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Examining Biopsychosocial Factors in the Drive for Muscularity and Muscle Dysmorphia Among Personal Trainers

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MS, Walden University, 2011

BS, Upper Iowa University, 2010

Dissertation Submitted in Partial Fulfillment

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Abstract

This cross-sectional quantitative study was conducted to assess the presence of muscle dysmorphia (MD) and a drive for muscularity (DFM) in 1,039 personal trainers using the Muscle Dysmorphia Inventory (MDI) and the Drive for Muscularity Scale (DMS). Muscle dysmorphia is considered a subtype of body dysmorphic disorder that can be exacerbated by an intense DFM, which may in turn lead to negative psychobehavioral outcomes. Because personal trainers are an unresearched population with regard to these 2 constructs, a multidisciplinary framework was used to ground the present research study. Independent variables were structured using a biopsychosocial foundation where the biological dimension was operationalized through the Body Comparison Scale, the psychological dimension through the Symptom Checklist-90-Revised, and the social dimension through the Sociocultural Attitudes Towards Appearance Questionnaire-4. Kendall's tau-b revealed that general appearance concerns, muscle concerns, and somatic features were positively related to both MD and a DFM. A DFM and MD were significantly, positively correlated with internalization of thin ideals, muscular/athletic ideals, family and peer pressures, but not media pressures. All psychological variables were significantly, positively related to MD and a DFM. The DMS was able to significantly predict scores on the MDI using hierarchal multiple regression. Trainers who displayed MD and DFM symptoms did so with little disparity between the sexes. Trainers are in a unique position of instruction as well as guidance, and therefore a better understanding of how MD presents in this specific fitness arena may impact not only personal trainers, but also their clients through increased body image disturbance awareness as well as provide a new population of interest for future MD research.

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Dedication

I would like to dedicate this work to my parents, family, and friends who have displayed unconditional support. Thank you Max and Annie.

Acknowledgments

I would like to acknowledge Drs. Olivardia, Baghurst, Thompson, Lantz, and McCreary and Mr. Mark Suffolk for their communications, support, and best wishes. Their expertise in and commitment to male body image are both evident and admired.

The first and greatest victory is to conquer yourself; to be conquered by yourself is of all things most shameful and vile.

- Plato

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Chapter 1: Introduction to the Study

Muscle dysmorphia (MD) is a proposed subtype of body dysmorphic disorder whereby individuals have a pathological preoccupation with their muscular build resulting from a body image disturbance (Pope, Gruber, Choi, Olivardia, & Philips, 1997). Individuals who have MD tend to view themselves as being insufficiently muscular and may engage in behaviors of compulsive weightlifting, disordered eating habits, and the use of anabolic steroids as a means to address the perceived flaws in their physical build (Olivardia, 2007; Olivardia, Pope, & Hudson, 2000). Muscle dysmorphic individuals also tend to suffer from severe vocational and social impairments, where their strict exercise and dietary behaviors inhibit their ability to spend time with others and interfere with the maintenance of occupations (Olivardia, 2001). Those with MD also experience salient anxiety in situations where their physique is exposed to others and often take careful precautions to circumvent such stressful scenarios (Grieve, Truba, & Bowersox, 2009). Researchers have indicated that muscle dysmorphic individuals may combat this social anxiety through the use of concealing clothing as a means to camouflage the perceived faults in their muscularity (Olivardia, 2007). Contrariwise, individuals with MD frequently participate in body checking behaviors, consulting mirrors and other reflective surfaces to engage in intensively scrutinous self-evaluation of their own musculature (Olivardia, 2007).

Muscle dysmorphia is considered an emerging disorder and is also considered underrecognized and under-researched in the extant literature (Olivardia, 2000; Parent, 2011; Tod & Lavallee, 2010). The disorder is asserted to be a result of an incipient *muscular ideal* that is the product of sociocultural and media influences regarding what

constitutes a socially desirable and aesthetic phenotype (Baghurst, Hollandar, Nardella, & Haff, 2006; Pope, Philips, & Olivardia, 2000; Thompson & Cafri, 2007). In response to perceived societal norms, individuals will pursue a muscular physique as defined by media messages and perceived societal standards. This pursuit of the muscular ideal has been operationalized by McCreary and Sasse (2000) as the *drive for muscularity* (DFM), in which a pursuit of the muscular ideal exists across a continuum, ranging from individuals who exhibit no interest in their physical build to those who commonly engage in intensive and often physically damaging behaviors to achieve an idealized muscular physique.

The Current Gap in the Literature

To date, no study has incorporated personal trainers (PTs) as a population in muscle dysmorphic and DFM research. Personal trainers are in a vocational position to provide athletic guidance and physical fitness education to their clients, and if PTs are struggling with psychological detriments such as an unhealthy DFM or MD, then they may not be able to provide adequate service to the clients with whom they work. Bodybuilders and weightlifters have been identified as populations at risk for MD (Olivardia, 2007; Pope et al., 2000). Many PTs may be involved in bodybuilding and weightlifting, and therefore it is important to ascertain whether personal training is a broad at-risk occupation for developing MD.

Few researchers have adopted a comprehensive, multidisciplinary, biopsychosocial (BPS) approach to examining potential affective, perceptual, social, and psychobehavioral connections with regard to a DFM and MD (see Cafri, van den Berg, & Thompson, 2006; Grieve, 2007; Lantz, Rhea, & Mayhew, 2001; Olivardia, 2001;

Woodruff, 2012). To date, only one study has addressed the predictive relationship between a DFM and a measure of MD in a mixed-gender sample (Robert, Munroe-Chandler, & Gammage, 2009), and it is important that the relationship between a DFM and MD be better explored in order to provide an adequate assessment of how these disorders interrelate.

Background

The phenomenon of MD was first discovered by Pope, Katz, and Hudson (1993) during a study exploring the (ab)use of anabolic androgenic steroids in a group of male bodybuilders. Pope and colleagues noticed a preoccupation with gaining weight, particularly muscle mass, based on ectomorphic self-appraisal. This *reverse* form of anorexia nervosa was later redesignated as *muscle dysmorphia* and postulated to be a subtype of body dysmorphic disorder (Pope et al., 1997).

Since its identification, MD has undergone categorical and diagnostic scrutiny based on symptomological associations with obsessive-compulsive disorders, eating disorders, and body dysmorphic disorders. Specifically, researchers have argued for MD to be classified as an obsessive-compulsive disorder (e.g., Chung, 2001; Muller, Denis, Schneider, & Joyner, 2004) relative to a preoccupation with physical fitness and perceivable compulsions to lift weights and engage in strict dietary regimens.

Additionally, researchers have supported that MD should be categorized as an eating disorder or eating disorder not otherwise specified (e.g., Hay, 2013; Lamana, Grieve, Derryberry, Hakman, & McClure, 2010; Murray & Touyz, 2013a, 2013b) because of the disordered eating many muscle dysmorphic individuals partake in to develop their physiques. Furthermore, there is a foundation of empirical evidence that

supports the disorder's classification as a type of body dysmorphic disorder (e.g., Hildebrandt, Schlundt, Langenbucher, & Chung, 2006; Pope et al., 2005) due to the salient preoccupation with musculature that is associated with MD. Alternatively, there is research that has supported the position that clinicians do not consider MD to be a viable diagnostic entity whatsoever (e.g., Vandereycken, 2011). This discordance in classificatory muscle dysmorphic research is likely the reason as to why there are no definitive diagnostic criteria for MD, and a lack of such criteria further complicates and inhibits the proper treatment of the disorder (Olivardia, 2007).

A Drive for Muscularity

A drive for muscularity and MD are interrelated insofar as an intense DFM can result in the exhibition of MD (McCreary, 2007). However, despite integrality, the DFM and MD are two separate constructs. The fifth edition of the *Diagnostic and Statistical Manual of Mental Disorders* (DSM-5; American Psychiatric Association [APA], 2013) indicates that MD is typically found in men. However, there is a growing body of research regarding cases of the disorder occurring in women (e.g., Hale, Diehl, Weaver, & Briggs, 2013; Leone, 2009). According to Cafri, van den Berg, and Thomas (2006), participation in sport is a significant predictor for MD, and although women may not face the same media messages geared toward men to pursue a muscular ideal, women affiliated with athletics (e.g., bodybuilding) may be at a comparable risk for developing MD (Hale et al., 2013). Therefore, a DFM and subsequent MD are potential health problems for both genders.

McCreary and Sasse (2000) developed the term *drive for muscularity* to describe a motivational ideology in men that exists as a possible gender-specified counterpart to

the drive for thinness in women. Although a DFM and a drive for thinness are not theoretically opposite from one another, the authors posited that just as women internalize slender media representations for an ideal female physique, men internalize muscular media representations for an ideal male physique. As mentioned, a DFM has been found to exist in both genders and has been positively correlated with detriments such as exercise dependence (Hale, Roth, DeLong, & Briggs, 2010), disordered eating (Rodgers, Ganchou, Franko, & Chabrol, 2012), and MD (Robert et al., 2009).

To date, there is a paucity of literature on how a DFM is related to MD as well as other biological, psychological, and social factors. It is not clear how aspects of these five factors intermingle with one another, and it is not clear which types of BPS factors are saliently associated with a high DFM and consequent MD. Furthermore, few researchers have a adopted a multidisciplinary approach to assessing MD, and I have found no research studies in which researchers have used a multidisciplinary approach to assessing MD as well as a DFM in a single research endeavor. Lastly, PTs are unresearched in the extant muscle dysmorphic literature, and an intense DFM and MD should be examined in PTs because the presence of these disorders within this population may negatively impact their ability to train others in a healthy manner, potentially resulting in an influential exacerbation of muscle dysmorphic symptoms.

Problem Statement

The etiology of MD is not well understood and is believed to be a complex matrix of biophysical, psychological, and social influences (Grieve, 2007; Grieve et al., 2009). An absence of established etiology is likely due to a lack of consensus on how to accurately classify MD. In turn, a discrepancy with regard to how MD is classified as a

disorder is likely to pose barriers to the efficacious recognition and subsequent treatment of MD. Furthermore, many muscle dysmorphic studies are replete with homogenous samples of White, college-aged males and/or ambiguously defined parameters for *bodybuilder*, *weightlifter*, and *athlete* (Suffolk et al., 2013), making it difficult to empirically and validly identify potential at-risk populations.

Similarly, there are further complications with regard to gender and assessing MD. First, women are a severely underresearched demographic in the MD literature (Leone, 2009). Muscle dysmorphia and disordered eating have been significantly associated with participation in specific sports in which aesthetics and weight class are strongly incorporated (Bratland-Sanda & Sundgot-Borgen, 2012a; Cella, Iannaccone, & Cotrufo; 2012). Female bodybuilders may be at a comparable or even higher risk for developing MD relative to their male counterparts (Hale et al., 2013). Secondly, body image disturbances have antecedently been salient for and associated with women, and some individuals report that body image is still considered only a women's issue (Bottamini & Ste-Marie, 2006). Therefore, it was important to evaluate whether and how female PTs experience a DFM and MD to address this current paucity in the literature.

Due to the fact that a DFM and MD are two separate constructs, it was logical to assess whether a DFM could predict MD in a sample of trainers. Furthermore, it is not clear how the DFM relates to measures of MD in a mixed-gender sample, or whether the DFM may moderate the relationship between psychopathologic factors and MD. A better understanding of pathways between BPS factors and a DFM and MD was intended to produce data concerning the underpinning ideological role that the DFM plays in the presentation of muscle dysmorphic symptoms.

Purpose Statement

There were several purposes of this quantitative research study:

1. To generate a correlation matrix to identify the relationship between BPS factors (body comparison, somatization, obsessive-compulsive behavior, interpersonal sensitivity, depression, anxiety, hostility, sociocultural attitudes towards appearance) and a DFM.
2. To generate a correlation matrix to identify the relationship between BPS factors (body comparison, somatization, obsessive-compulsive behavior, interpersonal sensitivity, depression, anxiety, hostility, sociocultural attitudes towards appearance) and MD.
3. To examine whether and to what extent a drive for muscularity can predict muscle dysmorphic symptoms in a gender-heterogeneous sample of personal trainers.
4. To examine whether there are gender differences between the Muscle Dysmorphia Inventory subscales (size and symmetry concerns, supplement use, exercise dependence, pharmacological use, dietary behavior, and physique concealment) in a sample of PTs.
5. To examine whether MD and an intense DFM are salient problems for personal trainers.

This quantitative study incorporated a BPS approach to contextualize the selected instruments into three specific dimensions of analysis. The subscales of these instruments represented the specific study variables within this research study (see Tables 1 and 2). The demographic questionnaire included seven general variables (race/ethnicity, sex, age,

competitive bodybuilder status, competitive weightlifter status, and self-reported height and weight). As mentioned, MD is a disorder that primarily affects men who are self-identified as weightlifters and/or bodybuilders, and therefore discerning these types of demographic characteristics was important to the central tendency of the resultant data.

Table 1

Proposed Measures

	Biological (IV)	Psychological (IV)	Social (IV)	Drive for muscularity (DV)	Muscle dysmorphia (DV)
Measure	Body Comparison Scale (BCS)	Symptom Checklist-90-Revised (SCL-90-R)	Sociocultural Attitudes Towards Appearance Questionnaire (SATQ-4)	Drive for Muscularity Scale (DMS)	Muscle Dysmorphia Inventory (MDI)
Measure author(s)	Fisher, Dunn, & Thompson (2002)	Derogatis (1994)	Thompson et al. (2011)	McCreary & Sasse (2000)	Rhea, Lantz, & Cornelius (2004)

Table 2

Tablature of All Proposed Study Variables by Dimension and Instrument

Dimension	Demographic factors	Biological factors	Psychological factors	Sociological factors	A drive for muscularity	Muscle dysmorphia
Instrument	DEM	BCS	SCL-90-R	SATAQ-4	DMS	MDI
Study variables	Sex Race Age Height Weight Competitive weightlifter Competitive bodybuilder	General appearance, nonweight, nonmuscular concerns Muscular concerns Weight concerns General somatic features	Somatization Obsessive-compulsive Interpersonal sensitivity Depression Anxiety Hostility	Internalization—thin/low body fat Internalization – Muscular/athletic Pressures—family Pressures—peers Pressures—media	A drive for muscularity (single score)	Size and symmetry concerns Supplement use Exercise dependence Pharmacological use Dietary behavior Physique concealment

Research Questions and Hypotheses

Research Question 1: Is there a relationship between biopsychosocial factors (body comparison, somatization, obsessive-compulsive behavior, interpersonal sensitivity, depression, anxiety, hostility, and sociocultural attitudes toward appearance) and muscle dysmorphia?

H_0: There is no relationship between biopsychosocial factors and muscle dysmorphia.

H_1: There is a relationship between biopsychosocial factors and muscle dysmorphia.

Research Question 2: Is there a relationship between biopsychosocial factors (body comparison, somatization, obsessive-compulsive behavior, interpersonal sensitivity, depression, anxiety, hostility, and sociocultural attitudes toward appearance) and the drive for muscularity?

H_0: There is no relationship between biopsychosocial factors and the drive for muscularity.

H_1: There is a relationship between biopsychosocial factors and the drive for muscularity.

Research Question 3: Will a drive for muscularity predict muscle dysmorphia?

H_0: A drive for muscularity will not significantly predict muscle dysmorphia.

H_1: A drive for muscularity will significantly predict muscle dysmorphia.

Research Question 4: Are there gender differences on the six Muscle Dysmorphia Inventory subscales (size and symmetry concerns, supplement use, exercise dependence, pharmacological use, dietary behavior, and physique concealment)?

H_0: There are no gender differences on the muscle dysmorphia inventory subscales.

H_1: There are gender differences on the muscle dysmorphia inventory subscales.

Significance

Olivardia (2001) indicated that a multidisciplinary approach such as the BPS framework is likely the most comprehensive and logical way to assess MD. As the symptomologic etiology and manifestation of MD are not well understood, it is vital that factors that may influence the development of MD be identified in order to bolster any type of comprehensive prevention or treatment program.

Therefore, this study was significant in that it was intended to (a) examine the possible relationships among a myriad of biological, psychological, and social factors and MD and a DFM in order to generate two comprehensive correlation matrices based on factors related to body image and body image disturbances and their relationships with a DFM and MD; (b) lay statistical groundwork so that a model for MD in PTs may be tested in future research, (c) build upon existing literature and past implications for future research by assessing the predictive relationship of a DFM on a measure of MD, and (d) examine potential muscle dysmorphic gender differences in an inherently athletic and underused target population.

In addition to the aforementioned significance, this study was intended to result in positive social change. A better understanding of the etiological factors that contribute to MD will likely influence the ways in which interventions are used with the disorder. A better understanding of how muscle dysmorphic symptoms present in PTs is expected to provide insight into how an unexamined population experiences MD and may lead to personal training fitness mandates and regulations as well as educational requirements and training programs that involve consideration both of and for body image-oriented

mental health disturbances. This particular implication for social change stands to be twofold, as personal trainers are in a position of instruction and guidance; a better understanding of how MD presents in this specific fitness arena may impact not only PTs, but also the clients with whom they work.

Nature of the Study

This quantitative study used Internet self-report survey methods to acquire data for analysis. Several demographic variables including participant gender, race, age, height, weight, and competitive weightlifter and/or bodybuilder status were obtained via a researcher-created demographic questionnaire in order to describe the characteristics of the sample. The independent variables of body comparison, psychopathology, and social attitudes toward appearance were operationalized through the aforementioned instrumentation. The dependent variables of a DFM and MD were operationalized through the Drive for Muscularity Scale (McCreary & Sasse, 2000) and the Muscle Dysmorphic Inventory (Rhea et al., 2004). All data were collected using Survey Monkey© and analyzed using SPSS 21.

Population and Recruitment Methods

The target population consisted of individuals who were certified PTs and who were also members of an International Athletic Accrediting Agency (IAAA) registered with the IAAA's national database. A listserv of all potential participants was available online with each trainer's contact information. A mass email was sent to all U.S.-based trainers providing them with informed consent and a link inviting them to participate in

the online study. All participants were asked to complete a demographic survey as well as the subsequent five measures in the aforementioned tables.

Theoretical Framework

The theoretical framework used to structure this study was the BPS approach from Engel (1977). Engel's multidisciplinary model was a response to inadequacies with the biomedical model, and the author posited that disease and illness were not strictly biological entities with similarly biological manifestations. Rather, disease and illness, as well as treatment and wellness, are influenced by a myriad of psychological and sociocultural factors. Therefore, treatment is undermined when practitioners only focus on the physical dimension of pathology. The BPS approach was appropriate for this study insofar as MD has been empirically proven to be composed of biological, psychological, and social dimensions (Grieve, 2007). Specifically, MD can be considered a preoccupation with *physically* altering one's body to be more muscular based on *psychological* body image disturbances influenced by *sociocultural* standards of beauty. Therefore, MD as the primary construct of interest associated with this study embodies each dimension of the BPS approach. However, the BPS approach was used to structure the independent measures within this study and format a comprehensive approach specifically relevant to MD and a DFM. A more detailed explanation of Engel's model and its relevance to MD is provided in the second chapter.

Definitions of Key Terms

The *Adonis complex* is a male body-related obsession associated with attaining a hypermesomorphic physique (Pope et al., 2000).

Anabolic androgenic steroids are the most commonly used illicit subtype of appearance- and performance-enhancing substances that increase muscle mass and reduce energy expenditure (Hildebrandt, Harty, & Langenbucher, 2012).

Body dysmorphic disorder refers to a preoccupation "with one or more perceived defects in physical appearance that are not observable or appear only slight to others", and are addressed by repetitive behaviors or mental acts (APA, 2013, p. 236).

Body image disturbance refers to disturbances associated with the affective, perceptual, and/or cognitive dimensions of perceiving and internalizing one's own physical weight and/or shape (McFarland & Kaminsiki, 2009).

Certified athletic trainers are unique health care providers who collaborate with physicians to provide preventative services, emergency care, clinical diagnoses, therapeutic intervention, and rehabilitation of injuries and medical conditions that occur to athletes and the physically active (National Athletic Trainers' Association [NATA], n.d.).

*Certified personal trainer*s are people who work with relatively healthy and able individuals in order to enhance their quality of life, improve their physical fitness, manage potential health risks, and promote lasting behavior change (American College of Sports Medicine [ACSM], 2010).

Drive for muscularity is a motivation related to a person's attitudinal, training-related, behavioral, and dietary practices in the pursuit of developing a muscular physique (McCreary & Sasse, 2000).

The *dual pathway model* is a theory that body dissatisfaction can be influenced by muscularity as well as weight concerns that constitute a dual pathway to body dissatisfaction (Jones & Crawford, 2005).

Eating disorders are eating-related behaviors that lead to an altered consumption of food that impairs physical health or psychosocial functioning (APA, 2013, p. 329).

Muscle dysmorphia is a preoccupation with muscularity and behaviors that result in building muscle mass while also controlling for adiposity (Morgan, 2000).

Obsessive-compulsive disorder is a mental disorder characterized by obsessions and/or compulsions that may consist of repetitive physical behaviors or thoughts, as well as persistent urges, images, or thoughts that are experienced as intrusive (APA, 2013, p. 235).

Self-objectification theory refers to the separation of physical characteristics, physical parts, and sexual function from a person's identity so as to reduce that person to the equivalent status of an object (Fredrickson & Roberts, 1997).

Social comparison theory refers to the position that individuals gain useful information through comparison to those whom they perceive to be better than themselves (Festinger, 1954).

Somatoperception refers to somatic stimuli on superficial portions of the body (i.e., perception of body size and shape/conscious body image) experienced through the parietal and anterior parietal lobes (Longo, Azanon, & Haggard, 2010).

Somatorepresentation is considered general-encyclopedic, lexical-semantic knowledge about bodies (Longo et al., 2010).

Threatened masculinity theory is the theory that men have begun to equate muscularity with masculinity due to an increase in female presence in vocational, educational, and athletic arenas (Mishkind, Rodin, Silberstein, & Striegel-Moore, 1986).

The *tripartite influence model* reflects the position that an individual's body image is influenced by three entities—media, parents, and peers—and is mediated by general societal ideals (Thompson, Heinberg, Altabe, & Tantleff-Dunn, 1999).

The *quadripartite influence model* is a variant of the tripartite influence model incorporating muscularity and adiposity dissatisfaction as dual pathway models to muscular enhancement and disordered eating behaviors, respectively (Tylka, 2011).

Assumptions

It was assumed that the assessment tools being used were appropriate for the identified sample. It was assumed that the BCS, SCL-90-R, SATAQ-4. DMS, and MDI were acceptably valid and reliable (as further explained in Ch. 3). It was assumed that participants were capable of understanding and completing each of these surveys accurately, and that all participants answered truthfully and candidly to the best of their ability. The impact of other demographic factors (race, age, height, weight, competitive weightlifting status, and competitive bodybuilding status) was negligible in relation to the hypotheses of this study. This assumption was examined in preliminary analyses, and the nature of the relationships both between demographic variables as well as in regard to MD and a DFM resulted in further subsequent analyses (see Ch. 4).

Scope and Delimitations

The study was limited to certified PTs who were over the age of 18 and were registered members of the chosen IAAA residing within the United States. Some certified PTs are not registered members of the chosen IAAA and are not documented in their listserv; such PTs were therefore not part of the population. This parameter also excluded individuals registered with other agencies, as the study did not consider for dual registration or association with multiple agencies. Furthermore, individuals residing in non-U.S. countries were excluded from this study. A majority of the data were used to generate a correlation matrix and not test a model that could be applicable to the PT population. Structural equation modeling or intensive regression analysis would likely yield a comprehensive model based on the BPS structure of the variables. However, this was not done within (and was considered beyond the scope of) the current study.

The quantitative approach did not provide data about the lived experiences or ethnographic characteristics of the participants. The information was limited to raw data, and therefore any type of qualitative approach was beyond the scope of the present study. Lastly, the method employed was a cross-sectional design, and therefore the assessment of effects occurring over time or in relation to an intervention was beyond the scope of the present study**.**

Limitations

Issues of Internal Validity

1. *Selection*: PTs registered with the selected IAAA made up a vast and diverse group of members. However, it is possible that their commonality in

occupation predisposed them to have higher levels of a DFM or even MD. Therefore, probability sampling was applied to combat potential similarity in other characteristics including age and gender.

2. *Mortality*: The entire survey was composed of five separate instruments and a demographic questionnaire with a collection of 163 items that was expected to take participants 20-25 minutes to complete. Therefore, it was possible that some participants would not finish the survey. This threat was addressed through recruiting a large (1,000+) sample from the population in order to compensate for attrition during the survey.
3. *Instrumentation*: It was possible that the five separate measures would negatively or overpositively interact with one another to influence atypical or insincere responses. Subscales of the biological questionnaires may have had adverse or confounding impacts on the physiological questions on the MD and DFM assessments. Furthermore, the survey was administered in the English language, and some PTs may not have been completely fluent in the English language.

Issues of External Validity

Basic Generalizability Issues: The IAAA's registry database was limited to only those who were PTs, and therefore the results cannot be generalized to other occupations such as dieticians or kinesiologists, or to other athletic databases. However, it was hypothesized that many of the participants were affiliated with a wide range of athletics, including weightlifting and bodybuilding, whose athletes are commonly researched

populations in the extant literature. Therefore, in designating a target population that was likely to have considerable diversity with regard to sports participation, the ability to generalize to these subpopulations was increased.

Chapter Summary

As mentioned, MD and intense DFM can lead to detriments to health and wellness. MD is not well understood, and the interrelationship between a DFM and MD is not comprehensively researched, especially in gender-heterogeneous samples. It was anticipated that, by including (a) a gender-heterogeneous sample, (b) a multidisciplinary instrument selection scheme, (c) an examination of the predictive relationship between the DFM and MD, and (d) the incorporation of an unresearched population, this study would further the collective understanding of MD in a unique subset of individuals. This chapter has included the theoretical framework underpinning the study as well as the BPS model's role in operationalizing the etiological, independent factors of interest. The scope, limitations, delimitations, and assumptions have been considered and are explored in-depth in Chapter 3. The following chapter provides a comprehensive review of the extant literature on body image disturbance, MD, DFM, the nine subscales of the SCL-90-R, body comparison, and body dissatisfaction in men and women. In the following chapter, the specific application of the BPS approach to MD and a DFM is explored and justified for use in this research study.

Chapter 2: Literature Review

Introduction

Muscle dysmorphia is currently considered a subtype of body dysmorphic disorder whereby individuals maintain a pathological preoccupation with regard to improving muscle mass but believe they have a "puny" or "weak" appearance (American Psychiatric Association [APA], 2013; Olivardia, 2001; Pope et al., 2005). Olivardia (2001) provided diagnostic criteria for MD that are rooted in principles typically used in identifying body dysmorphic disorder (e.g., the body dysmorphic disorder modification of the Yale-Brown Obsessive Compulsive Scale). However, MD does not have any definitive diagnostic criteria, and research is currently filled with conflicting evidence as to whether MD should be considered an eating disorder, a type of obsessive-compulsive disorder, or a body dysmorphic disorder. Without a clear understanding of the classificatory properties of MD, research into how BPS factors relate to the presentation of MD becomes relevant in order to better understand the perceptual, behavioral, and psychosocial components of the disorder.

This literature review addresses the proposed etiology of MD and includes research concerning various aspects of BPS factors believed to be associated with the disorder. A brief description of the literature search strategy used to compile the literature is included. Sequentially, this review of the literature will encompass the following: the development of MD criteria, the concept of the DFM, male and female body image, the tenets of the BPS model, the BPS theoretical framework as it applies to MD research, and the presence of mental health disturbances in physical fitness arenas. This chapter

concludes with a summary of the salient findings and how the current state of the literature influenced the instrumentation, population, and primary variables of the current study.

Description of the Literature Review Strategy

Articles and book chapters with relevance for this study were obtained through Google Scholar, Walden University Library, and ProQuest Dissertations and Theses. Databases searched included Academic Search Complete, CINHAHL Plus, ERIC, Health and Psychosocial Instruments, MEDLINE, PsycARTICLES, Psyc Books, PsycEXTRA PsycINFO, and SocINDEX. Key terms including *muscle dysmorphia, the Adonis complex, vigorexia, bigorexia, reverse anorexia*, and *personal trainers and muscle dysmorphia* were searched separately throughout each stage.

Muscle Dysmorphia Criteria

Muscle dysmorphia deals with a pathological pursuit of altering one's morphology into a muscular and self-perceived aesthetic unit through means that usually pose some type of threat to self-preservation, social wellbeing, and/or psychological wellbeing. The preoccupation in question must be with regard to musculature, and the putative criteria for MD originate from Pope's (1997) work and are based on diagnostic criteria for body dysmorphic disorder (see Table 3).

Table 3

Olivardia's (2001) Criteria for Muscle Dysmorphia

1. The person has a preoccupation with the idea that his or her body is not sufficiently lean and muscular.
2. The preoccupation causes clinically significant distress or impairment in social, occupational, or other important areas of functioning as demonstrated by at least two of the following four criteria:
a. The individual frequently gives up important social, occupational, or recreational activities because of a compulsive need to maintain his or her workout and diet schedule.
b. The individual avoids situations in which his or her body is exposed to others, or endures such situations only with marked distress or intense anxiety.
c. The preoccupation about the inadequacy of body size or musculature causes clinically significant distress or impairment in social, occupational, or other important areas of functioning.
d. The individual continues to work out, diet, or use performance-enhancing substances despite knowledge of adverse physical or psychological consequences.
3. The primary focus of the preoccupation and behaviors is on being too small or inadequately muscular, and not on being fat, as in anorexia nervosa, or on other aspects of the appearance, as in other forms of body dysmorphic disorder.

Note. From "Mirror, Mirror on the Wall, Who's the Largest of Them All? The Features and Phenomenology of Muscle Dysmorphia," by R. Olivardia, 2001, *Harvard Review of Psychiatry*, *9*(5), 254-259. Reprinted with permission.

Individuals with MD also engage in *physique concealment*, wherein they take measures to hide their bodies in social settings due to a fear that others will negatively perceive and judge their appearance (Grieve, Truba, & Bowersox, 2009). It is not uncommon for individuals with MD to avoid social settings where they feel as though their physical build will be exposed, and they often feel immense distress when unable to avoid such situations (Pope et al., 1997). Contrariwise, they also engage in ritualistic

body-checking behaviors whereby they meticulously scrutinize their muscularity in a myriad of reflective surfaces including mirrors and glass (Olivardia, 2007). It is common for men, specifically, to check their biceps, abdominal muscles, and chest in social settings where there is another male present in a form of social muscular comparison.

In addition to using the environment to engage in muscle dysmorphic behaviors, individuals with MD structure their lifestyles around their muscular dissatisfaction. According to Thompson and Cafri (2007), individuals with MD take great steps to arrange their lives in a way that does not compromise their dieting or physical fitness practices. Men with MD often seek employment in environments where they can engage in weight training, such as gyms. This example of rearranging one's life to adhere to pathological endeavors is not limited to men, as more than half (53%) of the women interviewed by Pope et al. (1997) reported that they procured occupations within their gymnasium because their bodybuilding schedule inhibited them from attaining any other form of vocation. In addition to these behaviors, strict and specified dieting is associated with MD.

Baghurst and Kissinger (2009) indicated that individuals suffering from MD tend to (ab)use dietary supplements to satisfy their unhealthy preoccupation with a highly structured diet, and have also been known to use laxatives and diuretics to control their weight. Individuals with MD often spend copious amounts of money on athletic supplements, vitamins, and dietary products that may or may or not succeed in enhancing their physique (Olivardia, 2007). Whether the dietary supplement technically improves musculature is of little consequence, because these individuals often continue to maintain

negative perceptions about their bodies and feel further distress over supplements they perceive to be ineffectual (Keane, 2005).

A behavioral subcategory of the rigid dietary regimen adopted by those with MD is the (ab)use of anabolic androgenic steroids. Esco, Olson, and Williford (2005) conducted an extensive review of muscle dysmorphic literature and found androgenic anabolic steroid abuse to be the most significant medical concern among those with MD. Encompassing the literature, the authors reported a disturbing trend where well over half of MD cases admitted to using anabolic steroids (e.g., Choi, Pope, & Olivardia, 2002; Olivardia, Pope, Bororwiecki, Cohane, & Geoferry, 2004). Importantly, in the initial publication where MD was unintentionally discovered as a disorder, Pope et al. (1993) found a significant relationship between those with *reverse anorexia* and steroid use, suggesting that the concept of muscular dissatisfaction and an acceptance of the use of harmful substances to remedy that dissatisfaction are likely related.

In conclusion, it is important to incorporate a current conceptualization of MD criteria to better illustrate the rationale for the instrumentation used in the study. Specifically, an explanation of the known criteria for MD is intended to provide the reader with a rationale for the various measures and their respective factors examined in this study so the reader can intelligently and independently assess the content validity of the selected measures. The presentation of MD criteria is also intended to provide the reader with the empirically recognized behavioral manifestations of the disorder.

The Drive for Muscularity

The phenomenon known as the *drive for muscularity* is believed to be an underlying motivational ideology held by those with MD. McCreary and Sasse (2000) developed the term *drive for muscularity* as an opposing, although not distinctly antithetical, ideology to the drive for thinness, the latter of which they found to be related with females and societal perceptions of female beauty. McCreary and Sasse posited that as many Western cultural standards of bodily attractiveness emphasize a slender and curvaceous physique for women, they also emphasize a muscular mesomorphic physique for men, and that this culturally influenced aesthetic ideal causes men to experience a DFM as women experience a drive for thinness. McCreary and Sasse stated that a DFM can have negative psychological effects on men in a similar manner that the drive for thinness can have on women, and that these effects may consist of lowered self-esteem, higher levels of depression, binge-eating habits, the abuse of steroids, and poor self-perception.

In an effort to quantitatively measure the DFM, McCreary and Sasse (2000) developed the Drive for Muscularity Scale (DMS) with specific factors intended to address behavioral indicators of the drive, training regimens, attitudes, and diet of the disorder. In their pilot study with a sample of 197 adolescents, the authors found (a) that boys rather than girls were most likely to exhibit a DFM; (b) that the drive was related to poor self-esteem and higher levels of depression among boys, but not girls; and (c) that the DFM was unrelated to a drive for thinness. The DMS was further used in studies examining a potential relationship between a DFM and exercise dependence (Hale et al.,

2010), disordered eating (Rodgers et al., 2012), body image attitudes and emotions (Tod & Edwards, 2013), and MD (Robert et al., 2009).

Specifically, Pritchard, Parker, and Nielson (2011) examined potential factors that predict a DFM in male and female college students (335 women, 232 men) in two separate studies. In the first study, the authors examined the influence of disordered eating and obligatory exercise on a DFM and found a DFM to be related to obligatory exercise and eating concern in women, whereas the drive was found to be related to obligatory exercise and shape concern in men. In the second study, the authors examined the influence of body dissatisfaction and exercise motivations on a DFM and found that a DFM was predicted by appearance orientation, affiliation, recognition of exercise motives, and personal goal achievement in men, whereas personal goal achievement, exercise motives, exercising to cope, and body dissatisfaction were predictors of a DFM in women. Essentially, the authors found that although more men tend to experience a DFM, there are salient similarities associated with what factors are likely to predict a DFM in both men and women, and they warned that an intense DFM could potentially develop into MD.

In a similar study, Smolak and Stein (2006) assessed the relationship between the DFM and sociocultural factors, self-esteem, physical attributes, gender roles, and social comparison in 287 seventh and eighth grade boys. The authors found that an investment in the media significantly impacted a DFM, and that male physical attribute endorsement was both a direct influence and moderator on and for the drive, meaning that even low to moderate endorsement of physical strength and athletic ability by boys is associated with

a higher DFM. These findings suggest that sociological factors (i.e., media representations of masculinity and environmental influences of athletic ability) are typically salient to boys when they develop an aspirational idea. However, this posited idea of socioenvironmental internalization and subsequent internalization is not limited to adolescents.

Grieve and Helmick (2008) conducted a study investigating the influence of self-objectification on male body image and found that men with high levels of self-objectification reported a greater DFM and increased levels of MD symptomology than men with lower levels of self-objectification. In a more recent study, Parent and Moradi (2011) tested *objectification theory*'s application to a DFM and a propensity to engage in anabolic steroid use in men. The authors found that internalization, body surveillance, and body shame were related directly and positively with one another, and that internalization had an additional positive indirect link with body shame through body surveillance. A DFM partially mediated the links of internationalization with anabolic steroid use and an intention to use anabolic steroids; and anabolic steroid use partially mediated the relationship between internalization and intention to use anabolic steroids. Although not noted by the authors, the results of the study were consistent with findings in the extant literature (e.g., Daniel & Bridges, 2010). Ultimately, Parent and Moradi concluded that an internalization of cultural standards of physical aesthetics is the nexus of overlap between a male DFM and the variables associated with objectification theory and a propensity to use anabolic steroids.

A Drive for Muscularity and a Drive for Thinness: The Dual Pathway Model

The DFM is believed to be at the heart of the psychobehavioral component of MD, but currently researchers suggest that a DFM is counterweighted with a drive for thinness in MD, and this drive for thinness may account for some of the similarities found between MD and anorexia nervosa. Pope, Olivardia, and Phillips (2000) explained that individuals with body dissatisfaction engaging in unhealthy, MD-like behaviors tend to either be underweight with a desire to bulk up, or overweight with a desire to display lean muscle mass. Although the primary component of MD is a preoccupation with behaviors resulting in increased muscularity, it is largely believed that individuals will also endeavor to control adiposity as a means to display musculature.

Fernandez and Pritchard (2012) conducted a study in which they examined relationships between self-esteem, media influence, and a drive for thinness in 294 college students consisting of both men and women. The authors found a significant relationship between the media and the drive for thinness, and self-esteem and a drive for thinness in both men and women. They also found that media models were the primary predictor for a drive for thinness in men and women, and that social pressure was a secondary predictor of the drive in women while internalization was a secondary predictor for the drive in men. Similar to the aforementioned literature on a DFM in men, Fernandez and Pritchard reported that internalization and self-objectification of socioenvironmental influences were integral to the development of a drive for thinness. However, it is important to consider that although a drive for thinness can affect both

men and women with similar social precursors, a DFM can also be a substantial concern for both sexes and can be exacerbated with an accompanying drive for thinness.

Kelley, Neufeld, and Musher-Eisenman (2010) specifically examined if a DFM and a drive for thinness were opposing sides of a continuum or if they could exist concomitantly as viable motivations. The authors investigated a drive for thinness and a DFM in 285 college freshman (174 female, 111 male) and found that a majority of individuals (65.4%) reported having both a drive for thinness and a DFM. Furthermore, the authors indicated that the presence of both drives significantly predicted body anxiety and body compulsivity among females and negative body-esteem among males. Therefore, these findings lend credence to the theory that a drive for thinness and a DFM are not mutually exclusive.

The findings from Kelley et al. (2010) and Fernandez and Pritchard (2012) are related to what Jones and Crawford (2005) termed *the dual pathway model*. According to the tenets of the dual pathway model, male body dissatisfaction can be experienced in a bimodal fashion where individuals (a) perceive themselves to be substantially ectomorphic and lacking in both muscular mass and general size, or (b) perceive themselves to be overweight and struggle with large amounts of adiposity. In an effort to distinguish between male weight and muscularity concerns, Jones and Crawford assessed constructs such as muscle-building conversations, weight concern, muscularity concern, body dissatisfaction, and body mass in a group of 128 eighth and 11th grade boys. The authors found that muscularity concerns were significantly higher among boys who reported more frequent muscle-building conversations with friends, had a lower body

mass index, and were younger. Weight concerns were significantly associated with elevated body mass indexes and more frequent appearance-related conversations with friends. The findings suggested that body dissatisfaction is not best represented by a singular pathway, but that both muscularity and weight concerns can result in body dissatisfaction.

The DFM is related to this proposal as it was putatively believed to be an underlying motivation behind MD. Furthermore, I had used a heterogeneous sample of both men and women, and therefore felt it pertinent to indicate that a DFM can occur in both sexes of PTs. Also, it was important to explain that resultant body dissatisfaction is not dependent upon a single pathway, but that both weight and muscularity concerns were important considerations for MD as well as possible body image disturbances.

Body Image and Muscle Dysmorphia

The concept of body image may involve perceptual, affective, cognitive, and behavioral disturbances in regard to (a) a how person perceives physical inadequacies and physical strengths, (b) how a person feels emotionally about perceived inadequacies and strengths, (c) what a person believes or evaluates to be physical flaws and inadequacies, and (d) what actions a person engages in regarding strengths or inadequacies based on these perceptual, affective, and cognitive influences (Ricardelli & McCabe, 2004).

The psychobehavioral approach used to describe the concept of body image has also been used in conceptual models of possible MD etiology (Lantz et al., 2002), and provides a practical, theoretical structure for MD if body image disturbance and/or body dissatisfaction are indeed central to MD (Grieve, 2007). Ricardelli and McCabe (2004)

found that body dissatisfaction is associated with disordered eating in both males and females, and that men who are dissatisfied with their bodies may have poor psychological adjustment, use steroids, and exhibit behaviors congruent with exercise dependence. However, there is a paucity of literature associated with gender and body image insofar as that a majority of literature on body image is associated with females and incorporates a consideration for a drive for thinness. Therefore it was important to assess MD and a DFM specifically in both males and females.

Male Body Image and Muscle Dysmorphia

A distorted body image and subsequent anorectic behaviors have been largely thought to be influenced by socioculturally devised standards of beauty based on Western ideology, but a distorted body image is likely an international problem (Costa-Font & Jofre-Bonet, 2013). Costa-Font and Jofre-Bonet conducted a study using the data from the European Survey to examine anorectic behaviors, body image, and peer influences, and found that the weight of a woman's peers greatly influenced the weight of a woman and also the likelihood of her being anorexic. However, males are also susceptible to peer influences and beliefs about body image.

In a study conducted with 269 adolescent boys, Cafri, et al. (2006) found that body dissatisfaction and body mass index were significant predictors of dieting to gain weight, and that media influence, negative affect, and participation in sport were significant predictors of MD symptoms. These findings are partially supported by a later meta-analysis conducted by Blond (2008), where Blond concluded that "combined, the studies suggest that images of male bodies that epitomize the societal muscular ideal pose

the greatest risk for increasing men's body dissatisfaction. All accounts of increased body dissatisfaction were found after exposure to images of athletic male bodies" (p. 248).

The notion that men's body satisfaction is negatively affected by sociocultural influence has also been qualitatively supported. Bottamini and Ste-Marie (2006) reported that most men believe a tall, muscular and lean physique to be ideal to both men and women, and that these ideals are heavily influenced by the media, peers, and potential mates. However, even though the participants in the study indicated that they were influenced by media outlets such as movies, television, magazines, and the internet, most acknowledged that these outlets exaggerate the importance of a muscular physique. Congruent with previous findings from Olivardia, Pope, Mangweth, and Hudson (1995), the participants also reported that most men tend to be reluctant to discuss body image concerns, and would prefer to let themselves believe that body dissatisfaction is only a women's issue despite media outlets promoting muscular, lean and generally athletic physiques geared towards male target audiences.

Athleticism and participation in sport are additional factors that have been found to be related to MD and body dissatisfaction in men (Cafri, et al., 2006), and the athletic environment can present a unique myriad of sociocultural influences relative to disordered eating, body dissatisfaction, and MD. Galli and Reel (2009) conducted a qualitative study whereby they explored the social construction of body image experiences for male athletes. They interviewed ten former athletes and found six general dimensional themes including (a) wide-ranging impact of sport on body image, (b) sociocultural body image influences, (c) body dissatisfaction, (d) body enhancing

behaviors, (e) positive feelings about one's body, and (f) positive consequences of achieving the ideal body (p. 100). The findings align with a more recent, qualitative study by Atkinson (2011) who found that males tend to view forms of self-starvation and emaciation generally acceptable if situated within a context of a sport, and that athletes tend to develop unique relationships with food where *food* is commonly viewed as merely fuel for a physical body-type best suited for their respective sport.

Female Body Image and Muscle Dysmorphia

Research into female MD and a woman's exhibited DFM resultant from body dissatisfaction are substantially underdeveloped, but women who compete in sports where weight and shape concerns are emphasized are believed to be at a higher risk for developing MD and an intense DFM (Andersen, Brownell, Morgan, & Bartlett, 1998). Female bodybuilders specifically had reported substantially high levels of dieting practices, weight loss, and weight regain prior to a competition; and MD symptoms in American women have been positively correlated with exercise dependence (Andersen et al., 1998; Giardino & Procidano, 2012). Furthermore, Andersen and colleagues found that from 26 female participants, 60% reported being very unsatisfied with their bodies, and that between 25% and 80% reported psychological distress such as anger, depression, fatigue, short temper, and anxiety. As with the participants' male bodybuilding counterparts, it is unclear if the females who engaged in disordered eating had suffered psychological distress due to sport influence and the demands of competition, or if they experienced body dissatisfaction and muscle dysmorphic symptoms when competition

was not involved. No substantial longitudinal studies exist to examine the moderating effects of sport on factors such as MD in conjunction with psychological well-being.

In a recent study, Goldfield (2009) assessed disordered eating, perceptions on body image, and the use of anabolic steroids in a group of competitive female bodybuilders as compared with a group of recreational female weight-training controls. Although the following factors were also present in the control group, the female bodybuilders scored higher on weight and shape preoccupation, body dissatisfaction, bulimic practices, and steroid use, but there were no significant general psychological differences between the two groups. Weight and shape related sports such as bodybuilding may also influence exercise dependence behaviors. Hale et al., (2013) examined exercise dependence, a drive for thinness, disordered eating, bodybuilding dependence, and MD among 26 expert bodybuilders, 29 novice bodybuilders, and 19 fitness lifters where all participants were female. The researchers found that the novice and expert groups of bodybuilders tended to score higher than the fitness lifters for bodybuilding dependence, disordered eating, exercise dependence, and size and symmetry concerns. The authors concluded that novice and expert female bodybuilders appeared to be at a higher risk for developing MD and exercise dependence than recreational weightlifters, and that female bodybuilders may be at an elevated risk comparable to male bodybuilders for developing muscle dysmorphic symptoms.

It is not well-understood if females associated with bodybuilding exhibit muscle dysmorphic behaviors due to underlying body dissatisfaction or if the subculture and normative practices of the sport somehow influence these behaviors (Probert, Leberman,

& Palmer, 2007). Leone (2009) presented a case study of a 23 year-old woman with MD and an extreme DFM. The participant presented lived experiences congruent with the exhibition of muscle dysmorphic behaviors and a strong DFM, including continuing to train after a series of severe injuries, social impairment, general muscularity and muscular performance dissatisfaction, and compulsive weightlifting. However, women tend to be underresearched with regard to MD, and Leone buttressed previous conclusions by asserting that women who are somehow affiliated with weight-and shape-related sports may be at a higher risk for developing the disorder. Furthermore, examining a DFM and MD in women from various cultures and backgrounds would address a dearth in the current MD literature. Leone ends his discussion by stating that "women continue to be understudied in terms of MD, drive for muscularity, gender typing, and the use of anabolic agents…a greater need exists to discover why women may react to circumstances precipitating muscle dysmorphic symptoms and excessive drive for muscularity" (p. 994).

Gender Differences and Similarities in Body Image and Muscle Dysmorphia

It appears that men typically exhibit a DFM and desire to develop a masculine, mesomorphic body type while women tend to exhibit a drive for thinness and develop a lean, yet curvaceous body type (Blashill, 2011). However, the prevalence for women adopting a DFM and men adopting a drive for thinness has not been thoroughly researched. Both men and women, as well as girls and boys, can exhibit a DFM, although this drive is not as strong for girls and women as it is for boys and men (McCreary & Sasse, 2000; McCreary, Sasse, Saucier, & Dorch, 2004). Furthermore, it is unclear as to

what most women believe an ideal male body to look like, what most men believe women look for in a male body, and how males tend to perceive their own bodies.

Grieve, Newton, Kelley, Miller, and Kerr (2005) examined muscular ideals and body perceptions in a group of college students (n = 244) and found that (a) men wanted to be more muscular than they currently appeared, and (b) men had poor insight into female preference for male body type, as men reported that women desired a more muscular male body type than what women actually reported liking. In addition to poor male insight, men and women tend to internalize ideal body images in different ways. Cahill and Mussap (2007) examined the emotional reactions of men and women to exposure to idealized body images. The authors found that exposure to thin female models significantly increased current-state anger, and significantly decreased body satisfaction in women. Alternatively, exposure to muscular male models decreased body satisfaction in men. Furthermore, model exposure led to increases of state anxiety and depression, and these factors were associated with an elevated drive for thinness and bulimic symptoms. Post exposure increases in body dissatisfaction in men correlated with muscle changing behaviors in men, which was congruent with both preceding and subsequent studies (e.g., Giles, & Close, 2008; Tiggemann, 2005). Body comparison and internalization mediated these relationships in men, and factors including trait depression, self-esteem, self-concept, confusion, and trait body dissatisfaction were mediators for women. Therefore, the authors concluded that (a) men and women internalize idealized body images differently, (b) women and men have psychological traits that may

predispose them to certain reactions, and (c) men and women adopt different body change strategies in reaction to an exposure to idealized bodies.

Researchers have indicated that models for a DFM can be applicable to both men and women. McCreary and Saucier (2009) examined the relationship between a DFM and social physique anxiety, general, weight-, and muscle-related aspects of body comparison in a group of men and women. An increased frequency of both muscle-and weight-related body comparison was predictive of higher social physique anxiety, and muscle-related comparison was substantially more associated with a DFM than weight-related concerns. The authors asserted that men may only consider weight and muscularity in the body comparison process, whereas women view these constructs separately. However, the authors stated that there were insignificant differences between men and women, and that their DFM model provided a significantly good fit to the data in both genders.

In a similar study, Robert et al., (2009) assessed the relationship between a DFM and MD in female and male recreational weight trainers. The authors found that although men scored higher on the Muscle-Appearance-Satisfaction Survey, as well as the attitudinal and dieting subscales of their Modified Drive for Muscularity Scale, the behavior and dieting subscales of the Modified Drive for Muscularity Scale significantly predicted MD in males and females. The authors also asserted that both men and women who engage in bodybuilding, weight-training, and even general fitness are likely to be at a higher risk for developing MD. This assertion is indicative of a how MD may be more significantly correlated with participation in sport than gender alone.

The purpose for including gender consideration with regard to body image and MD related to this study insofar as both men and women were assessed. The reason for including a gender heterogeneous sample is based on the extant literature insofar as that participation in sport (and even general fitness) may be influential in the development of a high DFM and possibly MD. Operating under this assumption, it was relevant to assess the nature of muscularity concerns in both men and women who are PTs as this vocational affiliation with sport may place both genders at risk for developing MD.

The Biopsychosocial Model and Muscle Dysmorphia

The theoretical framework selected for this study is the BPS model developed by Engel (1977). This theory was used to contextualize the independent variables within the study by providing dimensional structure to the instrumentation used. Specifically, one independent measure that related to the biological, psychological, and sociological dimensions of the BPS approach was used to form a total of three independent measures that assess a myriad of biophysical, psychological, and sociological variables. The BPS framework was selected because of its use in previous MD research, and also because it is largely inclusive of a variety of possible MD - contributing factors. Therefore the BPS framework had applicability for assessing a construct (MD) that is still considered emerging with etiology and psychobehavioral characteristics that are not well known.

The Biopsychosocial Model

The BPS model was originally conceived by Engel (1977) as a framework to address limitations with the biomedical model and also acknowledge the comorbidity of certain ailments considered to be inherently biophysical with associated psychiatric

complications. Engel claimed that "the boundaries between health and disease, between well and sick, are far from clear and never will be clear, for they are diffused by cultural, social and psychological considerations" (p. 196). Engel argued that biological criteria alone should not be ultimate in understanding a specific ailment, and that the biomedical model's focus on the physical dimension alone disrupts the understanding of if a person is sick or if a person is well. Specifically, Engel (1997) stated that:

> To provide a basis for understanding the detriments of disease and arriving at rational treatments and patterns of health care, a medical model must also take into account the patient, the social context in which he lives, and the complementary system devised by society to deal with the disruptive effects of illness, that is, the physical role in the health care system. (p. 196)

Engel's position was that biological and psychological ailments are interrelated, and that psychological ailments can have physical manifestations as biological ailments can have psychological manifestations. In turn, these manifestations can be impacted by societal and cultural environs, and these environs can also influence the behaviors a person engages in that may lead to a sickness, exacerbate a sickness, or lead to a remedy for that sickness.

Researchers explained that Engel's theory has developed and withstood numerous bouts of criticism, and that the BPS approach has become popular among those affiliated with medical and social sciences well into the 21st century. In Borell-Carrio et al.'s (2004) article *The Biopsychosocial Model 25 Years Later: Principles, Practice, and Scientific Inquiry,* the authors described how the BPS model had become both a

philosophy and practical guide to clinical care. They indicated the versatility of the model, as well as that the multifaceted approach concerning biological, psychological, and social components of the patient is an ideology which clinicians can apply comprehensive approaches to both diagnosis and treatment. However, despite the multidiscplined popularity of the BPS model, this framework has yet to be integrated in everyday medical care (Lane, 2014). In addition to popular yet limited utilization in clinical settings, Lane argued that the BPS model is also useful for testing theories, structuring research designs and exploring the characteristics of various psychological disorders.

Rationale for Selecting the Biopsychosocial Model

Researchers associated with MD literature tend to acknowledge the utility of the BPS approach because this model accounts for the symptoms commonly identified as being associated with MD (e.g., Cafri, van den Berg, & Thompson, 2006; Grieve, 2007; Woodruff, 2012). The BPS framework is also asserted to be the best approach to examining MD (e.g., Baum, 2006; Olivardia, 2001; Pope et al., 2000). This model is practical when one considers the proposed criteria for MD, the empirical research indicating the symptoms of MD, and the general nature of MD as a subtype of body dysmorphic disorder. Specifically, the strong biophysical component of MD (a preoccupation with physically altering one's muscular appearance), strong psychological presentation (anxiety and depression resulting from body dissatisfaction), and the presence of social influence (media, peer, familial, ideal internalization), are inclusive of important MD-related factors which are central to consider when examining the disorder.

Muscularity dissatisfaction, sense of self, and inadequacy are factors that can be influenced by how a person perceives themselves, as well as how they compare themselves to ideal physiques in their own environment. However, Olivardia (2001) indicated that it is possible for individuals to have muscularity dissatisfaction, low self-esteem, and be exposed to ideal physiques and not develop MD. Therefore, it was logical to adopt a multidisciplinary framework as a means to consider each dimension of the BPS model in order to comprehensively address MD as a disorder with biological, psychological, and sociological facets that can intermingle with different levels of variance and severity.

The Sociological Dimension of Muscle Dysmorphia

Congruent with Engel's (1977) BPS model where sociocultural influences must be considered when examining a disorder in its entirety, previous research into body image often includes a societal, socioenvironmental, or sociocultural element. In Cash's (2002) model of Cognitive Behavioral Body Image, he argued that physical characteristics, personality attributes, interpersonal experiences, and cultural socialization each contribute to how people feel, think, and behave in response to how they perceive their bodies. From Cash's model, it is possible to view *physique opinion* as an inherently neutral concept, where satisfaction with one's physique is underpinned only by social comparison with interpersonal interactions and internalizations of societal aesthetics as influences for how (un)favorably a person perceives their own body. In other words, a person's judgment on the adequacy of their own appearance is facilitated through a process of comparison, and the exemplars of both extremely desirable and extremely

undesirable physiques are the ends of a continuum created through societal ideals and interactions with others.

Media, Family, and Peer Pressures and Ideal Physique Internalization

Previously, individuals used to develop their identity primarily from social groups, such as family, religious affiliations, vocational relationships, and educational relationships, but the presence of micro and mass media has presented a myriad of influences whereby an individual's identity can be shaped (Orsetto, 2010). These media influences can affect the worldviews, mores, and perceptions of what individuals deem to be acceptable, and this structure of normalcy is also evident in physical self-appraisal.

Antecedently, women have been subjected to more idealized physique images than men (Buote, Wilson, Strahan, Gazzola, & Papps, 2011), but the phenotypical emphasis placed on a hyper-mesomorphic physique for men is beginning to parallel the emphases placed on lean and curvaceous physiques for women. Media internalization has been found to be a significant predictor of a DFM in college-aged men (Daniels & Bridges, 2010). Law and Labre (2002) examined changes in male images in magazines across a 30 year time period (1967 – 1997) and found that male bodies became more muscular and lean with broad shoulders, larger chests and tapered waists. The authors asserted that it is likely men experience increased pressures to be lean and muscular based on this common media presentation of the aesthetic male ideal, and parallel this assertion to the thin female body ideal and its relationship to disordered eating and body dissatisfaction. These findings are in line with those evidenced by Pope, Olivardia, Boroweicki and Cohane (2001) who found that the number of undressed males in

women's magazines had increased over a 40 year time period, while the number of undressed females had changed very little over the past 40 years. Furthermore, Ricciardelli, Clow, and White (2010) concluded that magazines influenced the image of a hegemonic lifestyle to men, and these magazines emphasized that men ought to enhance their appearance in order to attain the lifestyle they want.

Giles and Close (2008), found that the internalization of appearance ideals in magazines was a possible mediator of the relationship between idealized body exposure and a DFM and eating disturbance. Additionally, Baird and Grieve (2006) reported that college males who viewed magazine advertisements with male models as opposed to only the advertised product experienced an increase in body dissatisfaction. The results from each of the five aforementioned studies are related to Blond's (2008) comprehensive analysis of the extant literature on body esteem and media internalization, as he explained that it has been consistently, empirically supported that male body satisfaction can be negatively impacted by exposure to aesthetically ideal male bodies.

Detrimental internalizations of media ideals and muscularity also pertain to child action figures. Pope et al. (1999) measured the circumferences of the chest, waist, and biceps of G.I. Joe© and Star Wars© action figures, and found that recently produced figures were substantially more muscular and muscularly defined than figures produced 25 years ago. These findings aligned with those from Baghurst, Hollander, Nardella and Haff (2006), who measured the waist, neck, arm, forearm, chest, thigh and calf of five separate action figures. The authors found that, except for the waist, all other body part dimensions increased and became more muscular over a 25 year period. In a later study,

Baghurst, Carlston, Wood, and Wyatt (2007) indicated preadolescent and adolescent males preferred recent and more muscular action figures, and that the adolescents themselves desired physiques congruent with the level of musculature observed in the toys. In all three of the aforementioned studies, the authors indicated that the scaled dimensions of these action figures are physically unattainable and anatomically inaccurate. Additionally, Barlett, Harris, Smith, & Bonds –Raacke, (2005) found that simply handling muscular action figures led to a decrease in body esteem. Action figures are intended for impressionable and youthful audiences, and therefore researchers have speculated as to if these grossly inaccurate anatomical representations may somehow contribute to an unrealistic muscular ideal in children.

The possible negative ramifications of media influence are not limited to action figures and magazines, nor are they limited to the perceived physiques of models. Morrison and Halton (2009) examined a randomly selected series of action movies listed in the 150 top-grossing categories for films produced between 1980 and 2006 to investigate the depiction of muscular vs. non-muscular men. The authors found that (a) central and peripheral characters were substantially muscular and lean, (b) muscular and lean male characters were more likely to engage in acts of aggression, and embody figures of social/romantic desirability, and (c) muscular male characters were more likely to experience positive outcomes. In looking at the specific media outlet of cinema, Morrison and Halton were able to support that hypermesomorphic depictions were not only illustrative of idealized physiques, but that they were also characterologically given desirable attributes associated with masculinity.

Researchers have also indicated that exposure to specific media figures can supportively impact body satisfaction, and may have positive rather than negative ramifications. Young, Gabriel, and Hollar (2013) examined the construct of a parasocial relationship status, which they define as a one-sided psychological bond with a media figure. Young and colleagues found that men who had no parasocial bond with a specific superhero and were then exposed to a muscular depiction of that superhero experienced lower body-self-esteem, whereas men with a parasocial bond not only experienced stabilized body esteem, but also an increase in physical strength as measured by a hand-grip dynamometer. Therefore, the authors concluded that a parasocial bond can moderate the relationship between idealized superhero physique exposures and body esteem. Although this study provided empirical support for the hypothesis that not all idealized body exposures lead to lowered body-esteem, the study also helped to illustrate the strong influence media can have on self-appraisals, albeit positive or negative. Young and colleagues also illustrated a potentially measurable connection between an idealized body shape and physical strength, which further buttresses sociocultural associations between muscularity and masculinity.

The Adonis Complex and Threatened Masculinity Theory

Pope et al. (2000) explained that many men are secretly suffering from male body obsession, and struggle with adhering to the socioculturally constructed ideals for an aesthetic male physique. This crisis was termed by Pope and colleagues as *The Adonis Complex*, and conveys an ideologically structured phenomenon encompassing serious and often deleterious obsessions with attaining a hypermesomorphic body.

According to the authors, the body image concerns of men have been grossly underresearched and underrecognized, and men have long since been experiencing body image disturbances in a similar fashion to that of women. Men experience extreme distress over this obsession, and the disturbance influenced by an often unattainable muscular physique is associated with an extreme DFM and MD.

The Adonis Complex may be precipitated by the theory of Threatened Masculinity. Threatened Masculinity Theory was developed by Miskind, Rodin, Silberstein, and Striegel-Moore (1986) as a theoretical approach to understanding an empirically observed increase in male body dissatisfaction. Mishkind and colleagues adopted an etiological approach to the increase in male body dissatisfaction and theorized that increasing gender equality has displaced a substantial amount of men. Specifically, women have increasingly entered vocational, educational, and athletic arenas where they had previously maintained little-to-no presence. In an effort to assert ascendency over females, men began to equate masculinity with muscularity, believing that although women could dominate the aforementioned arenas, they could not biologically attain the same physical stature as men. Therefore, Mishkind and colleagues posited that as men began to equate muscularity with masculinity the also began to use muscularity to compensate for a perceived diminishment to their masculinity.

Threatened Masculinity Theory has been partially supported by researchers such as Fredrick, Buchanan, and Sadehgi-Azar (2007) who found that male muscular dissatisfaction is consistently higher in locations with belief systems that adopt gender equality as opposed to those with male-dominated societies. Researchers indicated that

muscle dissatisfaction tends to affect more men in Western (Kanayama & Pope, 2011, Goodwin Haycraft & Meyer, 2011) and European civilizations (Sokolova, Gonzales-Marti, Jordan & Bustos, 2013; Mangweth et al., 2001) than in Eastern portions of the world (Jung Forbes & Chan, 2010; Yang, Gray, & Pope, 2005).

Recently, Threatened Masculinity Theory gained both support as well as antagonism through an experimental endeavor. In a series of two studies, Hunt, Gonsalkorale, and Murray (2013) found that threats to masculinity in men resulted in (a) lower confidence in physical capabilities, (b) less muscular self-appraisals, (c) anxiety over appearance and (d) an increased DFM as opposed to a muscularity affirmation comparison group. Conversely, in the second study from Hunt and colleagues, men reported a higher DFM and lower appearance anxiety after a threat to masculinity as compared to an affirmation to masculinity control group. The authors attempted to rationalize this discrepancy by asserting that when "men experience a decrease in their confidence in their physical strength and perception of their current level of muscularity following a threat to their masculinity, they may also be motivated to explicitly deny that they are experiencing concerns related to their appearance" (Hunt et al., 2013, p. 8). Currently, Threatened Masculinity Theory's direct and empirical relationship with the development of MD is not known.

As emerging constructs, The Adonis Complex and Threatened Masculinity Theory have been well-accepted by most researchers (Lukacs & Tury, 2008). However, Swami and Voracek (2013) conducted a study where they examined a DFM in men resulting from sexist attitudes and objectification of women. The authors found sexist

attitudes, hostility towards women, objectification of women, and a belief that women were inferior to men led to a greater DFM, which contradicts the notion that men seek increased muscularity out of jeopardized masculinity. Although Threatened Masculinity Theory provides an etiological structure for explaining The Adonis Complex, it is clear that further research is needed in establishing the societal motivation for increasing muscularity concerns among men.

Body Comparison and Social Comparison Theory

A substantial amount of research into body image and the effects of sociocultural ideas on body esteem are rooted in Festinger's (1954) Social Comparison Theory. The basic tenet of Social Comparison Theory is that humans inherently engage in comparing themselves with others in terms of capabilities and appearance as a means to derive accurate self-evaluations. These evaluations also serve as structuring agents in that individuals make judgments about themselves in a directional, upward vs. downward, comparison. Directly relating to body image and MD, researchers believed that Social Comparison Theory has meaningful applications in these fields, especially with regard to how both men and women use body images presented in the media, as well as the physiques of other humans (friends, family, etc.) to make self-evaluations about their own physique (Baird & Grieve, 2006; Robert et al., 2009; Orsetto 2010).

The Tripartite Influence Model

Associated with Social Comparison Theory is the Tripartite Influence Model from Thompson, Heinberg, Altabe, and Tantleff-Dunn (1999). The central tenet of this model is that an individual's body image is influenced by three entities: media, parents, and

peers, and that this influence is mediated by societal ideals. In terms of body image, individuals compare themselves with media images, the physiques of friends, and/or the physiques of parents, and these social comparisons then influence an internalization of societal ideals. The interrelation between the Tripartite Influence Model and Social Comparison Theory in terms of the relationship between social comparison and internalization as impactful factors on body image has been empirically supported in both males (Karzia & Crowther, 2009; Karzia & Crowther, 2010) and adolescent boys (Cafri et al., 2006. This relationship has also been supported in both females (van den Berg, Thompson, Obremski-Brandon, & Coovert, 2002) and adolescent girls (Shroff & Thompson, 2006).

Social comparison and internalization may be markedly relative to a DFM. Smolak and Stein (2006) found that media influence and an endorsement of male physical attributes were significant correlates for a DFM in adolescent boys. Karzia and Crowther (2009) indicated that internalization and social body comparison mediated the relationship between social influences and muscularity dissatisfaction, and a later study from the same authors revealed that psychological variables mediated the relationship between societal influences and muscularity dissatisfaction in a group of college men (Karszia & Crowther, 2010).

A drive for muscularity includes body changing behaviors that extend to dieting and training regimens (McCreary and Sasse, 2000). After social comparison and an internalization of standards, individuals then make a self-evaluation about their physique. If this appraisal is negative, then it is likely the individual will engage in body change

behaviors that will facilitate the appropriate alteration. However, these behaviors are often congruent with specific goals insofar as individuals may pursue behaviors that reduce adiposity, pursue behaviors that increase muscle mass, or pursue an amalgamation of both size increase/decrease goal-oriented behaviors (Murray & Touyz, 2012). In a revised version of the Tripartite Influence Model, Tylka (2011) developed a Quadripartite Model where dual body image pathways were included. Tylka argued that although men are subject to social comparison and an internalization of societal ideals, muscular dissatisfaction and body fat dissatisfaction should be considered as separate entities that are also individually different constructs from a DFM and a drive for thinness, respectively.

Tylka's (2011) Quadripartite Model shares many similarities with the previously mentioned dual pathway model from Jones and Crawford (2005) in that individuals are likely to adopt binary and even multimodal approaches to achieving a desired physique that encompass both weight and muscularity concerns, and are influenced by psychosocial factors. In an application of the model, Tylka found that muscular dissatisfaction slightly predicted muscularity enhancement behaviors in men, and that dissatisfaction with body fat strongly predicted disordered eating behaviors. Tylka's model may also apply substantially to MD as a construct, as the ultimate goal facilitated by muscle dysmorphic behavior can briefly be defined as an endeavor to increase muscle mass without gaining fat (Morgan, 2000). It is possible that longitudinal research may reveal that men, and especially those associated with appearance- and weight-related sports, alternate respective body change behaviors based on immediate physical goals,

and that a series of these weight-vs. muscle-related alterations could collectively be indicative of MD.

However, societal ideals and interactions are largely influenced by a person's immediate milieu. As Grieve (2007) and Cafri et al. (2005) indicated, there appears to be a relationship between muscular dissatisfaction and participation in sport, and body builders have been indicated as a high-risk population for the development of MD (Anderson et al., 1998; Hallsworth, Wade, & Tiggemann, 2005). Blouin and Goldfield (1995), Robert et al. (2009) and Hale et al. (2013) had concluded that individuals who participate in weight- and appearance-related sports are at a higher risk for developing MD. Furthermore, individuals participating in sport report that social influences tend to be performance-and appearance-related, and that body image is highly regarded in athletics (Galli & Reel, 2009). Yet, social comparison and an internalization of media and interpersonal influences are only part of the collective BPS approach to MD. Muscle dysmorphia also consists of psychobehavioral components that are responsive to a negative self-evaluation of muscularity, and these components can have detrimental impacts on mental health.

The Psychological Dimension of Muscle Dysmorphia

Muscle dysmorphia can consist of demanding behaviors and negative perceptions of self that can lead to psychological impairment. Specifically, depression, anxiety, physique anxiety, obsessive-compulsive behavior, and disordered eating are six salient mental health disturbances that are consistently associated with MD and supported by current empirical research (Todd & Lavallee, 2010). Maida and Armstrong (2005)

reported that depression and general anxiety have a moderate association with MD, and that body dysmorphic disorder and obsessive-compulsive disorder were significantly associated with MD. Ebbeck et al. (2009) found that depression and social physique anxiety (negative affect variables) were also related with MD, but that these negative affect variables were not statistically significant enough to constitute as predictors for MD. Similarly, Goodale, Watkins, and Cardinal (2001) reported that MD was significantly related with disordered eating and depression in a mixed-gender sample of 323 college students.

Furthermore, other researchers have found MD to have significant positive associations with symptoms of body dysmorphic disorder in addition to muscularity concerns (Mayville et al., 2002). Individuals with MD "were significantly more likely to have comorbid body dysmorphic disorder based on preoccupations other than muscularity; 33% of the subjects with muscle dysmorphia had such comorbidity" (Hitzeroth et al. 2001, p. 523).

Combinations of lower total self-concept and higher scores of depression, anxiety, and interpersonal sensitivity have been reported to predict elevations in body dissatisfaction, and these four independent variables also predicted MD (McFarland & Kaminiski, 2009). However, the authors noted that when the effects of body dissatisfaction were controlled, factors such as obsessive-compulsive symptoms, paranoid ideation, and hostility remained significantly present in men with MD.

Research addressing psychological disturbances and potential connections between MD and bullying also yielded similar results. Wolke and Sapouna (2008)

examined childhood bullying experiences and MD in a sample of 100 bodybuilders, and found that high levels of MD and bullying victimization in childhood predicted global psychopathology (depression, anxiety, and obsessive-compulsive symptoms). In a study with slightly different results, Boyda and Shelvin (2011) discovered a significant, positive correlation between childhood victimization and MD, and that anxiety and not depression was significantly associated with MD. Similarly, Cafri et al. (2006) found that negative affect, media, and participation in power sports were predictors of MD in a group of adolescent boys, and that teasing about one's muscularity was significantly associated with MD and dieting to gain weight. In a recent study conducted by Grieve and Shacklette (2012), the authors specifically assessed a possible correlation between depressive symptoms and MD, and found that depression accounted for approximately 17% of the variance in muscle dysmorphic scores. All four studies are relative to research conducted by Olivardia (2000), who reported correlations between MD and history of mood disorders, history of anxiety disorder, disordered eating, functional impairment, and also a family of origin violence.

Specific SCL-90-R Variables and Muscle Dysmorphia

Somatization refers to mental distress when it is exhibited through physical manifestations, and few researchers have addressed the relationship between somatization and MD. Maida & Armstrong (2005) discovered a positive relationship between somatization and MD ($r = .16$, $p > .01$) in a sample of physically active males ($n = 106$). In a later study McFarland and Kaminski (2009) found a moderate, positive relationship between somatization and MD when the threshold value was equal to .05, but not .01 ($r =$

.05) in a sample of undergraduate men (n = 304). These aforementioned studies offer slightly conflicting results and are the only two known to have been conducted with somatization and MD.

Obsessive-compulsive tendencies have been found to maintain consistent positive correlations with MD. From the same aforementioned studies, Maida and Armstrong (2005) found a moderate, positive relationship between obsessive-compulsive tendencies and MD (r = .52, p < .01), and McFarland and Kaminsiki also found obsessive-compulsions to be weakly, yet positively related to MD (r = .13, p < .05). Such findings are supported by Wolke and Sapouna (2008), who found a strong, positive correlation between obsessive-compulsive tendencies and MD in a sample of 100 male bodybuilders using the obsessive-compulsive subscale of the SCL-90-R. Furthermore, Hildebrandt et al. (2006) also found a strong, positive relationship between obsessive-compulsive tendencies and MD in a sample of 237 men using the Maudsley Obsessive Compulsive Inventory rather than the SCL-90-R.

Researchers who have used the SCL-90-R as a measure have also reported significant, positive relationships between anxiety and MD. Maida and Armstrong reported a positive relationship between anxiety and MD (r = .39, p <.001), and McFarland and Kaminsiki (2009) later supported the results of a positive relationship (r = .02, p < .05). Wolke and Sapouna (2008) also found a significant, positive relationship between anxiety and MD.

Interpersonal sensitivity is another subscale of the SCL-90-R and refers to an individual's ability to accurately assess others. Currently, only McFarland and Kaminsiki

(2009) have used this particular subscale of SCL-90-R in conjunction with MD. The authors had found that a significant, positive relationship between interpersonal sensitivity and MD existed ($r = .12$, $p < .05$) in their sample of undergraduate men.

Depression has also been found to be consistently, positively related to MD. In studies that had incorporated the SCL-90-R, Maida and Armstrong (2005), Wolke and Sapounda (2008), and McFarland and Kaminsiki (2009) each found a significant, positive relationship between depression and MD ($r = .36$, .38, and .14, respectively). The results are congruent with findings by other researchers such as Ebbeck et al. (2009) and Goodale (2001) who had used a mixed-gender sample and found that muscle dysmorphic symptoms were also positively correlated with depression.

Phobic anxiety refers to anxiety that specifically emerges in response to a type of fear or phobia. Currently, only McFarland and Kaminsiki (2009) have assessed the phobic anxiety subscale of the SCL-90-R with a measure of MD. The authors found no significant relationship between phobic anxiety and MD.

Hostility is another subscale of the SCL-90-R and has been found to be significantly, positively related to MD. Maida and Armstrong (2005) indicated that hostility maintained a positive relationship with MD ($r = .45$, $p < .01$), and the research study by McFarland and Kaminsiki (2009) had later supported those findings ($r = .12$, $p < .05$).

Paranoid ideation refers to an individual's cognitive process whereby they have recurring thoughts of suspicion of being persecuted or treated unfairly by other people. Maida and Armstrong (2005) as well as McFarland and Kaminsiki (2009) used the

paranoid ideation subscale of the SCL-90-R with a measure of MD. McFarland and Kaminsiki found a significant, positive relationship between paranoid ideation and MD ($r = .17$, $p < .01$). However, Maida and Armstrong were unable to report any type of substantial relationship between the two constructs of paranoid ideation and MD.

In conclusion, it should be noted that only a handful of researchers have used the full or partial SCL-90-R in conjunction with a measure of MD. Furthermore, each of the studies mentioned in this section that did incorporate the SCL-90-R used samples that were entirely comprised of males. Therefore, there was an obvious need for this measure to be further employed in muscle dysmorphic research, and also for this measure to be used in a gender heterogeneous sample.

Depression, forms of anxiety, disordered eating, body dysmorphic disorder, and obsessive-compulsive symptoms are psychological factors commonly found in MD research. However, it is not yet clear if the relationship between such symptoms and MD are moderated by a DFM. Furthermore, it is important to consider a potential cyclical format with regard to MD and specific negative affect symptoms such as depression and anxiety. Although Olivardia (2000) mentioned an association between lifetime anxiety and mood disorders and MD, specific symptoms of depression and anxiety may be products of underlying dissatisfaction with one's biological makeup, and the behaviors associated with MD may in turn precipitate feelings of anxiety and depression.

The Biological Dimension of Muscle Dysmorphia

The biological dimension of MD is meaningful to both proposed etiological as well as behavioral aspects of the disorder. First, MD is a disorder where the primary

psychobehaviors are focused on improving the body (i.e., weight training to increase muscle and dieting to decrease adiposity). Secondly, body dissatisfaction is putatively central to muscle dysmorphic symptomology, and although psychocognitive elements influence the ways in which individuals self-evaluate, the body is still a physical object in an external world subject to somatosensation (Grieve, 2007). A potentially useful biopsychological approach to better understanding how the body and psyche integrate with the mechanics of MD is that of somatoperception and somatorepresentation (Longo, Azanon, and Haggard, 2010).

Longo et al. (2010) indicated that somatoperception refers to the act of perceiving the body itself, and also in identifying exteroceptive objects in the external world via their interaction with the body as well as interoceptive percepts about the state of the body itself. On the other hand, somatorepresentation includes the cognitive processes and information gathering about the body, such as "lexical-semantic knowledge" about the body, general knowledge about bodies, structural and "topical knowledge about one's own body" and the "formation of attitudes towards the body" (Longo et al., 2010, p. 656). According to the authors' theory, body representation exists beyond a somatosensory cortex and encompasses three levels of recognition consisting of somatosensation (basic sensory processing of somatic information), somatoperception (developing sophisticated percepts about one's body from individual experience) and somatorepresentation (the development of abstract knowledge gleaned from considering the body within the context of the environment).

It is important to note the similarities between Longo et al.'s (2010) proposed model and regarding MD in terms of the BPS model, in that somatosensation can comparably represent a strictly biological dimension, somatoperception can comparably represent a psychological dimension, and somatorepresentation can comparably represent a sociological dimension. In that regard, being able to create accurate percepts and maintain insightfulness is an important consideration for MD and body dissatisfaction. Maida and Armstrong (2005), as well as Olivardia et al. (2000) were unable to find a relationship between MD and interoceptive awareness. In the same study from Olivardia et al. assessing men with MD, the authors reported that ten (42%) had excellent or good insight, twelve (50%) had fair or poor insight, and two (8%) had entirely lacked insight into the actual build of their own physiques. Little research has been done on MD and levels of insight, but these results suggest that individuals with MD do have better insight than most sufferers of body dysmorphic disorder.

Mussap and Salton (2006) postulated a unique approach to identifying individuals who may be at-risk for body image instability by employing the *rubber hand illusion* (see Botvinick & Cohen, 1998). The authors operated under the assumption that perceptual body image is unstable and thus malleable, and hypothesized that "the ease with which an individual's perception of their body modified feedback, constitutes a risk for engaging in unhealthy body change", and that there would be a relationship between perceptual body image and unhealthy body change behavior as measured by the rubber hand illusion (Mussap & Salton, 2006 p. 629). They found that factors such as level of engagement in binging and purging behavior, level of muscle development, exercise, and chemical

supplement use was predicted by individual differences in the strength of the rubber hand illusion. Additionally, the authors stated that participants who were highly susceptible to the illusion exhibited body-image instability and were therefore at a higher risk for developing unhealthy body change behavior.

Gender, Gender Roles, and Muscle Dysmorphia

Gender is a biological factor specifically relevant to MD. Some researchers posit that MD is influenced by the gender roles and gender identity of the individual (Murray & Touyz, 2012; Murray, Rieger, Karlov & Touyz, 2013). For example, effeminate men may be at a lower risk for developing the disorder while masculine women may be at a higher risk despite their inherent gender difference (Murray and Touyz 2012).

Murray et al. (2013) assessed the divergence of male body image concerns in a group of men with MD (n = 21), a group of men with anorexia nervosa (n = 24) and a group of male gym-using controls (n = 30). The authors found that the men with anorexia nervosa reported significantly higher mean total scores regarding an endorsement of feminine norms than the muscle dysmorphic and control groups. The men with MD reported significantly higher mean total scores regarding an endorsement of masculine norms than the anorectic and control groups. The mean total scores for both anorexia nervosa and MD groups were significant in relation to the control group. Therefore, the authors concluded that a specific gender endorsement may predispose certain individuals to either a drive for thinness or a DFM.

Relative to gender roles and respective drives for thinness and/or muscularity, there is a growing body of literature pertaining to homosexual men and muscular

dissatisfaction. Bosley (2011) argued that gay and bisexual men may be at the highest risk for developing MD due to a confliction of feminine norms and male biology. Specifically, gay and bisexual men may be at a heightened risk for MD because a substantial portion of these individuals tend to endorse feminine gender roles and therefore may develop an increased drive for thinness, while also dealing with societal pressures to develop muscle mass and conform to their biology. Relationships among loneliness, self-esteem, disordered eating, depression, sexual risk, and internalized homonegativity and MD have also been found to exist in gay and bisexual men (Chaney, 2008; Brennan, Craig, & Thompson, 2012). Previous researchers have also indicated that gay and bisexual men may be at a higher risk for body disturbances due to this divergence in masculinity and femininity (Brennan et al., 2013).

The Co-Twin Study

Pope et al. (2000) indicated that "there's almost certainly a genetic, biologically based component" to what they deemed to be The Adonis Complex. Virtually no research has been able to empirically support a genetic factor for MD. However, a comparable research study comes from Raevuori et al. (2008) who examined anorexia nervosa, MD, and muscle dissatisfaction in a group of 319 Finish male twins born between 1975 and 1979. Raeviori et al. (2008) reported:

> we found a striking familial liability for several AN-related traits, manifesting as similar psychiatric morbidity and closely related psychological symptoms in both members of the twin pairs. Each of the five pairs in our study were discordant for AN, although the co-twins without anorexia suffered from affective and anxiety

> disorders and symptoms of muscle dysmorphia that may constitute potential endophenotypes of eating disorders in men. (p. 461)

The authors also found that five co-twins were screened positive for lifetime anorexia nervosa, and that symptoms of MD were common among anorexia-discordant co-twins. In each of the five co-twins, anorexia nervosa preceded the onset of depressive disorder. The authors also reported traits of obsessive-compulsive disorder in their sample, and indicated that, in men, genetic modelling and unique environmental factors each separately predicted muscle dissatisfaction, and that MD may be indicative of a larger and alternative phenotype of anorexia nervosa. Although the study did not provide evidence that genetics alone are responsible for the onset of MD, the researchers did succeed in presenting a possible genetic contribution to muscle dissatisfaction, which has shown to be a common precursor to MD.

Mental Health Disturbances and Athletic and Personal Trainers

There is a paucity of research on mental health presentation and PTs, but various researchers have noted the presentation of mental health disorders in student-athletes and therefore within the purview of athletic trainers. Specifically, Nagel, Black, Leverenz and Coster (2000) concluded that student-athletes were two-to-three times more likely to engage in disordered eating than individuals in the general population. Several researchers have found empirical evidence supporting the presence of disordered eating in a wide array of athletes associated with various endeavors, and that the presentation of disordered eating is often comorbid with other salient mental health issues including depression, anxiety, and obsessive-compulsive disorder (De Palma et al., 2002; Gee &

Telew, 1999; Hoskick, 2004). Schaal et al. (2011) reported that eating disorders were most prevalent for men in weight class sports, and that eating disorders were most prevalent for women in aesthetic and endurance sports. Bratland-Sanda and Sundgot-Borgen (2012a) determined that although there are no longitudinal studies that exist to support specific risk factors, biological factors such as genetics, psychological factors such as self-esteem, sociocultural factors such as peer and media pressure, and historical factors such as a history of bullying, are likely multifactorial predisposing risk factors for eating disorders in athletes. The authors also explained that experience in sports associated with weight cycling and dieting pressure (i.e., bodybuilding, competitive weight lifting, and wrestling) are likely environmental factors demarcated by the sport itself that may predispose someone to an eating disorder.

Depression is also a prominent mental health disorder commonly presented in student athletes and typically encountered by athletic trainers. Yang et al. (2007) indicated that student athletes are likely to be at a greater risk for depression due to additional social and academic pressures. Etzel, Ferrante, and Pinkney (2002) indicated that athletic trainers are in a unique position to identify mental health disturbances in student athletes, because often mental health disturbances manifest in sport performance. Additionally, certified athletic trainers are often viewed as guides or instructors in a counseling role, and it is not uncommon for students to convey physical and athletic concerns as well as psychoemotional concerns to athletic trainers. The authors posit that athletic trainers have a unique responsibility to steward the wellbeing of their students, and this stewardship often encompasses psychological as well as physical health counsel.

One situation where athletic trainers are almost forced to deal with psychobehavioral as well as physical detriments is when an athlete suffers from a sport-related injury. Brewer (2001) reported that many athletes view a sports injury in terms of a loss, and experience associated anxiety and grief accompanied by that loss. This is because a sports injury typically results in the athlete being unable to participate in their respective sport, and often the injury requires them to modify their training regimen in accordance to that particular injury. Brewer also explains that sport related injuries can be stressful for the athlete, and they may persist in training even after the injury has occurred. Training an individual who has experienced an injury often demands mental health acuity as well as physical support and guidance, and injured clients typically require more psychoemotional support than uninjured clients.

The previous section reinforces previous empirical data supporting the existence of mental health disturbances that are relative to MD (e.g. depression, anxiety, exercise past injury, eating disorders, and obsessive-compulsive disorder) in athletic arenas. Furthermore, the previous section emphasizes the importance of addressing PTs as a viable population given that a majority of research has been conducted with certified athletic trainers. PTs supervise a wider demographic of clients than athletic trainers, and the mental health education and competency requirements for PTs can be more varied and less structured due to the free market format of personal trainer certification systems (DeLuca, 2000; Foster, 2012). Therefore, PTs are an unresearched population with regard to mental health presentation and specifically MD. Furthermore, considering the nature of MD and its common presentation in, and association with sport, it is logical to assess

those who are considered instructors of physical fitness to examine how MD may present in a population responsible for the proper instruction of others.

Summary and Conclusion

The purpose of this literature review was to provide the reader with an inclusive synthesis of the existing research on MD and a DFM through exploring the biological, psychological, and social dimensions of these constructs. Muscle dysmorphia has influences that can be categorized by the BPS approach, and extant research has indicated that biological, psychological, and social factors each play unique roles in facilitating and also exacerbating the symptoms of MD. This literature review was also intended to explain the association between MD and body dysmorphic disorder, and illustrate how body image disturbances are foundational in the development of MD for both men and women.

Personal trainers are a population of interest to the field of MD research based on the nature of their work and their proximity to athletic and physical fitness arenas. Yet, PTs have never been recruited for any type of MD or DFM assessments. Therefore, from the extant literature it is apparent that a multidisciplinary instrument scheme assessing various BPS factors in PTs would be beneficial to muscle dysmorphic DFM research.

Chapter 3: Research Methods

Introduction

Purpose of the Study

There were five purposes of this quantitative research study:

1. To generate a correlation matrix to identify the relationship between BPS factors (body comparison, somatization, obsessive-compulsive behavior, interpersonal sensitivity, depression, anxiety, hostility, sociocultural attitudes towards appearance) and a DFM.
2. To generate a correlation matrix to identify the relationship between BPS factors (body comparison, somatization, obsessive-compulsive behavior, interpersonal sensitivity, depression, anxiety, hostility, sociocultural attitudes towards appearance) and MD.
3. To determine if and to what extent a drive for muscularity can predict muscle dysmorphic symptoms in a gender-heterogeneous sample of personal trainers.
4. To determine if there are gender differences between the Muscle Dysmorphia Inventory subscales (size and symmetry concerns, supplement use, exercise dependence, pharmacological use, dietary behavior, and physique concealment) in a sample of PTs.
5. To determine if MD and an intense DFM are salient problems for personal trainers.

Section Preview

This chapter contains a description of the research methods for the study. It includes a series of tables that concisely depict and operationalize the numerous variables within the study by illustrating their respective constructs and coding scheme used in data analysis. Rationale and design choices are discussed, as are population and sampling procedures. A data analysis plan is provided and conveyed so that the study may be reproduced by other researchers. The instrumentation used within this study is mentioned, justified, and explained in terms of reliability and validity. Various threats to validity are discussed, and ethical considerations and precautions taken to control for such threats are mentioned within this chapter.

Research Design and Rationale

Research Variables

The two overarching dependent variables of this study were *muscle dysmorphia* as measured by the Muscle Dysmorphic Inventory (MDI; Rhea et al., 2004) and a *drive for muscularity* as measured by the Drive For Muscularity Scale (DMS; McCreary & Sasse, 2000). The independent variables were as follows:

- *Biological variables*: Biological variables included sex, race, age, height, weight, and body comparison.
- *Psychological variables*: Psychological variables included somatization, obsessive-compulsive behavior, interpersonal sensitivity, depression, anxiety, and hostility.

- *Social variables*: Social variables included sociocultural attitudes toward appearance consisting of an internalization of thin/low body fat, an internalization of muscular/athletic physique, pressures from family, pressures from peers, and pressures from media.

A drive for muscularity will be treated as an independent variable with MD as the dependent variable to address the fourth research question (see the *Instrumentation and Operationalization of Constructs* section for complete and in-depth explanation of all study variables).

Study Design

This study had a quantitative, cross-sectional survey research design that involved using the Internet to contact participants and deliver the survey to them via an invitation to the posted survey on Survey Monkey©. The target population consisted of adult PTs who were members of the IAAA and were registered as actively operating within the United States.

The quantitative approach was deemed suitable to the research questions in that the research questions were deductive and did not include elements of lived experiences or ethnographic interpretation. Null and alternative hypotheses were used based on the exploratory nature of the study. The cross-sectional survey method is a popular approach in muscle dysmorphic and body image studies (Blashill & Willhelm, 2014; Hui & Brown, 2013; Tod & Lavallee, 2010) as well as in research involving mental health and athletic trainers (Biviano, 2010). Furthermore, the variables within this study were heavily influenced by self-report questionnaires, and the questionnaires were structured

by a BPS approach. Therefore, survey methods were integral to each research question, as well as the variables and inferential hypotheses contextualized therein.

Time and Resource Constraints

Data collection lasted for a total duration of 6 weeks. Individuals were invited to participate in a study via email addresses located through the IAAA registry. A follow-up email was sent out in the 4th and 5th weeks of data collection to remind individuals of the invitation to participate in the study.

Rationale and Consistency With Previous Research

As indicated in the literature review, the self-report survey method is commonly used to assess a DFM and MD in the extant literature, and this particular approach is one of the most common forms of data collection in social science research (Creswell, 2014). Furthermore, the self-report survey was consistent with previous studies assessing the same constructs including psychological variables using the SCL-90-R (e.g., Woodruff, 2012), body comparison using the BCS (Thompson et al., 1999), and social variables using the SATAQ-4 (Schaefer et al., 2012). Although exploring comparisons between web-based and paper-based survey methods is still an emerging field of research, several studies have found no significant differences between the two modalities as they apply to body image (Touvier et al., 2010), sociocultural (Hardré, Crowson, & Xie, 2012), and psychological variables (Birnbaum, 2004).

Methodology

Population

The target population included all certified PTs who were registered members with IAAA and were listed on the organization's international database webpage. The only exclusion criterion was that selected members must be within the United States. Upon searching all PTs registered in the database, a total of 12,782 email addresses, physical addresses, and telephone numbers were returned.

Sampling and Sampling Procedures

Single-stage probability sampling was used in the study. Each sampling unit (a U.S.-based personal trainer currently listed in the database) from the larger population had an equal probability of being drawn for the sample. An invitation email including the informed consent document was transmitted to all PTs who met the aforementioned criteria.

Due to a lack of reported effect size from previous studies, an estimated effect size was used. There was a total of 29 variables within this study, and therefore it was prudent to select a low-to-moderate effect size, given that an ample amount of data would likely allow for the detection of very small effect sizes (Israel, 1992). Furthermore, large effect sizes in the social sciences tend to be difficult to justify, and small-to-medium effect sizes are typically used instead (Rosnow & Rosenthal, 1996). Linear bivariate regression was the statistical test incorporated in this study that required the most participants, and therefore this procedure was used to demarcate the least acceptable sample for the study. A power analysis using G*Power© was computed with a desired

alpha level of $\alpha = .05$, a power of $\beta = .95$, and a small effect size of $r^2 = .15$. This computation yielded a minimum sample size of $n = 567$ with a critical F value of 1.96. Creswell (2014) indicated that attrition during survey research increases as the number of questions on the survey increases, and that researchers can combat attrition by recruiting larger samples. Considering that this survey had a total of 163 items, a buffer of 30% was used to safeguard against copious threats of attrition, resulting in an a priori sample size of 737. As mentioned, all registered PTs were invited to participate in the study, but these calculations were intended to provide a proximal, acceptable figure for the research study.

Recruitment Procedures

The IAAA agreed to cooperate with the current research study (see Appendix E) and specifically agreed to transmit a series of three emails to all U.S.-based PTs on my behalf. The first email invited PTs to participate in the study (see Appendix B) via Survey Monkey© and included the informed consent form (see Appendix A). This agreement indicated that clicking on the contained link would register as consent, and that the entire survey was completely voluntary. Two email reminders to complete the survey were transmitted on the 4th and 5th weeks of the 6-week data collection period by the IAAA on my behalf (see Appendix C).

Data Collection

Data collection occurred online through Survey Monkey©. The entire survey was composed of 163 questions spanning four independent questionnaires and two dependent questionnaires. The demographic questionnaire had seven questions (age, race, sex,

reported height and weight, competitive weightlifting status, and competitive bodybuilding status). Each questionnaire was presented one page at a time, beginning with the demographic questionnaire, followed by the dependent questionnaires and finally the independent questionnaires (see Appendices F- K). The participants were prompted to continue to the next page with the link to the next questionnaire at the bottom of each webpage until the survey was completed.

The survey was securely maintained on the Survey Monkey© website with sock layer protocol for the duration of the data collection period. The assembled data were retrievable only by me and through password input. Once the data collection period had ended, all data were stored on my personal computer and deleted from the website. All participation was automatically de-identified through using Survey Monkey as a third-party location for the survey administration, and therefore neither I nor the IAAA was able to track any specific responses back to any one PT.

Debriefing

After completion of the questionnaires, PTs were directed to a debriefing webpage before exiting the survey (see Appendix D). The debriefing statement reiterated that the survey they had just taken was on body image and also included my email and phone information if they had any questions or concerns pertaining to the survey or the research project. It was not necessary to pursue any follow-up procedures.

Instrumentation and Operationalization of the Biological Dimension

Demographic Questionnaire (DEM). A demographic questionnaire made was administered to all participants (see Appendix F). There were seven items on the

questionnaire regarding age, race/ethnicity, gender, self-reported height and weight, competitive weightlifting status, and bodybuilding status. The demographic survey was specifically developed for this study and included sample characteristics related to the biological dimension of the BPS framework.

Body Comparison Scale (BCS). The BCS from Fisher et al. (2002) is a 36-item self-report instrument that is intended to assess the ways in which both males and females tend to compare specific parts of their bodies with others of the same sex (e.g., chest, waist, muscle tone). Participants were required to respond on a 5-point Likert scale where 1 = *Never* and 5 = *Always*. The scale was standardized in a gender-heterogeneous group of 1,760 students, ranging from seventh graders to college sophomores (Fisher et al., 2002). Pertaining to the aforementioned sample, the BCS demonstrated excellent internal consistency ($\alpha = .95$). Lindner, Tantleff-Dunn, and Jentsch (2012) used the BCS in a later study testing a model for self-objectification and social comparison in a sample of 549 female students and also found the scale to have excellent internal consistency ($\alpha = .93$). The authors used multidimensional scaling analysis to designate four subscales: general appearance, muscular concerns, weight concerns, and general somatic features (see Table 4). The authors concluded that males and females structured self-comparisons along the dimensions of weight and muscularity, but weight was a dominant concern for women whereas muscularity was the dominant concern for men. It should be noted that only Items 1-25 that dealt with specific body-part concerns were used in this study to keep the battery of assessments as short as possible. The BCS can be found in Appendix G.

Table 4

Independent Variable I: Body Comparison

Construct instrument	Specific variable name and code	Item(s) on the BCS
Body Comparison Scale (BCS)	General appearance, nonweight, nonmuscular concerns (BCS:GAC)	See Questions 1-9
	Muscular concerns (BCS: MC)	See Questions 10-15
	Weight concerns (BCS: WC)	See Questions 16-20
	General somatic features (BCS: GSF)	See Questions 21-25

Instrumentation and Operationalization of the Psychological Dimension

Symptom Checklist-90-Revised (SCL-90-R). The SCL-90-R from Derogatis (1994) is a 90-item self-report survey intended to assess various dimensions of psychopathology across nine subscales (see Table 5). Respondents were required to indicate their current level of distress using a 5-point Likert scale range from 0 = *Not at all* to 4 = *Extremely*. In a recent study, Woodruff (2012) used three subscales from SCL-90-R (depression, interpersonal sensitivity, and anxiety) as an incorporative measure to operationalize a BPS model for MD. Woodruff reported that within a sample of 789 undergraduate males, the SCL-90-R subscales each demonstrated good internal consistency (alpha coefficients ranging from $\alpha = .81$ to $\alpha = .82$). Woodruff also indicated that the measure demonstrated good and excellent test-retest reliability over a period of 10 weeks ($r = .80$ to $r = .90$).

Simonds, Handel, and Archer (2008) reported that the depression, hostility, paranoid ideation, anxiety, psychoticism, and somatization subscales of the SCL-90-R

had demonstrated good incremental validity in a sample of 549 mental health inpatients at the .001 alpha level, and that R^2 change values were within the ranges of .00 to .01 (*Mdn* ΔR^2 = .01). It should be noted that the subscales of phobic anxiety, paranoid ideation, and psychoticism are not typically related to MD (see Tod & Lavallee, 2010, for review) and were therefore omitted from the current study to keep the battery of assessments as short as possible. The SCL-90-R can be found in Appendix H.

Table 5

Independent Variable II: Psychopathology

Construct instrument	Specific variable name and code	Item(s) on the SCL-90-R
Symptom Checklist-90-Revised (SCL-90-R)	Somatization (SCL:SOM)	See Questions 1, 4, 12, 27, 40, 42, 48, 49, 52, 53, 56, 58
	Obsessive-Compulsive (SCL:OC)	See Questions 3, 9, 10, 28, 38, 45, 46, 51, 55, 65
	Interpersonal Sensitivity (SCL:IS)	See Questions 6, 21, 34, 36, 37, 41, 61, 69, 73
	Depression (SCL: DEP)	See Questions 5, 14, 15, 20, 22, 26, 29, 30, 31, 32, 54, 71, 79
	Anxiety (SCL: ANX)	See Questions 2, 17, 23, 33, 39, 57, 72, 78, 80, 86
	Hostility (SCL: HOS)	See Questions 11, 24, 63, 67, 74, 81

Instrumentation and Operationalization of the Sociological Dimension

Sociocultural Attitudes Towards Appearance Questionnaire—4 (SATAQ-4).

The SATAQ-4 from Thompson et al. (2011) is a 22-item self-report measure that is intended to assess sociocultural influences on one's appearance. The SATAQ-4 is comprised of five factors that assess internalization as well as external pressures (see Table 6). The questionnaire is structured by a 5-point, Likert-type format where participants were asked to issue responses ranging from 1 = "*Definitely disagree*" to 5 "*Definitely agree*", and therefore all items are positively keyed. Schaefer et al. (2013) indicated that the SATAQ-4 demonstrated good-to-excellent internal consistency in a series of three separate samples using undergraduate females ($\alpha = .86$ to $\alpha = .96$). In a study consisting of 110 adolescents, Lunde (2013) partially supported Schaefer et al.'s findings by indicating an alpha coefficient of $\alpha = .90$ and $\alpha = .91$ for the thin ideal internalization and athletic ideal internalization respectively.

The SATA-Q-4 was further validated in a study incorporating Italian, British, and Australian women, where the original five-factor structure was replicated across all non-United States sites (Schaefer et al., 2012). Schaefer and colleagues used exploratory factor analysis with principal axis factoring via promax rotation for each sample and found no cross loading items at a secondary loading of .30 or more. Schaefer and colleagues also reported that the Eating Disorder Examination Questionnaire (EDEQ; Fairburn & Beglin, 2008) was significantly correlated with all subscales of the SATAQ-4, and that the Multidimensional Body-self Relations Questionnaire – Appearance Evaluation Subscale (Brown, Cash, & Mikulka, 1990) was significantly correlated with

all but the muscularity internalization subscale on the SATAQ-4. The SATAQ-4 can be found in Appendix I.

Table 6

Independent Variable III: Sociocultural Attitudes Towards Appearance

Construct Instrument	Specific Variable Name and Code	Item(s) on the SATAQ-4
Sociocultural Attitudes Towards Appearance Questionnaire-4 (SATAQ-4)	Internalization – Thin/Low Body Fat (SATAQ-4: TLI)	See Questions: 3, 4, 5, 8, 9
	Internalization – Muscular/Athletic (SATAQ-4:MAI)	See Questions: 1, 2, 6, 7, 10
	Pressures – Family (SATAQ-4:FP)	See Questions: 11, 12, 13, 14
	Pressures – Peers (SATAQ-4:PP)	See Questions: 15, 16, 17, 18
	Pressures – Media (SATAQ-4:MP)	See Questions: 19, 20, 21, 22

Instrumentation and Operationalization of Muscular Drive and Muscle Dysmorphia

The Muscle Dysmorphia Inventory (MDI). The MDI from Rhea at al. (2004) is a 27-item self-report survey consisting of six subscales (see Table 7). Participants were asked to respond to various statements about attitudes, feelings, and behaviors associated with MD (e.g., "I regulate my caloric intake to maximize muscle development"; "I wear clothes that help conceal my physique") on a 6-point, Likert scale where 1 = "*Never*" to 6 = "*Always*". Rhea and colleagues report that principle component factor analysis with a varimax rotation supported the 6-factor structure of the MDI, accounting for 54.17% of

the known variance. The MDI subscales represented internal consistencies ranging from $\alpha = .72$ and $\alpha = .94$, and factor loading supported the MDI's 6-factor format. The construct validity of the MDI was verified through confirmatory factor analysis. The authors also report that convergent validity for the MDI was supported by significant correlations among the six subscales of the MDI and measures of training dependency and drive for thinness. The MDI can be found in Appendix K.

Table 7

Dependent Variable I: The Presence of Muscle Dysmorphia

Construct Instrument	Specific Variable Name and Code	Item(s) on the MDI
Muscle Dysmorphia Inventory (MDI)	Size and Symmetry Concerns (MDI: SSC)	See Questions: 6, 11, 15, 17, 20
	Supplement Use (MDI:SU)	See Questions: 2, 7, 9, 12
	Exercise Dependence (MDI:ED)	See Questions: 3, 10, 13, 18
	Pharmacological Use (MDI:PU)	See Questions: 25, 26, 27
	Dietary Behavior (MDI:DB)	See Questions: 1, 4, 8, 16, 19
	Physique Concealment (MDI:PC)	See Questions: 5, 14, 21, 22, 23, 24

The Drive for Muscularity Scale (DMS). The DMS from McCreary and Sasse (2000) is a 15-item self-report measure intended to assess the degree to which individuals desire a more muscular physique through a series of attitudinal and behavioral questions. Each item on the DMS is measured on a 6-point, Likert scale where 1 = *"Never"* to 6 = *"Always"* (see Table 8). The DMS is used with reverse-direction coding to indicate that higher scores on the scale represent higher levels of the drive.

McCreary and Sasse (2000) reported good internal consistencies in initial examination of the DMS in a group of boys (α = .84) and girls (α = .78). McCreary & Saucier (2009) indicated that internal consistencies for the DMS were excellent and good for both men (α = .90) and women (α = .83). McCreary et al. (2004) further supported the reliability of the DMS by indicating corrected item-total correlations of .37-.65. In a separate study, Cafri and Thompson (2004) indicated that the DMS exhibited substantial 7-10 day test-retest correlations for men (α = 93).

Construct validity of the DMS was demonstrated through factor analysis and social desirability bias. Exploratory factor analysis revealed that the two subscales of the DMS were suitable for men, but not for women. However, when these two lower-ordered factors are loaded on a single, higher-order factor, the DMS is suitable for both men and women. Therefore a total DMS score will be used within the current study considering the gender-heterogeneity of the sample. Secondly, Duggan and McCreary (2004) assessed the association between the DMS and socially desirable responding in a study where heterosexual and homosexual men were asked to complete the Balanced Inventory of Desirable Responding in addition to the DMS. There were no significant correlations between the two measures for either group.

McCreary and Sasse (2000) established concurrent validity for the DMS by indicating group differences between boys and girls in their study standardizing the DMS. Further researchers supported that the DMS scores distinguished between known groups by indicating that there were gender differences between men and women for the DMS (McCreary et al., 2004). Additionally, McCreary (2007) reported that the DMS

exhibited elements of convergent validity by (a) being positively correlated with scores on a measure of muscularity attitudes suitable for both men and women, (b) being positively correlated with appearance orientation, (c) being positively correlated with measures of masculine-typed gender role socialization, and (d) being negatively correlated with measures of self-esteem in men, but not in women. The DMS can be found in Appendix J.

Table 8

Dependent Variable II: A Drive for Muscularity

	Specific Variable Name and Code	Item(s) on the DMS
Drive for Muscularity Scale (DMS)	A Drive for Muscularity (DFM)	See Questions: 1-15

Data Analysis Plan

All data was analyzed using SPSS 21. Before analysis can take place, the data was screened for outliers and missing items. Multiple imputation was used to correct the data distortions caused by outliers and missing items (see Ch. 4). The first two hypotheses were addressed by generating two separate correlation matrices with the DMS and the MDI as dependent variables, respectively. Specific BPS correlation matrices were generated to address the subscales of the MDI. Hypothesis three dealt with a predictive relationship and it isn't clear if one subscale of the MDI will account for more variance than the others. Therefore, a series of linear regressions using the method of least squares was used to determine how well the single score DMS predicts each of the subscales of the MDI as well as the total-item score of the MDI. Hypothesis four was originally

intended to be addressed with a one-way ANOVA because the independent variable of sex had three levels (male, female, transgendered) and the dependent variable had six subscales (see Table 9). However, no respondents indicated that they were transgendered and the hypothesis was addressed with a non-parametric t-test equivalent (see Chapter 4).

Research Question 1: Is there a relationship between biopsychosocial factors (body comparison, somatization, obsessive-compulsive behavior, interpersonal sensitivity, depression, anxiety, hostility, and sociocultural attitudes towards appearance) and muscle dysmorphia?

H_0: There is no relationship between biopsychosocial factors and muscle dysmorphia.

H_1: There is a relationship between biopsychosocial factors and the muscle dysmorphia.

Research Question 2: Is there a relationship between biopsychosocial factors (body comparison, somatization, obsessive-compulsive behavior, interpersonal sensitivity, depression, anxiety, hostility, and sociocultural attitudes towards appearance) and the drive for muscularity?

H_0: There is no relationship between biopsychosocial factors and the drive for muscularity.

H_1: There is a relationship between biopsychosocial factors and the drive for muscularity.

Research Question 3: Will a drive for muscularity predict muscle dysmorphia?

H_0: A drive for muscularity will not significantly predict muscle dysmorphia.

H_1: A drive for muscularity will significantly predict muscle dysmorphia.

Research Question 4: Are there gender differences on the six Muscle Dysmorphia Inventory subscales (size and symmetry concerns, supplement use, exercise dependence, pharmacological use, dietary behavior, and physique concealment)?

H_0: There are no gender differences on the muscle dysmorphia inventory subscales.

H_1: There are gender differences on the muscle dysmorphia inventory subscales.

Table 9

Independent and Dependent Constructs and Data Analyses in Relation to Research Questions

Research Question	Construct Scheme	Proposed Data Analysis
Research Question 1	Independent Constructs: Body Comparison, Six Subscales of the SCL-90-R (Somatization, obsessive-compulsive, interpersonal sensitivity, depression, anxiety, and hostility) and Social Attitudes Towards Appearance Dependent Construct: Muscle Dysmorphia (Six Subscales: Size and symmetry concerns, supplement use, exercise dependence, pharmacological use, dietary behavior, and physique concealment)	Correlation Matrix
Research Question 2	Independent Constructs: Body Comparison, Six Subscales of the SCL-90-R (Somatization, obsessive-compulsive, interpersonal sensitivity, depression, anxiety, and hostility) , and Social Attitudes Towards Appearance Dependent Construct: A Drive for Muscularity (Single Score)	Correlation Matrix
Research Question 3	Criterion Construct: Muscle Dysmorphia (Six Subscales: Size and symmetry concerns, supplement use, exercise dependence, pharmacological use, dietary behavior, and physique concealment) Predictor Construct: A Drive for Muscularity (Single Score)	Series of Linear Bivariate Regressions with the DMS and Each MDI Subscale
Research Question 4	Independent Construct: Sex (Three Levels: Male, female, transgendered) Dependent Construct: Muscle Dysmorphia (Six Subscales: size and symmetry concerns, supplement use, exercise dependence, pharmacological use, dietary behavior, and physique concealment)	Fixed-effects ANOVA

Threats to Validity

Issues of Internal Validity

1. *Selection*: PTs registered with the IAAA made up a vast and diverse group of international members. However, it is possible that their commonality in occupation and athletic involvement may have predisposed them to have higher levels of a DFM or even MD. Therefore, probability sampling was applied to combat potential similarity in these and other characteristics including age and gender.
2. *Mortality*: The entire survey was comprised of five separate instruments and a demographic questionnaire with a collection of 163 items that likely took participants 20-25 minutes to complete. Therefore, it some participants did not finish the survey. This threat was addressed through recruiting a larger sample (1,000+) from the population in order to consider for attrition during the survey.
3. *Instrumentation*: It was possible that the five separate measures had negatively interacted with one another to influence atypical or insincere responses. Subscales of the biological questionnaires might have had adverse or confounding impacts on the physiological questions on the MD and DFM assessments. Furthermore, the survey was administered in the English language, and some PTs may not have been completely fluent in the English language.

Issues of External Validity

The IAAA's registry database was limited to only those who are PTs, and therefore the results cannot be generalized to other occupations such as dieticians or kinesiologists. However, it was hypothesized that many of the participants would be affiliated with a wide range of athletics, including weightlifting and bodybuilding, which are commonly researched populations in the extant literature. Therefore, by designating a target population which is likely to have considerable diversity with regard to sports participation, the ability to generalize to these subpopulations is increased.

Statistical Conclusion and Construct Validity

Steps were taken to ensure that the resultant data would be representative of the population by selecting an appropriate alpha and statistical power level. This was done to ensure that statistical conclusion validity of the study was as strong as possible. Furthermore, inadequate preoperational explication of constructs was considered throughout the study. Specifically, the BPS approach was used to structure concepts into constructs, and specific instrumentation used to measure these constructs was designated to operationalize and provide testable variables for the hypotheses within this study. All instruments selected for use in the study maintained an adequate amount of data with regard to reliability and validity in previous studies as well as in the current study.

Ethical Procedures

Participant anonymity and confidentiality were two paramount considerations for this research study. Psychological experiences such as depression, anxiety, and hostility are sensitive and information considered confidential. The wellbeing of the participants

was considered at all times. The potential effects of this research on participant health were weighed carefully against the possible benefits to the athletic community as well as the current state of MD and DFM literature. Anonymity was an extreme priority and was assured to participants in the informed consent form preceding the series of surveys (see Appendix A).

Informed Consent

All selected participants were emailed via blind carbon copy, in order to maintain anonymity. Prior to the survey, participants were given an email where they were able to view the entire informed consent form. The informed consent form also indicated that I am an academic third entity not at all affiliated with the IAAA, and that their refusal to participate in the survey will not affect their standing as a member of the IAAA. The participants were assured of confidentiality and also that their names or contact information was not necessary for the survey. I had included my contact information in the email if any potential participants had inquiries related to the survey.

Debriefing

It was logical to consider that the completion of the survey could lead to emotional distress, even though the participants were not put in any direct risk. To address any potential discomfort with regard to the survey, I had included my contact information and the contact information of the dissertation chair to let individuals know that they can inform me or the chair of any complications, inquiries, or concerns regarding the survey.

IRB and IAAA Approval

Prior to data collection, approval from the IAAA and the Walden IRB was attained. The IRB approval number for this study is 02-03-15-0248979 and expires on February 2, 2016. Furthermore, the written approval to conduct research using the IAAA registry was attained from the IAAA prior to data collection.

Treatment of Data

Data was non-identifiable and kept confidential on a password protected personal computer with a locking CPU cabinet. I was the only one who had access to the computer in question and completed all data analysis within my home. Additionally, I was the only individual accessing the data and conducting the analyses. After data analysis, I copied the recorded files onto an external USB flash drive and deleted the origins of all said copies on my personal computer. The deletion of the files on the personal computer were followed with a thorough defragmentation. The USB drive will be stored in the locked CPU cabinet for a period of five years. Thereafter, all information pertaining to this study will be removed.

Summary

This quantitative research study consisted of online survey methods as a means to acquire data. The proposed study incorporated a total of six measures including the BCS (Fisher, 2002), the SCL-90-R (Derogatis, 1994), the SATAQ-4 (Thompson, et al., 2011), the DMS (McCreary & Sasse (2000), the MDI (Rhea, 2004), and a demographic questionnaire. Confidentiality and anonymity were paramount ethical considerations, and were addressed through blind carbon copying and careful data handling.

The next chapter will present the results and findings of the study. The fifth and final chapter of the dissertation will include a discussion about the results, an interpretation of the findings, and explanations regarding primary and secondary findings. Limitations and recommendations for future research will also be discussed.

Chapter 4: Results

Introduction

The purpose of this study was to explore MD and a DFM in PTs as well as examine the relationship between biophysically, psychologically, and socially structured variables with a DFM and MD. The following research questions were examined:

- *Research Question 1*: Is there a relationship between biopsychosocial factors and muscle dysmorphia?
- *Research Question 2*: Is there a relationship between biopsychosocial factors and the drive for muscularity?
- *Research Question 3*: Will a drive for muscularity predict muscle dysmorphia?
- *Research Questions 4*: Are there gender differences on the six Muscle Dysmorphia Inventory subscales (size and symmetry concerns, supplement use, exercise dependence, pharmacological use, dietary behavior, and physique concealment)?

Hypotheses 1 and 2 dealt with BPS constructs and their possible relationships to MD and a DFM, respectively. Hypothesis 3 dealt with the ability for a muscular drive to predict MD in PTs. Hypothesis 4 dealt with gender differences among PTs with regard to MD. The following chapter was organized to illustrate recruitment, data screening procedures, descriptive statistics, and the results for each of the tested hypotheses.

Data Collection Procedures

The listserv was screened for only U.S.-based PTs, which resulted in a total target population of 12,782. After a data collection period of 6 weeks, 1,127 PTs responded to the invitation email to participate in the study. Outliers and missing items were then assessed using SPSS 21 ©, resulting in a total of 1,039 cases.

The dataset had a considerable amount of missing items. Multiple imputation was used to correct the missing data. Most of the items on the dataset were structured with Likert-type scales, and multiple imputation has been shown to yield acceptable parameter estimates with Likert-type data where less than 10% of the total values are missing (Fox-Wasylyshyn & El-Masri, 2005; Leite & Beretvas, 2010). An analysis of monotonicity in the dataset was used to determine that only 5.1% of the total values were missing, but that 445 (42.8%) of the cases contained some type of missing values. There was no salient pattern in the dataset, and missing items appeared to be random. Cases with missing items > 70% were completely eradicated from the dataset, while cases with missing items $\leq$ 70% were addressed with five-factor multiple imputation using the linear regression model (Tabachnick & Fidell, 2001).

Constraints of minimum and maximum values were set to 0–4 for the Symptom Checklist-90-Revised (Derogatis, 1994) subscales to deter SPSS from computing negative numbers during the imputation process (Cole, Chu, & Greenland, 2006). Rounding for any of the measures was not used, and a two-decimal structure was kept throughout data analysis to ensure that the multiple imputation procedure was not distorted (Bodner, 2008). Although each measure was Likert-scaled and therefore

reflective of a whole number, each measure was scored similarly, in that item totals were added so that a higher score represented greater exhibition of the assessed subscale behaviors. Therefore, even the decimal places had meaningful interaction and supported the rationale to refrain from rounding and potentially undermining the imputation procedure (Fox-Wasylyshyn & El-Masri, 2005).

The data were analyzed for potential outliers. A majority of the items that displayed salient outliers were typically related to the putative symptoms of MD and high drives for muscularity. Muscle dysmorphia and potentially unhealthy drives for muscularity tend to affect only a small portion of individuals (Olivardia, 2001, 2007; Pope et al., 2000), and therefore it was not surprising to see similar phenomena in the data. These outliers were retained because their exclusion would likely remove the demonstration of MD as a measured behavior and potentially undermine the intention of the study.

As a negative result of retaining the outliers, all variables related to the independent and dependent measures displayed a bimodal distribution and were clearly non-normally distributed. A series of Kolmogorov-Smirnov, Lilliefores corrections, and Shaprio-Wilk tests ($p < .001$) statistically supported that these variables were not normally distributed. However, the preliminary observation of bimodal distributions using Q-Q plots in the data partially supported the assumption that most data were composed of one "normal" group of responses and one less prominent "muscle dysmorphic/muscular drive" group of responses. Therefore, nonparametric techniques were employed in lieu of further data transformation to preserve outliers that were likely

meaningful to the study. The use of multiple imputation to account for missing items was also beneficial in normalizing the distortion caused by outliers without removing them from the dataset. After the data were screened for missing items and unusable cases, a final sample of n = 1,039 was used in the subsequent analyses.

Reliability Analysis

The internalization of thin/low body fat physiques, (α = .74), the internalization of muscular/athletic physiques (α = .84), family pressure (α = .88) peer pressure (α = .92), and media pressure (α = .96) subscales of the Sociocultural Attitudes Towards Appearance Questionnaire all yielded acceptable-to-high internal consistency. The general appearance concerns (α = .85), muscular concerns (α = .89), weight concerns (α = .88) and general somatic features (α = .95) subscales of the Body Comparison Scale all demonstrated high internal consistency. The somatization (α = .81), anxiety (α = .88), depression (α = .92), obsessive compulsive (α = 90), interpersonal sensitivity (α = 88), and hostility (α = 82) subscales of the Symptom Checklist-90-Revised all had excellent internal consistency.

The dietary behavior (α = .70), supplement use (α = .83), exercise dependence (α = .71), physique concealment (α = .74), and size and symmetry concerns (α = .82) subscales of the Muscle Dysmorphia Inventory all yielded acceptable-to-high results. However, the pharmacological use subscale yielded low internal consistency (α = .32), and item total statistics indicated that the deletion of the question “I use steroids” would only modestly improve that level to α = .45. Therefore, researchers should exercise caution when interpreting analyses related to the pharmacological subscale of the Muscle

Dysmorphia Inventory. The Drive for Muscularity is a single-score item and demonstrated high reliability (α = .89).

Descriptive Statistics

Of the 1,039 participants in the sample, there were more men than women and more Caucasians than any other race. A small but almost equal amount of participants identified as bodybuilders and weightlifters. Participants ranged in age from 18–86 (years), ranged in height from 4’8’’- 6’8’’ (feet and inches), and ranged in weight from 98-290 (pounds). All demographic characteristics of the sample are depicted in Table 10.

Table 10

Demographic Characteristics of the Study Sample (N =1,039)

Characteristic	*N*	%	*M*	*SD*
Age range (18-86)	1,039	100%	35.1	.384
Participant sex				
Male	353	34%		
Female	686	66%		
Race/ethnicity				
African American	49	4.7%		
European American/Caucasian	872	83.9%		
Asian/Pacific Islander	23	2.2%		
Native American	8	.8%		
Hispanic/Latino	39	3.8%		
Biracial/multiracial	23	2.2%		
Other	25	2.4%		
Weight in pounds range (98–290)	1,039	100%	153.74	332.86
Height in feet and inches range (4’8’’–6’8’’)	1,039	100%	7.82	1.87
Competitive weightlifter	60	5.8%		
Competitive bodybuilder	59	5.7%		

Hypothesis Set 1

H_0: There is no relationship between biopsychosocial factors and muscle dysmorphia.

H_1: There is a relationship between biopsychosocial factors and muscle dysmorphia.

Kendall's tau-b was used to assess the relationship between biological, psychological, and social factors and the MDI to address the first set of hypotheses. This method was chosen because Kendall's tau has shown to be more robust and accurate than other nonparametric correlation tests (e.g., Spearman's rho) and also tends to better display concordant and discordant pairs based on the nature of the assessment when used to detect minute versus squared differences (Field, 2009).

These correlations have been sectioned into six separate correlation matrices depicting first biophysical, then sociological, and finally psychological variable relationships with the MDI total-item scores as well as the separate subscales of the MDI. The results were structured in this manner because it was important to examine how these variables correlated with one another as well as with MD. Furthermore, it was important to examine how each specific variable correlated with each subscale of the MDI in order to better operationalize the presence of MD across biophysical, sociological, and psychological dimensions rather than relying only on one broad, item-total score.

Table 11

Biophysical Variable Relationships and the Muscle Dysmorphia Inventory: Correlations and Descriptive Statistics

Variables	1	2	3	4	5	6	7	8	9	10	11	12	13
1. Muscle Dysmorphia Inventory	–												
2. Sex	-.25	–											
3. Race/ethnicity	.04	-.11**	–										
4. Weight (pounds)	.20**	-.55**	.07*	–									
5. Age	-.17**	.10**	-.01	-.05	–								
6. Competitive bodybuilder	.23**	.00	.06	.00	-.06	–							
7. Competitive weightlifter	.16**	-.08**	-.01	.09**	-.10**	.19**	–						
8. BCS: General Appearance[a]	.08*	.17**	-.08*	-.09**	-.13**	-.03	-.03	–					
9. BCS: Muscle Concerns	.28**	-.04	-.05	.10**	-.16**	.04	.03	.42**	–				
10. BCS: Weight Concerns	.15**	.27**	.06	-.07*	-.14**	.02	-.02	.44**	.56**	–			
11. BCS: Somatic Features	.24**	.11**	-.08*	.02	-.17**	.05	.01	.39**	.64**	.65**	–		
12. *M*	64.70	1.66	1.51	153.74	35.08	1.06	1.06	15.77	15.51	14.14	15.64	–	
13. *SD*	16.20	.47	1.40	32.86	12.35	.23	.23	5.68	5.41	4.90	4.88	–	–

Note. [a]Body Comparison Scale. *$p < .05$, two-tailed. ** $p < .001$, two-tailed.

Table 11 was generated using Kendall's tau-b to analyze the relationships between the BCS, Demographic Questionnaire items, and total-item scores on the MDI as a means to operationalize a biophysical dimension for this study. All variables within this biophysical dimension were positively, significantly correlated with MD except for sex and race. Age was significantly, negatively correlated with MD. The general appearance subscale of the BCS was the only variable to be significantly correlated with MD at the .05 alpha level. Somatic features and identification as competitive bodybuilder were found to have the strongest correlations with MD, while general appearance and weight-related concerns were found to have the weakest relationships with scores on the MDI.

Table 12

Biophysical Variable Relationships With the Muscle Dysmorphia Inventory Subscales: Correlations and Descriptive Statistics

Variables	Dietary behavior	Supplement use	Exercise dependence	Physique concealment	Size and symmetry concerns	Pharmacological use
1. Sex	-.14**	.25**	-.8*	-.14**	-.32**	.01
2. Race/ethnicity	.04	.06	.00	.05	.03	.02
3. Weight (pounds)	.11**	.21**	.04	.15**	.22**	.03
4. Age	.06	-.13**	-.14**	-.17**	-.16**	-.01
5. Competitive bodybuilder	.21**	.21**	.19**	.09**	.18**	.16**
6. Competitive weightlifter	-.10**	.16**	.12**	.08*	.16**	.04**
7. BCS: General Appearance[a]	.10**	.00	.05	.20**	.07*	.09**
8. BCS: Muscle Concerns	.13**	.15**	.20**	.27**	.28**	.11**
9. BCS: Weight Concerns	.07*	.04	.14**	.21**	.10**	.13**
10. BCS: Somatic Features	.12**	.10**	.19**	.24**	.22**	.11**
11. *M*	16.12	8.17	14.33	10.62	12.16	3.30
12. *SD*	4.76	4.55	4.03	4.00	5.00	.99

Note. [a]Body Comparison Scale. *$p < .05$, two-tailed. ** $p < .001$, two-tailed.

Table 12 was created by using the same scheme of biophysical variables present in Table 11 to examine their relationships to the specific subscales of the MDI. A Kendall's tau-b analysis revealed that race was the only biological variable not to have a significant relationship with any of the MDI subscales. Identification as a competitive bodybuilder, muscle concerns, and somatic features maintained statistically significant and positive relationships with each subscale of the MDI. Identification as a competitive weightlifter was negatively related only to the dietary behavior subscale of the MDI. Physique concealment and size and symmetry concerns had statistically significant relationships with all variables except for race in the biophysical dimension.

Table 13

Sociological Variable Relationships and the Muscle Dysmorphia Inventory: Correlations and Descriptive Statistics

Variables	1	2	3	4	5	6	7	8
1. Muscle Dysmorphia Inventory	–							
2. SATAQ-4: Internalization of Thin/Low Body Fat	.08*	–						
3. SATAQ-4: Internalization of Muscular/Athletic Physique	.38**	.33**	–					
4. SATAQ-4: Family Pressures	.08*	.21**	.11**	–				
5. SATAQ-4: Peer Pressures	.10**	.25**	.17**	.48**	–			
6. SATAQ-4: Media Pressures	.02	.32**	.17**	.26**	.32**	–		
7. *M*	64.70	15.44	18.33	6.40	6.88	12.30	–	–
8. *SD*	16.20	4.06	3.83	3.43	3.78	5.57	–	–

Note. [a]Sociocultural Attitudes Towards Appearance Questionnaire-4. *$p < .05$, two-tailed. ** $p < .001$, two-tailed.

Kendall's tau-b was used to depict relationships between each subscale of the SATAQ-4 and item-total scores on the MDI as a means of operationalizing the sociological dimension for this study (see Table 13). No variables within the SATAQ-4 were negatively associated with total-item MDI scores. An internalization of thin/low body fat was only modestly related to MD. Internalization of the muscular/athletic physique maintained the strongest relationship with MDI scores while pressures from the media to alter one's physique did not have a significant relationship with MD.

Table 14

Sociological Variable Relationships With the Muscle Dysmorphia Inventory Subscales: Correlations and Descriptive Statistics

Variables	Dietary Behavior	Supplement Use	Exercise Dependence	Physique Concealment	Size and Symmetry Concerns	Pharmacological Use
1. SATAQ-4: Internalization of Thin/Low Body Fat[a]	.07*	-.01	.12**	.14**	.00	.10**
2. SATAQ-4: Internalization of Muscular/Athletic Physique	.25**	.22**	.34**	.23**	.33*	.11**
3. SATAQ-4: Family Pressures	.01	.03	.00	.16**	.07*	.08*
4. SATAQ-4: Peer Pressures	.03	.05	.03	.21**	.09*	.09*
5. SATAQ-4: Media Pressures	-.01	.00	.01	.14**	-.03	.05
6. *M*	16.12	8.17	14.33	10.62	12.16	3.30
7. *SD*	4.76	4.55	4.03	4.00	5.00	.99

Note. [a]Sociocultural Attitudes Towards Appearance Questionnaire-4. *$p < .05$, two-tailed. ** $p < .001$, two-tailed.

Table 14 was generated using Kendall's tau-b to assess the relationships between each subscale of the SATAQ-4 and each subscale of the MDI. Physique concealment was the only muscle dysmorphic subscale to have a significantly positive relationship with every subscale of the SATAQ-4 at the .001 alpha level. An internalization of muscular/athletic ideals maintained a statistically positive relationship with every subscale of the MDI. Supplement use and size and symmetry concerns had the weakest relationships with variables on the SATAQ-4.

Table 15

Psychological Variable Relationships and the Muscle Dysmorphia Inventory: Correlations and Descriptive Statistics

Variables	1	2	3	4	5	6	7	8	9
1. Muscle Dysmorphia Inventory	–								
2. SCL-90-R: Somatization[a]	.13**	–							
3. SCL-90-R: Obsessive-Compulsive	.13**	.48**	–						
4. SCL-90-R: Interpersonal Sensitivity	.15**	.43**	.59**	–					
5. SCL-90-R: Depression	.13**	.48**	.63**	.66**	–				
6. SCL-90-R: Anxiety	.12**	.48**	.60**	.56**	.61**	–			
7. SCL-90-R: Hostility	.13**	.41**	.52**	.54**	.55**	.48**	–		
8. *M*	64.70	.47	.66	.59	.65	.35	.40	–	–
9. *SD*	16.20	.41	.65	.61	.67	.49	.49	–	–

Note. [a]Symptom Checklist-90-Revised. *$p < .05$, two-tailed. ** $p < .001$, two-tailed.

Table 15 was created using the SCL-90-R to operationalize the psychological dimension for this study. A Kendall's tau-b analysis revealed that all psychological variables (somatization, obsessive-compulsive behavior, interpersonal sensitivity, depression, anxiety, and hostility) were significantly, positively related to item-total MDI scores. All of the relationships between psychopathology and the MDI were small but significant at the .001 alpha level. However, it should be noted that the variable "Anxiety" and the variable "Interpersonal Sensitivity" subscales of the SCL-R-90 were only differentiated by a degree of .03.

Table 16

Psychological Variable Relationships With the Muscle Dysmorphia Inventory Subscales: Correlations and Descriptive Statistics

Variables	Dietary Behavior	Supplement Use	Exercise Dependence	Physique Concealment	Size and Symmetry Concerns	Pharmacological Use
1. SCL-90-R: Somatization[a]	.06	.10**	.10**	.14**	.09**	.14**
2. SCL-90-R: Obsessive-Compulsive	.02	.06	.08*	.19*	.13*	.11**
3. SCL-90-R: Interpersonal Sensitivity	.02	.07*	.10**	.23**	.15**	.01**
4. SCL-90-R: Depression	.02	.07*	.08*	.18**	.13**	.11**
5. SCL-90-R: Anxiety	.02	.07*	.06*	.17**	.12**	.12**
6. SCL-90-R: Hostility	.05	.09**	.10**	.16**	.13**	.07*
7. *M*	16.12	8.17	14.33	10.62	12.16	3.30
8. *SD*	4.76	4.55	4.03	4.00	5.00	.99

Note. [a]Symptom Checklist-90-Revised.*$p < .05$, two-tailed. ** $p < .001$, two-tailed.

Table 16 was generated using Kendall's tau-b to examine the relationship between each subscale of the SCL-90-R and every specific subscale of the MDI. Physique concealment was the strongest behavior of MD to be correlated with the SCL-90-R. The dietary behavior subscale of the MDI was not statistically correlated with any of the SCL-90-R variables. Somatization and hostility were the two psychological variables that exhibited the most consistent positive relationships with every MDI subscale. Obsessive compulsive behavior depicted the least consistency across the MDI subscales.

Hypothesis Set 2

H_0: There is no relationship between biopsychosocial factors and the drive for muscularity.

H_1: There is a relationship between biopsychosocial factors and the drive for muscularity.

Kendall's tau-b was also used to assess the relationship between BPS factors and a DFM. The results of these correlations are depicted in matrices separated into groups consisting of the biophysical, social, and psychological dimensions (see Tables 17–19). Overall, symptoms of a muscular drive maintained statistically significant correlations ($p < .001$) similar to MD with a number of variables in each of the BPS dimensions.

Table 17

Biophysical Variable Relationships With the Drive for Muscularity: Correlations and Descriptive Statistics

Variables	1	2	3	4	5	6	7	8	9	10	11	12	13
1. Drive for Muscularity Scale	–												
2. Sex	-.26**	–											
3. Race/Ethnicity	.02	-.11**	–										
4. Weight (Pounds)	.22**	-.55**	.07*	–									
5. Age	-.22**	.10**	-.01	-.05	–								
6. Competitive Bodybuilder	.14**	.00	.06	.00	-.06	–							
7. Competitive Weightlifter	.14**	-.08**	-.01	.09**	-.10**	.19**	–						
8. BCS: General Appearance[a]	.10*	.17**	-.08*	-.09**	-.13**	-.03	-.03	–					
9. BCS: Muscle Concerns	.40**	-.04	-.05	.10**	-.16**	.04	.03	.42**	–				
10. BCS: Weight Concerns	.20**	.27**	.06	-.07*	-.14**	.02	-.02	.44**	.56**	–			
11. BCS: Somatic Features	.32**	.11**	-.08*	.02	-.17**	.05	.01	.39**	.64**	.65**	–		
12. *M*	39.33	1.66	1.51	153.74	35.08	1.06	1.06	15.77	15.51	14.14	15.64	–	
13. *SD*	12.63	.47	1.40	32.86	12.35	.23	.23	5.68	5.41	4.90	4.88	–	–

Note. [a]Body Comparison Scale. *$p < .05$, two-tailed. ** $p < .001$, two-tailed.

Table 17 was generated using the same variable scheme as for table 11 to operationalize the biophysical dimension for this study. Only the DMS was used in place of the MDI to assess muscular drive instead of muscle dysmorphic behavior. Similar to the MDI, scores on the DMS maintained statistically significant and positive relationships with all biophysical variables except for race. However, the variables of sex and age were significantly, negatively correlated with a DFM. Muscular concerns were significantly, positively associated with a DFM to a greater degree than with MD.

Table 18

Sociological Variable Relationships With the Drive for Muscularity: Correlations and Descriptive Statistics

Variables	1	2	3	4	5	6	7	8
1. Drive for Muscularity Scale	–							
2. SATAQ-4: Internalization of Thin/Low Body Fat [a]	.62	–						
3. SATAQ-4: Internalization of Muscular/Athletic Physique	.38**	.33**	–					
4. SATAQ-4: Family Pressures	.11*	.21**	.11**	–				
5. SATAQ-4: Peer Pressures	.13**	.25**	.17**	.48**	–			
6. SATAQ-4: Media Pressures	.06	.32**	.17**	.26**	.32**	–		
7. *M*	39.33	15.44	18.33	6.40	6.88	12.30	–	–
8. *SD*	12.63	4.06	3.83	3.43	3.78	5.57	–	–

Note. [a]Sociocultural Attitudes Towards Appearance Questionnaire-4. *$p < .05$, two-tailed. ** $p < .001$, two-tailed.

Table 18 was formatted using the subscales from the SATAQ-4 to operationalize a sociological dimension for this study. An internalization of thin/low body fat was not significant for a DFM even though it was modestly significant for MD. Both DMS and MDI scores illustrated a strong, positive relationship with an internalization of muscular and athletic ideals. Media pressures were not related to a DFM, nor were they related to the total MDI scores in this sample of PTs.

Table 19

Psychological Variable Relationships With the Drive for Muscularity: Correlations and Descriptive Statistics

Variables	1	2	3	4	5	6	7	8	9
1. Drive for Muscularity Scale	–								
2. SCL-90-R: Somatization[a]	.13**	–							
3. SCL-90-R: Obsessive-Compulsive	.15**	.48**	–						
4. SCL-90-R: Interpersonal Sensitivity	.17**	.43**	.59**	–					
5. SCL-90-R: Depression	.17**	.48**	.63**	.66**	–				
6. SCL-90-R: Anxiety	.13**	.48**	.60**	.56**	.61**	–			
7. SCL-90-R: Hostility	.14**	.41**	.52**	.54**	.55**	.48**	–		
8. *M*	39.33	.47	.66	.59	.65	.35	.40	–	–
9. *SD*	12.63	.41	.65	.61	.67	.49	.49	–	–

Note. [a]Symptom Checklist-90-Revised. *$p < .05$, two-tailed. ** $p < .001$, two-tailed.

Similar to the MDI, total-item scores on the DMS depicted a statistically strong and positive relationship with all psychopathological variables at the .001 level. Interpersonal sensitivity and depression were the two variables most strongly related to a DFM. Somatization and anxiety were the variables that depicted the weakest correlation with a DFM. Depression had a stronger relationship to a DFM than it did with MD. Somatization had a weaker relationship with a DFM than it did with MD.

Hypothesis Set 3

H_0: A drive for muscularity will not significantly predict muscle dysmorphia.

H_1: A drive for muscularity will significantly predict muscle dysmorphia.

Linear bivariate regression analysis using the least squares method was used to evaluate the ability of the DMS to predict each subscale as well as the total score of the MDI. This method was chosen because the investigation of R^2 using linear regression has shown to be robust when multiple imputation has been used (Harel, 2009), and also because : (a) linear regression as a parametric test has demonstrated valid statistical results for non-normally distributed data in large samples, (b) large sample sizes tend to exhibit normal distributions regardless of shape, and (c) the means of large random samples tend to exhibit normality even if the distributions appear non-normal (Elliott & Woodward, 2007; Lumley, Diehr, Emerson, & Chen, 2002; Pallant, 2007, pp. 179-200).

A drive for muscularity was able to significantly predict MD in this study sample of PTs, $\beta = .98$, $t(6{,}092)$ $p < .001$. Linear regression indicated that 96% of the variance in MD was explained by a DFM, $R^2 = .96$ $F(1, 6.091) = 141{,}025.98$, $p < .001$.In the current study sample, the DMS was an excellent measure in predicting MDI scores (see

Figure. 1). A series of bivariate linear regressions were run on each of the subscales to specifically investigate the DMSs' predictive power of specific characteristics related to MD. The DMS was an excellent predictor of each MDI subscale, but variance was best explained in the size and symmetry concerns and exercise dependence subscales of the MDI (see Table 20).

Table 20

Series of Linear Regressions Between Muscular Drive and Muscle Dysmorphia Inventory Subscales

MDI Subscales	B	S. E.	*B*	t	*p*	F	F Sig.	R^2
Dietary Behavior	.39	.00	.95	231.70	.000	54,147.82	.000	.90
Supplement Use	.21	.00	.91	176.85	.000	31,276.20	.000	.84
Exercise Dependence	.35	.00	.96	263.51	.000	69,437.70	.000	.92
Physique Concealment	.26	.00	.94	209.69	.000	43,968.96	.000	.88
Size and Symmetry	.31	.00	.97	329.65	.000	108,668.15	.000	.95
Pharmacological Use	.08	.00	.93	201.38	.000	40,553.38	.000	.87

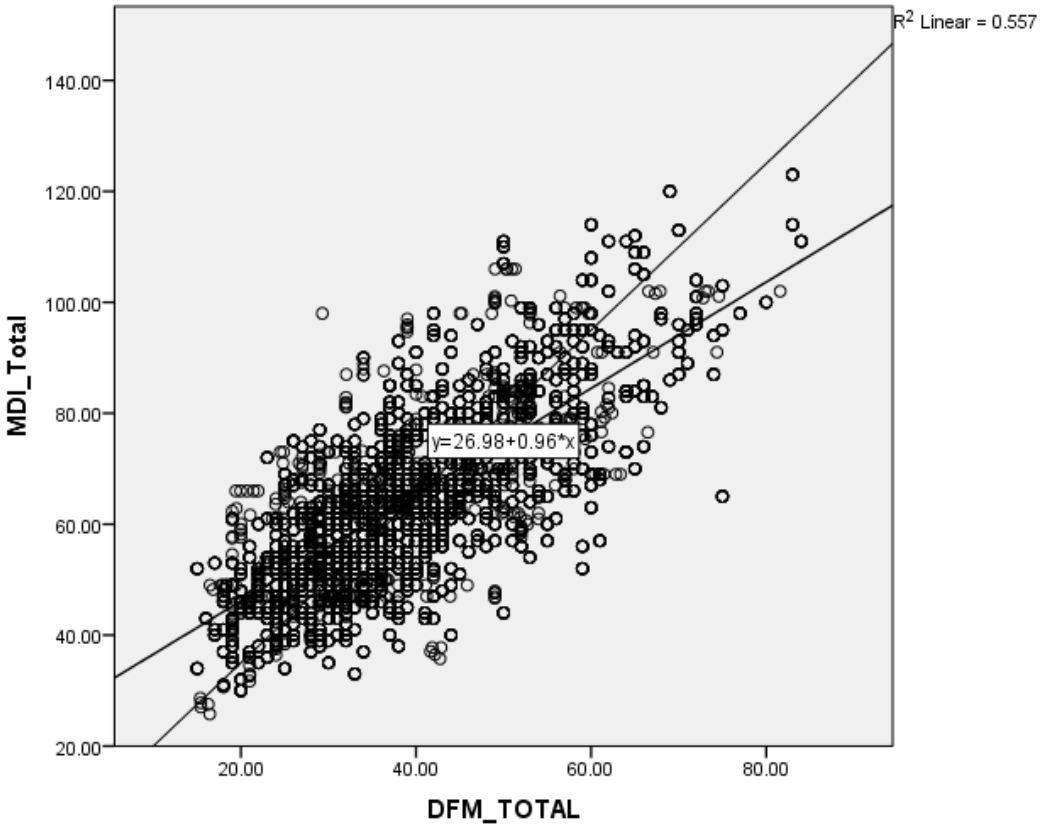

Figure 1. Scatterplot depicting the regression line for the drive for muscularity and muscle dysmorphia.

Researchers have indicated that using measures such as the MDI or the DMS with individuals who identify as being weightlifters and/or bodybuilders can be problematic because these types of individuals typically engage in rigorous valetudinarian procedures as mandates of their sport and not from some type of underlying body image disturbance (Baghurst, 2009; Suffolk, 2013). A follow-up analysis was done to examine if the DMS could predict MD when bodybuilders and weightlifters were treated as statistical controls.

Assumptions were assessed during the hierarchical multiple regression analysis. Multicolinearity (tolerance = .941-.943, VIF = 1.06), and outliers did not pose a problem (Cook's distance, max = .03). The entire model accounted for 60% of the variance in

MDI scores, and the DFM accounted for an additional 47 % of variance after the variables of bodybuilder and weightlifter had been statistically controlled (see Table 21).

Table 21

Hierarchical Multiple Regression Predicting Muscle Dysmorphia From a Drive for Muscularity With Controls

		B	S. E.	β	t	p	R	R^2	ΔR^2
1	(Constant)	30.51	2.80		10.89	.000			
	Competitive Bodybuilder	20.81	2.06	.30	10.09	.000	.37	.13	.13
	Competitive Weightlifter	11.53	2.05	.17	5.64	.000			
2	(Constant)	10.49	2.00		5.25	.000			
	Competitive Bodybuilder	13.76	1.42	.20	9.69	.000	.77	.60	.47
	Competitive Weightlifter	3.96	1.41	.06	2.80	.005			
	Drive for Muscularity	.90	.026	.70	34.53	.000			

Hypothesis Set 4

H_0: There are no gender differences on the muscle dysmorphia inventory subscales.

H_1: There are gender differences on the muscle dysmorphia inventory subscales.

A Mann-Whitney U test was conducted to evaluate if there was a difference between males and females on the subscales as well as the total scale of the MDI. Overall, men exhibited more muscle dysmorphic symptoms than women, $U = 75{,}862.50$, $z = -9.87$, $p < .001$, $r = 31$. Men had an average rank of 647.70 and women had an average rank of 454.29. Differences between gender on the dietary subscale were significant, $U = 96{,}893$, $z = -5.29$, $p < .001$, $r = .16$. Men had an average rank of 588, while women had an average rank of 485. Men and women also differed significantly on the supplement use subscale, $U = 78{,}316$, $z = -9.48$, $p < .001$, $r = .29$. Men had an average rank 640.88 and women had an average of 457. Differences between men and

women on the exercise dependence subscale were statistically significant, U = 107,356.50. z = -2.956, $p < .05$, r = .30. Men had a mean rank of 558.15 while women had a mean rank of 500.37.

The physique concealment subscale of the MDI was also statistically significant with regard to gender differences, U = 97,214, z = -5.23, $p < .001$, r = 16. Men's average rank was 587.45 and women had an average rank of 485.29. Differences between men and women on the size and symmetry concerns subscale of MDI were significant, U – 66,264.50, z = -12.00, $p < .001$, r = 37. Men had an average rank of 676.32 and women were ranked at 439.56. Results for gender difference on the pharmacological subscale were not significant, U = 120,435.50, z = -.22, p = .82, r = .01. Men had an average rank of 516.67 and women had a rank of 521.72.

A further hierarchical regression analysis was computed holding competitive weightlifter and bodybuilder status as controls to assess their influence on gender and MD. Multicolinearity (tolerance = .96-.943, VIF = 1.05), and outliers did not pose a problem (Cook's distance, max = .001). The analysis indicated that gender explained 9% of the variance within the model. Furthermore, the analysis showed that identification as a competitive weightlifter or bodybuilder accounted for 13% of the total variance, and therefore influenced MDI scores by slightly more than sex (see Table 22).

Table 22

Multiple Hierarchical Regression Depicting Bodybuilder and Weightlifter Controls

		B	S. E.	β	t	p	R	R^2	ΔR^2
1	(Constant)	30.58	2.80		10.91	.000			
	Competitive Bodybuilder	20.77	2.06	.30	10.08	.000	.37	.13	.13
	Competitive Weightlifter	11.50	2.04	.17	5.63	.000			
2	(Constant)	48.89	3.16		15.48	.000			
	Competitive Bodybuilder	21.11	1.96	.30	19.80	.000	.47	.22	.09
	Competitive Weightlifter	9.71	1.95	.14	4.99	.000			
	Sex	-10.13	.094	-2.6	-10.75	.000			

Specific manifestation of MD and a DFM segregated by sex warranted additional investigation. Scores on the MDI were assessed using SPSS to identify a minimum score of 27 and a maximum score of 123. That data was used to transform MDI scores into a dichotomous variable where values through 75 (lower 50%) were deemed minimally muscle dysmorphic and a range of 76-123 (upper 50%) was considered maximally muscle dysmorphic. Similar measures were taken with the DMS so that a score through 45 (lower 50%) was considered a minimal drive and a score of 46 to 90 (upper 50%) was considered a maximum drive.

Crosstabulation revealed an important and relative proximity between the sexes. The number of males (135) and females (102) who scored maximally on the MDI were only differentiated by 33 cases. Similarly, males (158) and females (130) were only differentiated by 28 cases on the maximal end of the DMS. These findings indicated that

perhaps muscle dysmorphic and muscular drive behaviors do not skew as greatly between genders in PTs when compared to other populations. Therefore, the exhibition of MD and a DFM was proximal to both sexes even when considering for gender disparity.

Chapter Summary

In summary, MD and a DFM were present among the study sample of PTs, but neither MD nor a DFM had prevalent frequency or severity to be considered a salient problem for that particular demographic based on the measures used within the study. Importantly, a DFM and MD displayed statistically significant and positive relationships with numerous variables across each of the biophysical, psychological, and social dimensions. The DFM was able to predict MD even when competitive bodybuilders and weightlifters were controlled. Finally, men displayed more muscle dysmorphic symptoms than women on the MDI as a total score as well as on each of the subscales of the MDI. Although these figures may be disparate with an equal number of sexes, the current data did reveal a minor disparity which should be acknowledged in future research. The final chapter includes a discussion on the results, addresses the findings relevant to each hypothesis, states the limitations of the study, and suggests prospective action with implications for social change.

Chapter 5: Discussion

Introduction

The purpose of this cross-sectional study was to assess the presence of MD and a DFM in PTs and examine potential correlations that these variables might have had with various biopsychosocially structured constructs. The biophysical dimension variables of weight, identification as competitive bodybuilder, identification as a competitive weightlifter, general appearance concerns, muscle concerns, and somatic features were significantly, positively related to MD and a DFM. Results from the social dimension analysis indicated that the DFM and MD were significantly related to an internalization of muscular/athletic ideals, family pressures, and peer pressures to improve appearance but were not related to media pressures, and that only those with MD exhibited an internalization of thin/low body fat ideals.

All psychological variables (somatization, obsessive compulsive behavior, interpersonal sensitivity, depression, anxiety, and hostility) were significantly, positively related to MD and a DFM. The DMS was able to significantly predict scores on the MDI, even when controlling for the variables of weightlifter and bodybuilder. Men exhibited greater muscle dysmorphic and muscular drive behaviors than women even though they constituted only 34% of the total sample. The gender disparity between high muscular drive and exhibition of muscle dysmorphic behaviors was less prominent for PTs than for other populations in the extant literature. In this chapter, I discuss these results in depth and sectionalize them into (a) a contrast of biological, psychological, and social variables as they apply to a DFM and MD; (b) the ability for a DFM to predict MD; and (c) gender

differences with regard to MD in PTs. The implications of these results for future research, their intended contribution to social change, and the potential novelty as well as the limitations associated with the results are discussed.

The Biophysical Dimension

An important finding from this research was that a muscular drive and the display of muscle dysmorphic symptoms as operationalized by the DMS and MDI, respectively, were positively correlated with the same variables except for race. Both the DFM and MD tended to diminish in relation to age, and this was consistent with findings from previous researchers (e.g., Todd & Lavallee, 2010). To date, the BCS has not been used in concomitance with the MDI, but it is not surprising that muscle concerns and somatic features were the subscales most strongly correlated with both a DFM and MD because both subscales dealt with aspects of physicality and musculature.

It is somewhat surprising that weight concerns were positively correlated with MD at an alpha level of .05 while weight concerns were positively correlated with a DFM at an alpha of .001. Previous research has indicated that muscle dysmorphic individuals engage in strenuous exercise and typically use supplements for the purpose of diminishing adiposity so as to better display musculature (Morgan, 2000). Based on the symptoms of MD, one would expect weight control to be less prominent in the DFM and more symptomatic of an underlying body image disturbance associated with MD. However, more research is needed, and new measures ought to be developed to establish how a preoccupation with weight differs between muscle dysmorphic behaviors and muscular drive, especially in PTs.

Muscular concerns were more strongly, positively correlated with a DFM than with MD. This finding is important, as it may help to contrast the two disorders. Specifically, an individual who exhibits muscle dysmorphic behaviors may have a strong preoccupation with becoming more muscular, accompanied with feelings of inadequacy about his or her own physique, but an individual with an intense drive for muscularity may harbor more muscular concerns because the ultimate objective of the drive is the attainment and/or display of physical muscularity. The incorporation of a measure that reflects consideration of underlying body image disturbances would be useful in separating individuals who singularly have a strong drive for muscularity from those who have a strong drive for muscularity associated with MD.

The Psychological Dimension

The DFM and MD each had statistically significant relationships with psychopathology (somatization, interpersonal sensitivity, depression, anxiety, obsessive compulsive behavior, and hostility), with interpersonal sensitivity being the largest common correlation between the two dependent variables. These findings are noteworthy, as few studies have incorporated a measurement of psychopathology like the SCL-90-R in muscle dysmorphic and muscular drive assessments as a means to provide data that are inclusive of psychological disturbances. However, these results support the findings from previous researchers who used the SCL-90-R, including Maida and Armstrong (2005), McFarland and Kaminiski, (2009), and Wolke and Sapouna (2008).

Different from the aforementioned studies, obsessive compulsive behavior depicted the least consistency across the MDI subscales. However, the correlation matrix

indicated that obsessive compulsive behavior exhibited a stronger relationship with a DFM and that depression had a stronger correlation with a DFM than MD. Interpersonal sensitivity maintained a strong, significantly positive relationship for both a DFM and MD. Therefore, the results from the present study suggested that social sensitivity may be more applicable to at least PTs in exacerbating MD symptomology and unhealthy muscular drives than obsessive behaviors or feelings of depression. Further research that deals with obsessive and interpersonal sensitivity behaviors as temporal agents and can classify them as either byproducts or precipitators of MD would greatly help to conceptualize the symptomologic breadth of the disorder.

The correlations for both the DMS and the MDI on the SCL-90-R were small, but their identical correlational significance with examples of psychopathology suggests that a muscular drive may be influenced by psychological disturbance in a manner similar to MD. Future research would benefit from further dichotomizing MD and a DFM and assessing potential psychopathologic relationships with alternate measures that assess constructs such as obsessive-compulsive behavior, depression, anxiety, and interpersonal sensitivity. Also, research that goes beyond correlations and assesses the potential causal relationships between psychopathology and a DFM and MD would greatly contribute to the current literature.

The Social Dimension

Internalization of thin/low body fat ideals was not significant for a DFM even though it was significant for MD. Considering the similarity with which the scores from the DMS and MDI depicted on all study variables, it may be prudent to explore this

specific variable in future research. Based on previous work, it was expected that muscle dysmorphic individuals would have more adipose concerns (e.g., Morgan, 2000; Olivardia, 2007), but individuals who reported a high DFM had more weight-related concerns on the BCS than thin/low body fat concerns on the SATAQ-4. Although these two subscales assess different constructs, their disparity with regard to MD suggested that muscle dysmorphic and muscular drive goals are different despite a goal commonality in increased musculature.

The internalization of a muscular and athletic physique was the strongest related subscale for both MD and a DFM. Media pressure was the least correlated variable for both the MDI and the DMS and also not significant. These results were surprising because several researchers have shown that the internalization of media-based muscular ideals is related to and/or statistically capable of predicting MD (Cafri et al., 2006; Daniels & Bridges, 2010; Fernandez & Pritchard, 2012), as well as to a DFM (Giles & Close, 2008). It is possible that this variation may be unique to PTs. Notably, a postexamination using Spearman's rho rather than Kendall's tau-b indicated a statistically positive, albeit small, correlation between media influence and MD. However, this finding through post examination is likely attributable to rank-order deviations over concordant/discordant pair methods rather than actual statistical significance. Whether PTs acquire some type of fortitude to media influence based on their education or training is unknown and necessitates further examination. The use of alternative nonparametric measures or the use of parametric measures after a transformation of data is also viable in further examining the extent to which the media affects the exhibition of MD and a DFM.

When the specific subscales of the MDI were separated, media pressures were shown to have a statistically positive relationship with physique concealment but did not illustrate a meaningful relationship with any other MDI subscale. Physique concealment was the only subscale of the MDI to depict a significantly positive relationship with every variable across each BPS dimension except for race. Despite a focal preoccupation with muscularity, these findings suggested that the act of concealing one's physique may be a more prominent behavior of MD than putatively believed. Additional research that isolates physique concealment as a distinct behavior of MD and compares its manifestation to other body image disturbance behaviors may help to indicate the provenance of concealing one's physique as a behavior of MD.

Drive for Muscularity and Muscle Dysmorphia: Predictive Capabilities

A drive for muscularity was able to significantly predict MD in this study sample of PTs. A drive for muscularity also explained 47% of the variance when controlling for weightlifters and bodybuilders and was more instrumental in predicting MD than competitive bodybuilding or weightlifting status. Few studies have specifically looked at the ability of a DFM to predict MD, and fewer studies have controlled for bodybuilders and weightlifters in muscle dysmorphic and muscular drive research. Future research into the interplay between a DFM and MD would help to better establish the commonalities between these two separate constructs. Specifically, McCreary and Sasse (2000) indicated that the DMS could be split into two separate subscales denoting behaviors and attitudes. It would be beneficial to address these specific subscales of the DMS and

examine which attitudinal or behavioral aspects of a DFM are more or less instrumental in predicting MD.

Gender Differences and the Muscle Dysmorphia Inventory

It was anticipated that men and women might have had similar exhibitions of muscle dysmorphic behavior based on the commonality of personal training and ultimately vocational proximity to sport and fitness. To address these issues, MDI and DMS scores were looked at with cut-off points in the postanalysis phase. Crosstabulation with cut-off points for the DMS and the MDI revealed that men and women who had exhibited maximal scores were only differentiated by 28 cases for the DMS and 33 for the MDI.

A score on the MDI indicative of severe MD is one of 162, while a score of 27 is indicative of no MD symptomology. The mean average for the display of muscle dysmorphic symptomology among PTs in this sample was $M = 64.1$, which indicated that although muscle dysmorphic behaviors were present in the sample, they were relatively minimal. Drives for muscularity were slightly more pronounced in this sample of PTs.

The minimum and maximum DMS scores were 15 and 90, respectively. Personal trainers scored an average of $M = 39$, which is indicative of a small-to-medium presence of a DFM in the sample. Participants who identified as being competitive weightlifters and/or bodybuilders were almost equally split between males and females. This equality likely bolstered the data when competitive statuses were treated as controls.

The findings from the current study indicated that perhaps muscle dysmorphic and muscular drive behaviors do not skew as greatly between genders in PTs when

compared to other populations such as students or gym members. It is important to note that there were more women than men who participated in the study. Men exhibited significantly more symptoms of MD than women, which is congruent with numerous research studies, including those of Pope et al. (1993), Giardino and Procidano (2001), and Pope et al. (1997). However, crosstabulation revealed minimal differences with regard to muscle dysmorphic cases between the genders, which is congruent with the findings of researchers such as Robert et al. (2009), Goodale et al. (2001), and Ebbeck et al. (2009). Gender-heterogeneous studies are still very sparse in muscle dysmorphic literature, and it is not clear which covariates close or widen the gap between men and women with regard to MD. However, the case-wise exhibition of MD and a DFM was noticeably proximal to both sexes in this sample even when considering for gender disparities.

Limitations and Recommendations

This study had a cross-sectional design and was intended to explore possible relationships between biopsychosocially structured variables in an unresearched population. Therefore, causality cannot be established. Furthermore, the biopsychosocially structured correlation matrices were intended to demonstrate relationships and not (dis)prove an operational model. Aspects of structural equation modeling or types of factor analysis were not part of the study. Therefore, this study does not establish any type of model that is unique to PTs or any other population. However, because many of the subscales used displayed strong, positive correlations with MD and

a DFM, it is likely that these data could be transformed into a suitable muscle dysmorphic/muscular drive model for PTs.

A primary limitation of this study related to generalizability and the characteristics of the participants. A majority of participants identified as being Caucasian, and this could substantially limit how the chosen BPS factors relate to trainers of other races. Furthermore, the sample was largely composed of females and had a small percentage of individuals who identified as being competitive bodybuilders or weightlifters. These subgroups have been identified as at-risk populations for MD, and it might have benefited the study to have had a more gender-equal sample, if not more self-identified bodybuilders and weightlifters. However, during data analysis, the importance of garnering a "*pure*" sample of muscle dysmorphic individuals became apparent, and the identification as bodybuilder and/or weightlifter became a means of filtration, as these statuses were instrumentally used as covariate controls.

The phobic anxiety, psychoticism, and paranoid ideation subscales of the SCL-90-R were not used in this study, as they have exhibited little to no relationship with MD in the past literature (see Todd & Lavallee, 2010). Although the omission of these subscales was likely beneficial in improving response rates, their omission was problematic in scoring the measure. Only raw scores for the SCL-90-R were used in this study and were not scored across three global indices or transformed into standard T-scores as suggested by Derogatis (1997). Deviation from this suggested scoring procedure may have negatively impacted the psychopathologic comprehensiveness of the study. Furthermore, the inclusion of these subscales would likely have been useful, given that each of the

SCL-90-R subscales was positively correlated with a DFM and MD. However, the addition of three subscales would likely have resulted in a greater amount of missing items and perhaps even a lower sample size.

Implications and Social Change

It was intended for this study to offer a unique perspective on MD and DFM as they manifest in PTs. In buttressing this exploratory study, it is was also intended to incorporate a variety of multidimensional variables that are likely relative to both MD and a DFM, including measures of psychopathology and sociocultural attitudes that are seldom used in muscle dysmorphic literature. This study was intended to draw attention to potential body dysmorphic disorder prevalence in athletics and among individuals who instruct sports as a means to better conceptualize an emerging and misunderstood disorder. This study was also intended to examine gender differences within this particular athletic paradigm and evaluate the prevalence and interplay between a DFM and MD. Ultimately, it was my intention to amalgamate each of these unique perspectives and a make a meaningful contribution to the literature resulting in positive social change.

Specifically, this study is expected to affect researchers, personal trainers, and educators by providing a structured assessment of muscle dysmorphic behaviors that exist within the domain of personal training. Muscle dysmorphia is still considered an emerging disorder, and identifying vocations in which the disorder might exist may help to identify and ultimately treat the disorder. A better understanding of the etiological

factors that contribute to MD will likely influence the ways in which interventions are used with the disorder.

A better understanding of how MD symptoms present in PTs is expected to provide insight into how an unexamined population experiences MD, and may lead to personal training fitness mandates and regulations as well as educational requirements and training programs that consider for body image-oriented mental health disturbances. This particular implication for social change stands to be twofold as personal trainers are in a position of instruction and guidance, and therefore a better understanding of how MD presents in this specific fitness arena may not only impact PTs, but also the clients with which they work.

Lastly, it may be beneficial to reconceptualize MD in terms of behavior exhibition that consist of inward versus outward characteristics based on the significant correlations found in the present study. Physique concealment, concerns about size and symmetry, social comparison, internalization of peer and familial input, interpersonal sensitivity, anxiety, depression, obsessive behavior, and even experienced muscular drives are likely suitable examples of an introverted exhibition of MD. Alternatively, the engagement in weightlifting, dietary practices, pharmacological use, and exercise dependences are extroverted and action-oriented exhibitions of muscle dysmorphic symptomology. Dichotomizing MD into introverted and extroverted symptomological categories in future research would provide researchers with an additional opportunity for comparison and likely contribute to the understanding of MD as a disorder.

Conclusion

The primary purpose of this study was to evaluate MD as measured by the MDI and a DFM as measured by DMS in PTs. This is the first known study of PTs regarding these two constructs. A total of 1,039 PTs were asked to complete a survey containing 163 questions based on a biopsychosocial theoretical foundation. This theoretical foundation was chosen as a means to include the most variables, across the greatest spectrum, in the most reasonable manner.

Primarily, the findings from this study suggested that MD and a DFM are indeed present in the vocation of personal training, and also that they are closely intertwined. Although these two constructs do not stake a salient majority in the sample, they are correlated with psychopathology that belies the necessary inclusion, emphasis and, support for individuals, trainers, and clients who may struggle with body dysmorphic disorder and body image disturbances.

This study has provided unique insight into an unresearched population. Personal trainers were shown to display muscle dysmorphic and muscular drive behaviors that were largely congruent with the extant literature, but the presence of MD seemed to be less inclusive of gender and much more related to muscular drives. Furthermore, PTs were particularly susceptible to pressures from peers and displayed less influence by the media to alter their physiques. Muscle dysmorphia as well as the DFM shared similar, statistically positive correlations with psychopathologic variables, especially interpersonal sensitivity. Muscular drive and MD were often strongly associated with the same variables using the same alpha level (.001), and they both displayed statistically

significant correlation across the BPS dimensions. This finding is congruent with an extensive muscle dysmorphic literature review from Jones and Morgan (2010), who had found that "men with muscle dysmorphia show abnormalities on every biopsychosocial variable" (p. 26).

The severity of moderate-to-high MD and a DFM was present in this sample of PTs, but this presence included a relatively small portion. Muscle Dysmorphia Inventory scores in the upper 50% only comprised 237 cases (22.8%), and DMS scores in the upper 50% only comprised 280 (27.7%) cases. Therefore, while MD and an extreme DFM are not necessarily salient problems for most PTs, they are modestly present and exist with less gender disparity when compared to populations such as students or recreational weightlifters.

The physique concealment subscale of the MDI was significantly and positively related to every variable except for race. This particular finding indicated that physique concealment may be a more salient symptom of MD than putatively believed, and partially suggests that "*protecting*" one's physique may be more important than engaging in the activities required to build one's physique. A comparison of such introverted muscle dysmorphic behaviors with extroverted muscle dysmorphic behaviors would further the knowledge about physique concealment's symptomological interplay with MD.

The overarching meaning of this exploratory study was to examine the presence and nature of MD and a DFM in PTs, despite suspected minuteness or comorbidity with other biological, psychological, or social disorders. Importantly, muscle dysmorphic

behaviors may often be overlooked because they affect a small percentage of most populations (Olivardia, 2007).

A novel and initial step is to identify at-risk populations and identify milieus that muscle dysmorphic individuals may thrive in or be drawn to based on etiological body image disturbances. The progression of important diagnostic and classificatory research on MD has stagnated in the current literature. However, it was logical to pursue other potential at-risk populations and look at vocations such as PTs in the absence of the etiological and classificatory growth of MD as a means to foster social change in the field of body image research.

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Appendix A: Informed Consent

You are invited to take part in a research study pertaining to body image and muscularity concerns in personal trainers. The researcher is inviting all personal trainers who are members of the [redacted] to participate in this research. Your email address was located through the public database [redacted] on the [redacted]. This form is part of a process called "informed consent" in order to provide you with all the necessary information about this study before you decide whether or not you would like to participate.

This study is being conducted by Beau Diehl, a doctoral student at Walden University with his Master's Degree in Health Psychology. The collective survey contains six questionnaires which should take no longer than 20-25 minutes to complete. The purpose of this study is to assess exercise behaviors, weight, muscularity, diet, and general body-image concerns in personal trainers. This study is also intended to address potential gender differences with regard to these concerns. There is no compensation for participating in the study.

Privacy

Any information you provide is on a secure website and only available to the researcher under password protection. All of your information is 100% confidential, and all participants are assured anonymity. There is no way that any of your answers can be traced back to you. The researcher will not use your information for any purposes beyond this research project. Furthermore, the researcher will not include your name or any other identifying information. The researcher is in no way affiliated with the [redacted], and your participation in this research study will have no impact on your standing within the organization. All information will be kept for a period of at least 5 years, as is required by the University.

Voluntary Nature of the Study

This is study is 100% voluntary in nature. Your decision to participate is completely confidential, and your ultimate decision to participate will be respected. If you decide to begin participation now, you are still free to change your mind at any time during or after the study. You have no obligations and may stop at any time.

Risks and Benefits of Being in the Study

There is a small risk of minor discomfort and possibly anxiety over answering questions that require you to evaluate your own body. Again, your answers can never be

connected to your identity, and being in this study will not risk your wellbeing or safety. Your participation in this study stands to yield immense benefits as your answers can provide professionals with a deeper understanding of just how personal trainers assess their own body image. Typically, personal trainers have significant passions about helping others develop their bodies and improve their health. An understanding of how personal trainers feel about their own bodies should be extremely beneficial to psychology, personal training, and athletics collectively.

Contacts and Questions

You are more than welcome to contact the researcher via email or by phone with any questions or concerns you may have about the study. The contact information for the researcher is – Email: beau.diehl@walden.edu, Phone: [redacted] You are also free to contact [redacted] or the chair of this dissertation [redacted] If you have any questions about your rights as a participant you can contact the University Ethics department ([redacted]). You may also contact Walden University directly:

X

Please print or save this consent form for your own records

Statement of Consent

I have read the above information and understand the study well enough to decide my participation. By clicking the link below, I understand that I am agreeing to the terms above.

Appendix B: Invitation to Participate in Research Email Outreach

Subject Line: Invitation to Participate in Personal Training Research Study

Greetings [redacted] Personal Trainers,

This email is an invitation for you to participate in an important research study on diet, muscularity, and body image concerns. This study is being conducted by Beau Diehl, a doctoral student at Walden University with a Master's Degree in Health Psychology. Participation is 100% voluntary, and your decision to participate will in no way impact your standing in the [redacted]. All information is completely anonymous and your identity will be held confidential. You must be 18 years or older to participate in the study. You are in no way obligated to participate in the study. However, the information you provide will help professionals to better understand issues of body image, muscularity concerns, dieting practices, and exercise behaviors of personal trainers. Please carefully read the informed consent form at the bottom of this email.

Thank you so much for your consideration

Appendix C: Follow-Up Reminder Email

Greetings [redacted] Personal Trainers,

This email is a follow-up invitation for you to participate in an important research study on diet, exercise behavior, muscularity, and body image concerns. This study is being conducted by Beau Diehl, a doctoral student at Walden University with a Master's Degree in Health Psychology. Participation is 100% voluntary, and your decision to participate will in no way impact your standing in the [redacted]. All information is completely anonymous and your identity will be held confidential. You must be 18 years or older to participate in the study. You are in no way obligated to participate in the study. However, the information you provide will help professionals to better understand the issues of body image, muscularity concerns, dieting practices, and exercise behaviors of personal trainers. Please carefully read the informed consent form at the bottom of this email.

Thank you so much for your consideration

Appendix D: Debriefing

Thank you so much for your participation. The series of surveys you have just completed assess body image, muscularity concerns, dieting practices, and exercise behaviors in personal trainers. Your responses will be analyzed and interpreted to gauge body image disturbances in personal trainers. The results of this study could impact training and educational resources for personal trainers in the future. Your participation is very much appreciated and stands to benefit many individuals well beyond the athletic and personal training communities. Again, all of your responses are completely confidential. If you have any questions or concerns, please contact Beau Diehl at [redacted] or via email at [redacted] You can also contact Walden University directly:

X

If you are feeling any amount of distress or discomfort from completing the survey, you are encouraged to contact the [redacted], the chair of this dissertation ([redacted]), or visit http://www.samhsa.gov/find-help. This website includes resources for people who are feeling suicidal, severely depressed, struggling with substance abuse issues, navigating disaster or who are experiencing mental health problems specifically related to veterans.

Thank you again for your participation.

Appendix E: Letter of Cooperation from the [redacted]

[redacted]

11/6/14

Dear Beau James Diehl,

The [redacted] agrees to provide database support of U.S. based [redacted] Certified Personal Trainers (CPT) as a means of participant recruitment for your dissertation studies. This authorization is under the provision that we, the [redacted], "will send a direct email blast to our U.S. based [redacted] CPTs and include your documentation and links for the study. We would also send up to 2 reminder emails on your behalf to the same pool of people."

The [redacted] is aware that the participation of our U.S. based [redacted] CPTs in this study is voluntary and at their own discretion as stated in the informed consent and invitation letters.

The [redacted] acknowledges that there will be no physical or telecommunication between the researcher and any [redacted] CPTs, and that the direct email blast will be used only as a recruitment method whereby U.S. based [redacted] CPTs are invited to partake in the researcher's study.

The [redacted] reserves the right to withdraw from the study at any time if any circumstances change.

The [redacted] will transmit a series of 3 invitation emails to all U.S. based CPTs on behalf of Mr. Diehl and this transmission complies with the policies of the [redacted].

The [redacted] understands that the data collected will remain entirely confidential and may not be provided to anyone outside of the supervising faculty/staff without permission from the Walden University IRB.

The [redacted] requests that this letter incorporate two signatures where: (1) the signature and contact information of the [redacted] representative allows authorization for the researcher to access the database through an [redacted] outreach, and (2) the signature and contact information of Mr. Diehl establishes that he, as the researcher, acknowledges and will abide by the parameters of this agreement.

Sincerely, Researcher Signature,

[redacted]
Assistant Director of Certification
[redacted]

Beau J. Diehl M.S.
beau.diehl@waldenu.edu

Walden University policy on electronic signatures: An electronic signature is just as valid as a written signature as long as both parties have agreed to conduct the transaction electronically. Electronic signatures are regulated by the Uniform Electronic Transactions Act. Electronic signatures are only valid when the signer is either (a) the sender of the email, or (b) copied on the email containing the signed document. Legally an "electronic signature" can be the person's typed name, their email address, or any other identifying marker. Walden University staff verify any electronic signatures that do not originate from a password-protected source (i.e., an email address officially on file with Walden).

Appendix F: Demographic Questionnaire

General Demographic Information

Please fill out this brief demographic survey to the best of your knowledge. Click the "next" button at the bottom of the page when you have finished to move on to the second of six surveys. Thank you.

1. Sex

    (1) Male

    (2) Female

    (3) Transgendered

2. Race

    (1) European American/Caucasian/non-Hispanic

    (2) Black/African-American

    (3) Asian/Pacific Islander

    (4) American Indian/Native American

    (5) Latina/Chicano/Hispanic

    (6) Biracial/Multiracial

    (6) Other

3. Age _____

4. Height (in nonmetric, feet and inches) _____

5. Weight (in pounds) _____

6. Do you plan on competing in a weightlifting competition within the next 6 months OR have you already competed in a weightlifting competition within the past 6 months?

(1) Yes

(2) No

7. Do you plan on competing in a bodybuilding competition in the next 6 months OR have you already competed in a bodybuilding competition within the past 6 months?

(1) Yes

(2) No

Appendix G: Body Comparison Scale Questionnaire

For the items below, use the following scale to rate how often you compare these aspects of your body to those of other individuals of the same sex. NOTE: Please be sure that you read and respond to all of the questions according to how you would compare yourself to your same sex peers.

Never 1	Rarely 2	Sometimes 3	Often 4	Always 5

1.	Ears	1	2	3	4	5
2.	Nose	1	2	3	4	5
3.	Lips	1	2	3	4	5
4.	Hair	1	2	3	4	5
5.	Teeth	1	2	3	4	5
6.	Chin	1	2	3	4	5
7.	Shape of face	1	2	3	4	5
8.	Cheeks	1	2	3	4	5
9.	Forehead	1	2	3	4	5
10.	Upper arm	1	2	3	4	5
11.	Forearm	1	2	3	4	5
12.	Shoulders	1	2	3	4	5
13.	Chest	1	2	3	4	5
14.	Back	1	2	3	4	5
15.	Waist	1	2	3	4	5

15.	Stomach	1	2	3	4	5
17.	Buttocks	1	2	3	4	5
18.	Thighs	1	2	3	4	5
19.	Hips	1	2	3	4	5
20.	Calves	1	2	3	4	5
21.	Muscle tone of upper body	1	2	3	4	5
22.	Overall shape of upper body	1	2	3	4	5
23.	Muscle tone of lower body	1	2	3	4	5
24.	Overall shape of lower body	1	2	3	4	5
25.	Overall body	1	2	3	4	5

Appendix H: Symptom Checklist-90-Revised Questionnaire

INSTRUCTIONS

The SCL-90-R consists of a list of problems people sometimes have. Read each one carefully and select the number that best describes HOW MUCH THAT PROBLEM HAS DISTRESSED OR BOTHERED YOU DURING THE PAST 7 DAYS INCLUDING TODAY. Select only one number for each problem. Do not skip any items. If you change your mind, you can select a new choice.

0 = Not at all

1 = A little bit

2 = Moderately

3 = Quite a bit

4 = Extremely

HOW MUCH WERE YOU DISTRESSED BY:

1.	Headaches	0	1	2	3	4
2.	Nervousness or shakiness inside	0	1	2	3	4
3.	Repeated unpleasant thoughts that won't leave your mind	0	1	2	3	4
4.	Faintness or dizziness	0	1	2	3	4
5.	Loss of sexual interest or pleasure	0	1	2	3	4
6.	Feeling critical of others	0	1	2	3	4
7.	The idea that someone else can control your thoughts	0	1	2	3	4
8.	Feeling others are to blame for most of your trouble	0	1	2	3	4

9.	Trouble remembering things	0	1	2	3	4
10.	Worried about sloppiness or carelessness	0	1	2	3	4
11.	Feeling easily annoyed or irritated	0	1	2	3	4
12.	Pains in heart or chest	0	1	2	3	4
13.	Feeling afraid in open spaces or on the streets	0	1	2	3	4
14.	Feeling low in energy or slowed down	0	1	2	3	4
15.	Thoughts of ending your life	0	1	2	3	4
16.	Hearing voices that other people do not hear	0	1	2	3	4
17.	Trembling	0	1	2	3	4
18.	Feeling that most people cannot be trusted	0	1	2	3	4
19.	Poor appetite	0	1	2	3	4
20.	Crying easily	0	1	2	3	4
21.	Feeling shy or uneasy with the opposite sex	0	1	2	3	4
22.	Feelings of being trapped or caught	0	1	2	3	4
23.	Suddenly scared for no reason	0	1	2	3	4
24.	Temper outbursts that you could not control	0	1	2	3	4
25.	Feeling afraid to go out of your house alone	0	1	2	3	4
26.	Blaming yourself for things	0	1	2	3	4
27.	Pains in lower back	0	1	2	3	4
28.	Feeling blocked in getting things done	0	1	2	3	4
29.	Feeling lonely	0	1	2	3	4

30.	Feeling blue	0	1	2	3	4
31.	Worrying too much about things	0	1	2	3	4
32.	Feeling no interest in things	0	1	2	3	4
33.	Feeling fearful	0	1	2	3	4
34.	Your feelings being easily hurt	0	1	2	3	4
35.	Other people being aware of your private thoughts	0	1	2	3	4
36.	Feeling others do not understand you or are unsympathetic	0	1	2	3	4
37.	Feeling that people are unfriendly or dislike you	0	1	2	3	4
38.	Having to do things very slowly to insure correctness	0	1	2	3	4
39.	Heart pounding or racing	0	1	2	3	4
40.	Nausea or upset stomach	0	1	2	3	4
41.	Feeling inferior to others	0	1	2	3	4
42.	Soreness of your muscles	0	1	2	3	4
43.	Feeling that you are watched or talked about by others	0	1	2	3	4
44.	Trouble falling asleep	0	1	2	3	4
45.	Having to check and double-check what you do	0	1	2	3	4
46.	Difficulty making decisions	0	1	2	3	4
47.	Feeling afraid to travel on buses, subways, or trains	0	1	2	3	4
48.	Trouble getting your breath	0	1	2	3	4
49.	Hot or cold spells	0	1	2	3	4
50.	Having to avoid certain things, places, or activities because they	0	1	2	3	4

	frighten you					
51.	Your mind going blank	0	1	2	3	4
52.	Numbness or tingling in parts of your body	0	1	2	3	4
53.	A lump in your throat	0	1	2	3	4
54.	Feeling hopeless about the future	0	1	2	3	4
55.	Trouble concentrating	0	1	2	3	4
56.	Feeling weak in parts of your body	0	1	2	3	4
57.	Feeling tense or keyed up	0	1	2	3	4
58.	Heavy feelings in your arms or legs	0	1	2	3	4
59.	Thoughts of death or dying	0	1	2	3	4
60.	Overeating	0	1	2	3	4
61.	Feeling uneasy when people are watching or talking about you	0	1	2	3	4
62.	Having thoughts that are not your own	0	1	2	3	4
63.	Having urges to beat, injure, or harm someone	0	1	2	3	4
64.	Awakening in the early morning	0	1	2	3	4
65.	Having to repeat the same actions such as touching, counting, or washing	0	1	2	3	4
66.	Sleep that is restless or disturbed	0	1	2	3	4
67.	Having urges to break or smash things	0	1	2	3	4
68.	Having ideas or beliefs that others do not share	0	1	2	3	4
69.	Feeling very self-conscious with others	0	1	2	3	4

70.	Feeling uneasy in crowds, such as shopping or at a movie	0	1	2	3	4
71.	Feeling everything is an effort	0	1	2	3	4
72.	Spells of terror panic	0	1	2	3	4
73.	Feeling uncomfortable about eating or drinking in public	0	1	2	3	4
74.	Getting into frequent arguments	0	1	2	3	4
75.	Feeling nervous when you are left alone	0	1	2	3	4
76.	Others not giving you proper credit for your achievements	0	1	2	3	4
77.	Feeling lonely even when you are with people	0	1	2	3	4
78.	Feeling so restless you couldn't sit still	0	1	2	3	4
79.	Feelings of worthlessness	0	1	2	3	4
80.	The feeling that something bad is going to happen to you	0	1	2	3	4
81.	Shouting or throwing things	0	1	2	3	4
82.	Feeling afraid you will faint in public	0	1	2	3	4
83.	Feeling that people will take advantage of you if you let them	0	1	2	3	4
84.	Having thoughts about sex that bother you a lot	0	1	2	3	4
85.	The idea that you should be punished for your sins	0	1	2	3	4
86.	Thoughts and images of a frightening nature	0	1	2	3	4
87.	The idea that something serious is wrong with your body	0	1	2	3	4
88.	Never feeling close to another person	0	1	2	3	4
89.	Feelings of guilt	0	1	2	3	4
90.	The idea that something is wrong with your mind	0	1	2	3	4

Appendix I: Sociocultural Attitudes Towards Appearance Questionnaire

Directions: Please read each of the following items carefully and indicate the number that best reflects your agreement with the statement.

Definitely Disagree = 1

Mostly Disagree = 2

Neither Agree Nor Disagree = 3

Mostly Agree = 4

Definitely Agree = 5

1. It is important for me to look athletic.	1 2 3 4 5
2. I think a lot about looking muscular.	1 2 3 4 5
3. I want my body to look very thin.	1 2 3 4 5
4. I want my body to look like it had little fat.	1 2 3 4 5
5. I think a lot about looking thin.	1 2 3 4 5
6. I spend a lot of time doing things to look more athletic.	1 2 3 4 5
7. I think a lot about looking athletic.	1 2 3 4 5
8. I want my body to look very lean.	1 2 3 4 5
9. I think a lot about having very little body fat	1 2 3 4 5
10. I spend a lot of time doing things to look more muscular.	1 2 3 4 5

Answer the following questions with relevance to your FAMILY (include parents, brothers, sisters, relatives):

11. I feel pressure from family members to look thinner.	1 2 3 4 5
12. I feel pressure from family members to improve my appearance.	1 2 3 4 5
13. Family members encourage me to decrease my level of body fat.	1 2 3 4 5
14. Family members encourage me to get in better shape.	1 2 3 4 5

Answer the following questions with relevance to your PEERS (include close friends, classmates, and other social contacts):

15. My peers encourage me to get thinner.	1 2 3 4 5
16. I feel pressure from my peers to improve my appearance.	1 2 3 4 5
17. I feel pressure from my peers to look in better shape.	1 2 3 4 5
18. I get pressure from my peers to decrease my level of body fat	1 2 3 4 5

Answer the following questions with relevance to the MEDIA (include television, magazines, the internet, movies, billboards, and advertisements):

19. I feel pressure from the media to look in better shape.	1 2 3 4 5
20. I feel pressure from the media to look thinner.	1 2 3 4 5
21. I feel pressure from the media to improve my appearance.	1 2 3 4 5

22. I feel pressure from the media to decrease my level of body fat. 1 2 3 4 5

Appendix J: Drive for Muscularity Scale

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

1	2	3	4	5	6
Always	Very Often	Often	Sometimes	Rarely	Never

1. I wish that I were more muscular.	1	2	3	4	5	6
2. I lift weights to build up muscle.	1	2	3	4	5	6
3. I use protein or energy supplements.	1	2	3	4	5	6
4. I drink weight gain or protein shakes.	1	2	3	4	5	6
5. I try to consume as many calories as I can in a day.	1	2	3	4	5	6
6. I feel guilty if I miss a weight training session.	1	2	3	4	5	6
7. I think I would feel more confident if I had more muscle mass.	1	2	3	4	5	6
8. Other people think I work out with weights too often.	1	2	3	4	5	6
9. I think that I would look better if I gained 10 pounds in bulk.	1	2	3	4	5	6
10. I think about taking anabolic steroids.	1	2	3	4	5	6
11. I think that I would feel stronger if I gained a little more muscle mass.	1	2	3	4	5	6
12. I think that my weight training schedule interferes with other aspects of my life.	1	2	3	4	5	6
13. I think that my arms are not muscular enough.	1	2	3	4	5	6
14. I think that my chest is not muscular enough.	1	2	3	4	5	6
15. I think that my legs are not muscular enough.	1	2	3	4	5	6

Appendix K: Muscle Dysmorphia Inventory

INSTRUCTIONS

This scale measures a variety of attitudes, feelings, and behaviors. Read each item (1-27) carefully and then indicate the degree to which the item is characteristic or true of you by circling the appropriate number corresponding to each statement. There are no right or wrong answers so please respond as honestly as possible. The anonymity of your responses is guaranteed.

	Never	Rarely	Sometimes	Often	Usually	Always
1. I regulate my caloric intake to maximize muscle development.	1	2	3	4	5	6
2. Before a workout, I consume energy supplements.	1	2	3	4	5	6
3. I maintain a strict workout schedule.	1	2	3	4	5	6
4. I monitor my diet closely to limit my fat intake.	1	2	3	4	5	6
5. I wear bulky clothing to hide my muscular physique from others.	1	2	3	4	5	6
6. I am concerned with losing muscle mass.	1	2	3	4	5	6
7. I use supplements to help me recuperate from strenuous workouts.	1	2	3	4	5	6
8. I control the intake of proteins, carbohydrates, and fats to maximize my muscular development.	1	2	3	4	5	6
9. I use supplements to increase my lifting performance.	1	2	3	4	5	6
10. My workouts are designed to develop the maximum amount of muscle mass.	1	2	3	4	5	6
11. I am preoccupied that I look small.	1	2	3	4	5	6
12. I use nutritional supplements to help me train through injuries.	1	2	3	4	5	6
13. It bothers me to miss a scheduled workout.	1	2	3	4	5	6
14. I prefer to work out when no one else can see me.	1	2	3	4	5	6
15. Developing large muscle mass is important to me.	1	2	3	4	5	6
16. My diet is regimented to the point that I eat the same foods several days in a row.	1	2	3	4	5	6
17. I will benefit from having large muscles.	1	2	3	4	5	6

Go on to next page

	Never	Rarely	Sometimes	Often	Usually	Always
18. I have a hard time taking a scheduled day off from training.	1	2	3	4	5	6
19. I avoid foods high in sodium.	1	2	3	4	5	6
20. I am preoccupied with a desire to be larger.	1	2	3	4	5	6
21. I avoid situations where other weightlifters may see my muscle development.	1	2	3	4	5	6
22. I wear clothes that help conceal the size of my physique.	1	2	3	4	5	6
23. It is important that other weight trainers see how muscular I am.	1	2	3	4	5	6
24. I would rather keep others from seeing my level of muscle development.	1	2	3	4	5	6
25. I use steroids.	1	2	3	4	5	6
26. I use laxatives.	1	2	3	4	5	6
27. I use diuretics.	1	2	3	4	5	6

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Permission to use the BCS

Beau

Hi, see our website below. You have my permission. Not sure how to assist you in contacting Drs. Grieve and Cafri, I would simply cite their work, not sure you need permission, really, as long as you cite them correctly.

Kevin

https://sites.google.com/site/bodyimageresearchgroup/

Permissions to use the SATAQ-4

Beau

It's still under revision, but feel free to use it, it's already been validated in many samples, one in press at Int. J of Eating Disorders. Stay in touch with me for further information in the coming months.

Kevin

Permission to use the MDI

Dear Mr. Diehl,

Thank you for contacting me regarding use of the Muscle Dysmorphia Inventory (MDI) for your dissertation research. Please consider this email as my written consent for you to use this instrument in your research. I appreciate your asking. I have attached both the instrument and the scoring key, and give you my best on the success of your research.

CL

Chris Lantz, Ed.D.

Permission to use the DMS

Beau, thanks for your email. Please let your IRB know that I am happy to have you use my Drive for Muscularity Scale in your research -- and thanks for the overview of what you are planning on doing. You have identified an interesting population and I'd be curious to see how your results turn out.

Best of luck with your doctorate.

Don

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