Model</th>
<th>$\chi^2$ (df)</th>
<th>CFI</th>
<th>RMSEA</th>
<th>SRMR</th>
<th>$\Delta$ CFI</th>
<th>$\chi^2_{diff}$</th>
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</thead>
<tbody>
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<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Caucasians</td>
<td>314.57** (74)</td>
<td>0.93</td>
<td>0.08</td>
<td>0.08</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>African Americans</td>
<td>135.51** (74)</td>
<td>0.94</td>
<td>0.07</td>
<td>0.08</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Multi-group analyses</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Configural Invariance</td>
<td>452.06 (148)</td>
<td>0.93</td>
<td>0.08</td>
<td>0.06</td>
<td>-</td>
<td>-</td>
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<tr>
<td>Metric Invariance</td>
<td>480.71 (162)</td>
<td>0.92</td>
<td>0.08</td>
<td>0.07</td>
<td>.003</td>
<td>27.75*</td>
</tr>
<tr>
<td>Partial Metric Invariance</td>
<td>471.42 (159)</td>
<td>0.93</td>
<td>0.08</td>
<td>0.06</td>
<td>.002</td>
<td>18.90</td>
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<tr>
<td>Scalar Invariance$^a$</td>
<td>534.32 (173)</td>
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<td>0.09</td>
<td>0.08</td>
<td>.013</td>
<td>80.35**</td>
</tr>
</tbody>
</table>

Note. $\chi^2_{diff} = \chi^2$ difference test; CFI = comparative fit index; RMSEA = Root Mean Square Error of Approximation; SRMR = Standardized Root Mean Square Residual.

$^a$ Although partial scalar invariance analyses were conducted, the number of items exhibiting non-invariance was greater than one-half of the overall number of items on the measure, therefore a final partial invariance model was not supported.

*p<.05, **p<.001
Table 3. Results of Measurement Invariance Analyses for the Muscle Dysmorphic Disorder Inventory

<table>
<thead>
<tr>
<th>3-Factor Model</th>
<th>$\chi^2$ (df)</th>
<th>CFI</th>
<th>RMSEA</th>
<th>SRMR</th>
<th>$\Delta$ CFI</th>
<th>$\chi^2_{\text{diff}}$</th>
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</thead>
<tbody>
<tr>
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<td></td>
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<td></td>
<td></td>
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<tr>
<td>Caucasians</td>
<td>187.85** (59)</td>
<td>0.95</td>
<td>0.07</td>
<td>0.05</td>
<td>-</td>
<td>-</td>
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<tr>
<td>African Americans</td>
<td>124.13** (59)</td>
<td>0.92</td>
<td>0.08</td>
<td>0.07</td>
<td>-</td>
<td>-</td>
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<tr>
<td><strong>Multi-group analyses</strong></td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Configural Invariance</td>
<td>323.361** (118)</td>
<td>0.94</td>
<td>0.07</td>
<td>0.05</td>
<td>-</td>
<td>-</td>
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<tr>
<td>Metric Invariance</td>
<td>331.31** (132)</td>
<td>0.94</td>
<td>0.07</td>
<td>0.06</td>
<td>0.002</td>
<td>5.06</td>
</tr>
<tr>
<td>Scalar Invariance</td>
<td>370.55** (144)</td>
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<td>0.07</td>
<td>0.08</td>
<td>0.006</td>
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<tr>
<td>Partial Scalar Invariance</td>
<td>364.97** (143)</td>
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<td>0.07</td>
<td>0.07</td>
<td>0.005</td>
<td>35.6</td>
</tr>
</tbody>
</table>

*Note. $\chi^2_{\text{diff}} = \chi^2$ difference test; CFI = comparative fit index; RMSEA = Root Mean Square Error of Approximation; SRMR = Standardized Root Mean Square Residual.
*p<.05, **p<.001
Table 4. *Intercorrelations between the Drive for Muscularity Scale (total and subscales) and measures/variables used to assess construct validity.*

<table>
<thead>
<tr>
<th></th>
<th>1</th>
<th>2</th>
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<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. DMS Total</td>
<td></td>
<td>-</td>
<td>.84**</td>
<td>.84**</td>
<td>-.16**</td>
<td>-.04</td>
<td>.15**</td>
<td>.19**</td>
<td>.11*</td>
<td>-.03</td>
</tr>
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<td>2. DMS Attitudes</td>
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<td>-</td>
<td></td>
<td>.42**</td>
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<tr>
<td>3. DMS Behaviors</td>
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<td>.09</td>
<td>.19**</td>
<td>.09*</td>
<td>.13**</td>
<td>-.04</td>
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<tr>
<td>4. BASS</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td>.74**</td>
<td>-.17**</td>
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<td>-.58**</td>
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<tr>
<td>5. Appearance Eval</td>
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<td>-.08</td>
<td>-</td>
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<td></td>
<td>-.13**</td>
<td>-.41**</td>
<td>-.64**</td>
<td>.14**</td>
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<tr>
<td>6. EDI Bulimia</td>
<td>.25**</td>
<td>.23**</td>
<td>.18*</td>
<td>-.22**</td>
<td>-.33**</td>
<td>-</td>
<td>.18**</td>
<td>.12*</td>
<td>.09</td>
<td>.06</td>
</tr>
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<td>7. EDI Thinness</td>
<td>.20*</td>
<td>.26**</td>
<td>.10</td>
<td>-.28**</td>
<td>-.51**</td>
<td>.51**</td>
<td>-</td>
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<td>8. EDI Dissatisfaction</td>
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<td>-.53**</td>
<td>.25**</td>
<td>.72**</td>
<td>-</td>
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<td>-.09*</td>
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<td>9. Aerobic Exercise</td>
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<td>.17</td>
<td>.13</td>
<td>-.06</td>
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<td>-.18*</td>
<td>-</td>
<td>.28**</td>
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<td>.46**</td>
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<td>.06</td>
<td>.19*</td>
<td>.01</td>
<td>-.09</td>
<td>.56**</td>
<td>-</td>
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</tbody>
</table>

*Note.* Correlations below the diagonal are for African Americans and correlations above the diagonal are for Caucasians.

BIG-O Fat = Current rating of body fat; BIG-O Muscle = Current rating of muscularity; BASS = Body Areas Satisfaction Scale; Appearance Eval = Overall appearance evaluation; EDI = Eating Disorder Inventory; Aerobic Exercise = Average weekly hours of exercise; Weightlifting = Average weekly hours of weightlifting.

*p < .05; **p < .01
Table 5. Intercorrelations between the Muscle Dysmorphic Disorder Inventory (total and subscales) and measures/variables used to assess construct validity.

<table>
<thead>
<tr>
<th></th>
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<th>2</th>
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<th>11</th>
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<td>.17*</td>
<td>.39**</td>
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<td>-.05</td>
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<td>.15**</td>
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<td>.33**</td>
<td>.17*</td>
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<td>.18**</td>
<td>.12*</td>
<td>.09</td>
<td>.06</td>
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<td>.52**</td>
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<td>.51**</td>
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<td>9. EDI Dissatisfaction</td>
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<td>.52**</td>
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<td>-.52**</td>
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<td>-.18*</td>
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<tr>
<td>11. Weightlifting</td>
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<td>-.05</td>
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<td>.19*</td>
<td>.01</td>
<td>-.09</td>
<td>.56**</td>
<td></td>
</tr>
</tbody>
</table>

*Note. Correlations below the diagonal are for African Americans and correlations above the diagonal are for Caucasians.

BIG-O Fat = Current rating of body fat; BIG-O Muscle = Current rating of muscularity; BASS = Body Areas Satisfaction Scale; Appearance Eval = Overall appearance evaluation; EDI = Eating Disorder Inventory; Aerobic Exercise = Average weekly hours of exercise; Weightlifting = Average weekly hours of weightlifting.

*p < .05; **p < .01
Table 6. Intercorrelations between the Bodybuilder Image Grid-Original (current ratings and discrepancy indices) and measures/variables used to assess construct validity.

<table>
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<th>10</th>
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<td>-.06</td>
<td>-.35**</td>
<td>-.39**</td>
<td>.00</td>
<td>.33**</td>
<td>.44**</td>
<td>-.10*</td>
<td>-.10*</td>
</tr>
<tr>
<td>2. BIG-O Muscle</td>
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<td>-</td>
<td>.07</td>
<td>-.66**</td>
<td>.19**</td>
<td>.16**</td>
<td>-.01</td>
<td>.09</td>
<td>.04</td>
<td>.04</td>
<td>.41**</td>
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<td>.10</td>
<td>-</td>
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<td>-.35**</td>
<td>-.30**</td>
<td>.01</td>
<td>.33**</td>
<td>.37**</td>
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<td>.02</td>
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<td>.132</td>
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<td>.09*</td>
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<td>-.05</td>
<td>-.04</td>
<td>-.15**</td>
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<td>5. BASS</td>
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<td>-.41**</td>
<td>-.58**</td>
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<td>.15**</td>
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<td>.61**</td>
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<td>.03</td>
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<tr>
<td>9. EDI Dissatisfaction</td>
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<td>11. Weightlifting</td>
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<td>.06</td>
<td>.19*</td>
<td>.01</td>
<td>-.09</td>
<td>.56**</td>
<td>-</td>
</tr>
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</table>

Note. Correlations below the diagonal are for African Americans and correlations above the diagonal are for Caucasians. BIG-O Fat = Current rating of body fat; BIG-O Muscle = Current rating of muscularity; BASS = Body Areas Satisfaction Scale; Appearance Eval = Overall appearance evaluation; EDI = Eating Disorder Inventory; Aerobic Exercise = Average weekly hours of exercise; Weightlifting = Average weekly hours of weightlifting. *p < .05; **p < .01
Table 7. Comparisons of Body Image, Disordered Eating, and Appearance Attitudes among African American and Caucasian Men

<table>
<thead>
<tr>
<th>Measure</th>
<th>African Americans</th>
<th>Caucasians</th>
<th>t</th>
<th>p</th>
<th>α (AA/C)</th>
<th>Test-Retest (AA/C)²</th>
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<tr>
<td>DMS Total</td>
<td>2.77 (1.1)</td>
<td>3.13 (1.0)</td>
<td>3.65</td>
<td>&lt;.001</td>
<td>.92/.91</td>
<td>.92/.77</td>
</tr>
<tr>
<td>DMS Attitudes</td>
<td>3.18 (1.3)</td>
<td>3.65 (1.2)</td>
<td>4.08</td>
<td>&lt;.001</td>
<td>.92/.91</td>
<td>.90/.84</td>
</tr>
<tr>
<td>DMS Behaviors</td>
<td>2.44 (1.1)</td>
<td>2.62 (1.2)</td>
<td>1.53</td>
<td>ns</td>
<td>.88/.90</td>
<td>.87/.63</td>
</tr>
<tr>
<td>MDDI Total</td>
<td>12.90 (8.8)</td>
<td>16.61 (8.0)</td>
<td>4.76</td>
<td>&lt;.001</td>
<td>.81/.81</td>
<td>.77/.79</td>
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<tr>
<td>MDDI Size</td>
<td>6.90 (4.7)</td>
<td>9.03 (4.7)</td>
<td>4.80</td>
<td>&lt;.001</td>
<td>.85/.85</td>
<td>.71/.93</td>
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<tr>
<td>MDDI AI</td>
<td>3.69 (4.1)</td>
<td>4.53 (3.9)</td>
<td>2.25</td>
<td>&lt;.05</td>
<td>.86/.86</td>
<td>.86/.88</td>
</tr>
<tr>
<td>MDDI FI</td>
<td>2.44 (3.7)</td>
<td>3.09 (3.5)</td>
<td>1.96</td>
<td>ns</td>
<td>.70/.89</td>
<td>.58/.59</td>
</tr>
<tr>
<td>BIG-O Fat</td>
<td>2.89 (1.4)</td>
<td>2.97 (1.0)</td>
<td>0.69</td>
<td>ns</td>
<td>-</td>
<td>.85/.63</td>
</tr>
<tr>
<td>BIG-O Muscle</td>
<td>2.74 (1.0)</td>
<td>2.61 (1.0)</td>
<td>-1.40</td>
<td>ns</td>
<td>-</td>
<td>.50/.68</td>
</tr>
<tr>
<td>Fat Discrepancy</td>
<td>0.80 (1.4)</td>
<td>0.85 (0.9)</td>
<td>0.43</td>
<td>ns</td>
<td>-</td>
<td>.72/.59</td>
</tr>
<tr>
<td>Muscle Discrepancy</td>
<td>0.78 (0.9)</td>
<td>0.86 (0.8)</td>
<td>0.96</td>
<td>ns</td>
<td>-</td>
<td>.65/.56</td>
</tr>
<tr>
<td>BASS</td>
<td>3.76 (0.8)</td>
<td>3.49 (0.6)</td>
<td>-3.74</td>
<td>&lt;.001</td>
<td>.88/.81</td>
<td>-</td>
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<tr>
<td>Appearance Evaluation</td>
<td>3.85 (0.8)</td>
<td>3.54 (0.8)</td>
<td>-4.17</td>
<td>&lt;.001</td>
<td>.86/.90</td>
<td>-</td>
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<td>Appearance Investment</td>
<td>3.54 (0.5)</td>
<td>3.27 (0.7)</td>
<td>-4.87</td>
<td>&lt;.001</td>
<td>.72/.87</td>
<td>-</td>
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<td>EDI Bulimia</td>
<td>0.79 (2.3)</td>
<td>0.51 (1.2)</td>
<td>-1.43</td>
<td>ns</td>
<td>.84/.58</td>
<td>-</td>
</tr>
<tr>
<td>EDI Thinness</td>
<td>3.30 (4.0)</td>
<td>3.15 (4.1)</td>
<td>-0.38</td>
<td>ns</td>
<td>.73/.78</td>
<td>-</td>
</tr>
<tr>
<td>EDI Dissatisfaction</td>
<td>5.49 (5.0)</td>
<td>4.67 (4.5)</td>
<td>-1.81</td>
<td>ns</td>
<td>.77/.70</td>
<td>-</td>
</tr>
</tbody>
</table>
Table 7 continued…

<table>
<thead>
<tr>
<th>Measure</th>
<th>African Americans</th>
<th>Caucasians</th>
<th>t</th>
<th>p</th>
<th>α (AA/C)</th>
<th>Test-Retest (AA/C)</th>
</tr>
</thead>
<tbody>
<tr>
<td>EDE-Q Global</td>
<td>0.88 (1.1)</td>
<td>0.89 (0.9)</td>
<td>0.12</td>
<td>ns</td>
<td>.96/.93</td>
<td>-</td>
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<tr>
<td>EDE-Q Restraint</td>
<td>0.81 (1.2)</td>
<td>0.91 (1.1)</td>
<td>0.85</td>
<td>ns</td>
<td>.87/.76</td>
<td>-</td>
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<tr>
<td>EDE-Q Eating</td>
<td>0.59 (1.0)</td>
<td>0.39 (0.8)</td>
<td>-2.18</td>
<td>&lt;.05</td>
<td>.88/.81</td>
<td>-</td>
</tr>
<tr>
<td>EDE-Q Shape</td>
<td>1.19 (1.4)</td>
<td>1.35 (1.3)</td>
<td>1.21</td>
<td>ns</td>
<td>.91/.88</td>
<td>-</td>
</tr>
<tr>
<td>EDE-Q Weight</td>
<td>1.02 (1.3)</td>
<td>1.01 (1.1)</td>
<td>-0.09</td>
<td>ns</td>
<td>.84/.79</td>
<td>-</td>
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<tr>
<td>SATAQ-3 Info</td>
<td>25.56 (9.9)</td>
<td>22.65 (9.5)</td>
<td>-3.15</td>
<td>&lt;.01</td>
<td>.95/.96</td>
<td>-</td>
</tr>
<tr>
<td>SATAQ-3 Pressures</td>
<td>15.73 (7.2)</td>
<td>17.03 (7.4)</td>
<td>1.87</td>
<td>ns</td>
<td>.94/.96</td>
<td>-</td>
</tr>
<tr>
<td>SATAQ-3 Internal-Gen</td>
<td>20.48 (8.8)</td>
<td>22.40 (8.2)</td>
<td>2.37</td>
<td>&lt;.05</td>
<td>.96/.94</td>
<td>-</td>
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<tr>
<td>SATAQ-3 Internal-Ath</td>
<td>14.72 (5.8)</td>
<td>17.32 (4.6)</td>
<td>4.88</td>
<td>&lt;.001</td>
<td>.84/.85</td>
<td>-</td>
</tr>
</tbody>
</table>

Note. AA = African American; C = Caucasian; DMS = Drive for Muscularity Scale; MDDI = Muscle Dysmorphic Disorder Inventory; MDDI AI = MDDI Appearance Intolerance; MDDI FI = MDDI Functional Impairment; BIG-O Fat = Current rating of body fat; BIG-O Muscle = Current rating of muscularity; BASS = Body Areas Satisfaction Scale; EDI = Eating Disorder Inventory; EDE-Q = Eating Disorder Examination – Questionnaire; SATAQ-3 = Sociocultural Attitudes Towards Appearance Questionnaire-3; SATAQ-3 Internal-Gen = SATAQ-3 ideal body internalization- general; SATAQ-3 Internal-Ath = ideal body internalization- athlete.

* Test-Retest Reliability values are based on a 2-week test-retest interval, with n = 10 African Americans and n = 12 Caucasians.
Figure 1. Measurement Model for Ethnic Identity, Sociocultural Attitudes, and Body Satisfaction
Figure 2. Ethnic Identity, Sociocultural Attitudes, and Body Satisfaction Mediational Model
Figure 3. Measurement Model for Ethnic Identity, Sociocultural Attitudes, and Eating Disorder Symptoms
Figure 4. Ethnic Identity, Sociocultural Attitudes, and Eating Disorder Symptoms
Mediation Model