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EXAMINING THE RELATIONSHIP BETWEEN TRAINING ENVIRONMENT AND
MUSCLE DYSMORPHIA SYMPTOMS

A Thesis
Presented to
The Faculty of the School of Kinesiology, Recreation, and Sport
Western Kentucky University
Bowling Green, Kentucky

In Partial Fulfillment
Of the Requirements for the Degree
Master of Science

By
Michelle Bubnis

May 2016

EXAMINING THE RELATIONSHIP BETWEEN TRAINING ENVIRONMENT AND
MUSCLE DYSMORPHIA SYMPTOMS

Date Recommended 4/22/16


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 4/25/16
Dean, Graduate Studies and Research Date

I dedicate this thesis and all future endeavors to God who ignited a fire within me to take back my mental and physical health after many years of struggling with poor body image and obesity. I would not be the woman I am today had I not asked for Him to change me so that I may glorify Him as a wife, sister, and daughter.

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EXAMINING THE RELATIONSHIP BETWEEN TRAINING ENVIRONMENT AND MUSCLE DYSMORPHIA SYMPTOMS

Michelle Bubnis

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Directed by: K. Jason Crandall, Mark Schafer, and Frederick Grieve

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Muscle Dysmorphia (MD) is characterized by preoccupation with muscularity. Although there is a growing body of research concerning MD, there is a lack of research concerning the potential role exercise training environment has on the clinical features of MD. The purpose of this study was to compare MD symptomology in traditional strength-trained (TRAD) individuals to individuals training in communal high intensity functional training environments (HIFT). Participants were recruited from both types of facilities. Participants (N=376) completed online (Qualtrics) demographics survey and Muscle Dysmorphia Inventory (MDI). One-way ANOVA compared the effect of training environment on MDI scores among HIFT, TRAD, both HIFT and TRAD (BOTH), home gym (HOME), and "OTHER." Training environment significantly affected MDI for the 5 environments [$F(4, 345) = 3.765, p = .005, d = 0.737$]. Mean score for TRAD ($M = 111.73, SD = 20.39, [107.78, 115.68]$) was significantly higher than HIFT ($M = 102.20, SD = 19.59, [99.17, 105.23]$). MDI for BOTH ($M = 107.06, SD = 18.01, [100.77, 113.34]$), HOME ($M = 108.89, SD = 22.80, [99.86, 117.90]$), and OTHER condition ($M = 108.19, SD = 22.43, [97.97, 118.40]$) did not significantly differ from HIFT or TRAD. Results suggest training environment is correlated with levels of MD symptomology. Specifically, males and females with higher levels of MD symptoms prefer to train in a traditional training environment, which is potentially more conducive to facilitating and perpetuating MD symptomology. The results of this study provide

insight into the social physique anxiety associated with MD, as participants with higher levels of MD symptoms do not prefer to train in a HIFT environment where training occurs communally and other gym members provide extrinsic motivation. Additionally, the results of the present study further our understanding into the psychopathology of MD in that the motivating factors related to aesthetics (high level of body focus) associated with a TRAD environment take precedence over the motivating factors relating to self-improvement and the desire to increase functional fitness that is associated with a HIFT environment. Results may provide knowledge for creating optimal treatment programs for individuals with clinical MD.

Introduction

Sociocultural standards for attractiveness infiltrate nearly every area of popular media, constantly reinforcing in men and women the image of the ideal body. From an early age, boys and girls are groomed to strive for a particular body type, depending on media stereotypes (Benowitz-Fredericks, Massey, & Vasagar, 2012; Grieve, 2007; Pope, Olivardia, Gruber, & Borowieki, 1999; Tiggemann, Slater, & Smyth, 2014). For men, the ideal body is muscular—indicating power and success (Grossbard, Lee, Neighbors, & Larimer, 2009). From superheroes to action figures, the ideal male form has increased in muscularity to a point of unrealistic proportions (Pope, 1999), with boys as young as six reporting a strong preference for a more muscular physique (McCreary & Sasse, 2000). For women, the ideal body has been depicted in magazine advertisements and models on the runway as skeletal and emaciated—an unachievable look for most. Findings by Bissell and Zhou (2004) show a direct correlation between frequency of viewing the thin media ideals and higher levels of body dissatisfaction. Although most Western women tend to score high on the Drive for Thinness Scale, several qualitative studies indicate that many female bodybuilders show similar body image concerns as men, including drive for muscularity (McCreary & Sasse, 2000; Thompson, Heinberg, Altabe, & Tantleff-Dunn, 1999). Further, recent research concerning body image concerns among female bodybuilders recruited from the “Arnold Sports Festival” held in 2009 in Columbus, OH indicate that expert and novice female bodybuilders scored significantly higher than fitness lifters on scales concerning supplement use, dietary behavior, exercise dependence, and size symmetry (Hale, Diehl, Weaver, & Briggs, 2013).

The desire to attain the ideal level of attractiveness can manifest in internalization, or behavior modification in attempt to achieve set societal norms, which is a risk factor for the development of negative attitudes toward food and body perception (Benowitz-Fredricks, 2012; Thompson & Stice, 2001). For both men and women, behavioral modifications such as excessive diet, restricting meals, and bingeing and purging can lead to the growing problem of eating disorders (Benowitz-Fredricks, 2012; Grieve, 2007; Levine & Harrison, 2004). The National Eating Disorder Association (NEDA) reports that, in the United States, 30 million individuals suffer from clinically significant eating disorders such as anorexia nervosa, bulimia nervosa, or an eating disorder not otherwise specified (NEDA, 2015). Although eating disorders were once thought to be more common in women, male body image research suggests an increasing prevalence of eating disorders among men (Frederick et al., 2007; Garner, 1997; Olivardia, Pope, & Hudson, 2000). With the increasing societal and internal pressure to achieve the ideal physique, certain individuals present a debilitating preoccupation with body image that has given way to disorders such as Body Dysmorphic Disorder and Muscle Dysmorphia.

Body Dysmorphic Disorder

Individuals with Body Dysmorphic Disorder are repulsed by a physical flaw in their appearance, either real or imagined, and spend many hours per day consumed with checking appearance in the mirror, camouflaging, or seeking reassurance from others (American Psychiatric Association, 2013). In a similar way to individuals with Obsessive Compulsive Disorder (OCD), the preoccupations are often intrusive, repetitive, distressing, and challenging to resist (Olivardia, Pope, & Hudson, 2000; Pope et al., 2005). These debilitating preoccupations have been found to affect both marital and

employment status as well, adding to an overall low quality of life, with high incidence of hospitalizations, suicidal ideation, and suicide attempts (Albertini & Phillips, 1999; Pope, Katz, & Hudson, 1993; Wilhelm, Phillips, Fama, Greenberg, & Steketee, 2011).

Several studies indicate that exercise may have a positive impact on body image (Depcik & Williams, 2004; Fisher & Thompson, 1994; Furnham, Titman, & Sleeman, 1994; McDonald & Thompson, 1992), and other studies show a positive correlation between exercise and a decrease in symptoms of depression (Doyme et al., 1987; Martinsen, Medhus, & Sandvik, 1985), a decrease in social physique anxiety (Williams & Cash, 2001), and an enhanced self-efficacy (Williams & Cash, 2001). A study on college women with disturbed body image investigated the effects of weight training on body satisfaction and found that more than one-third of those in the weight-training group, when compared to a control group, were no longer classified as having body-image disturbance after the study (Depcik & Williams, 2004). Body dissatisfaction, depression, social physique anxiety, and poor self-efficacy are all concepts closely related to the diagnostic criteria for Body Dysmorphic Disorder (BDD). Hence, the findings of past studies on body image and exercise suggest that strength training as a treatment for BDD is worth investigating.

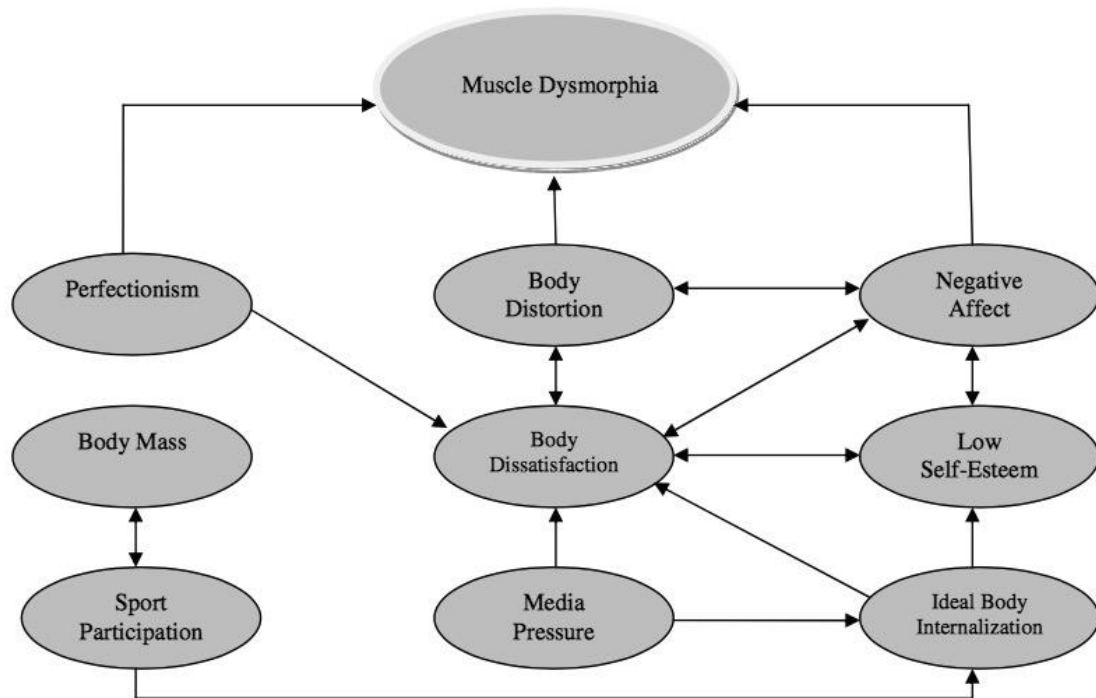
Muscle Dysmorphia

Muscle Dysmorphia is a subclass of BDD in which body image disturbance manifests in a person's preoccupation with the belief that one's muscular physique is too small, when in reality his or her physique is larger than their perception (Pope, Gruber, Choi, Olivardia, & Phillips, 1997; Pope, Phillips, & Olivardia, 2000). Pope and colleagues (1993) examined anabolic steroid use in male weight lifters and found that

many of the participants had a debilitating preoccupation with muscularity. Coining the syndrome as “reverse anorexia,” the researchers observed many similarities between the male weightlifters who had a preoccupation with muscularity and individuals with anorexia nervosa (Pope et al., 1993). Similarities between the two disorders include an individual having a preoccupation with his or her physique, high levels of distress and anxiety, desire to camouflage his or her physique in loose clothing, and participation in compulsive behaviors aimed at achieving the ideal body (Grieve, 2007; Maida & Armstrong, 2005; Olivardia, 2001). Although muscle dysmorphia has been predominantly explored in the male population, the disorder has been found to affect both men and women (Olivardia, 2001).

Underlying Factors of Muscle Dysmorphia

There is limited research exploring the factors that contribute to the onset of Muscle Dysmorphia. However, a conceptual model constructed by Grieve (2007) postulated that the development of Muscle Dysmorphia stems from a variety of factors, including socio-environmental (media portrayal of ideal body and sports participation), emotional (negative affect), psychological (body dissatisfaction, ideal body internalization, body distortion, perfectionism, self-esteem), and physiological factors (body mass) (see Figure 1).



From Grieve (2007). A conceptual model of factors contributing to the development of Muscle Dysmorphia. Adapted from *Eating Disorders*, 15, 63-80.

Criteria for Muscle Dysmorphia

Olivardia (2001) outlined the following diagnostic criteria for Muscle Dysmorphia. First, the individual must have a preoccupation with the notion that his or her physique is insufficiently muscular and lean. Second, two of the four following criteria must be established: (a) the individual regularly forfeits social, occupational and/or recreational activities due to the compulsive need to maintain his or her training and dietary schedule; (b) the individual avoids situations in which his or her body is exposed to others, and if avoidance is not possible the individual experiences significant anxiety and distress; (c) the preoccupation about the inadequacy of body size causes clinically significant distress or impairment in social, occupational, or other important

areas of life; (d) the individual spends an excessive amount of time devoted to working out, criticizing his or her diet, or uses performance enhancers despite being informed of potential harms associated with the use of the performance enhancing drug. Lastly, the primary focus of the preoccupation cannot be better accounted for by another disorder (Olivardia, 2001).

Training Environment and Muscle Dysmorphia

Although individuals who strength train regularly may have a certain level of drive for muscularity, the research surrounding Muscle Dysmorphia focuses on the extreme end of the continuum where the preoccupation with achieving a muscular physique becomes unhealthy and pathological (Thompson & Cafri, 2007). The current literature on Muscle Dysmorphia is largely comprised of individuals who train in a traditional training environment in order to carry out a bodybuilding regimen associated with the specific goal of achieving substantial increases in musculature. Hence, to better understand Muscle Dysmorphia and its associated psychopathology, it is important to postulate how a traditional training environment feeds into the facilitation of Muscle Dysmorphia symptomology—specifically, the high levels of body focus, obsessive compulsions, and social physique anxiety associated with Muscle Dysmorphia.

A traditional gym accommodates a typical bodybuilding, strength, or resistance program that focuses on isolating particular muscle groups and manipulating variables such as training frequency, intensity, and volume to achieve muscle hypertrophy and growth (Narici, Roi, Landoni, Minetti, & Cerretelli, 1989). This type of programming is specifically designed to add muscle mass onto an individual's frame with symmetrical presentation and aesthetics in mind, similar to that of a sculptor working on a

masterpiece. Training a specific muscle group toward the predetermined goal of hypertrophy reinforces a high level of body focus to an individual with Muscle Dysmorphia, a training focus that feeds into Muscle Dysmorphia psychopathology.

A common obsessive compulsion exhibited by individuals with MD is excessive mirror-checking and constant critique of his or her physique (Chandler, Grieve, Derryberry, & Pegg, 2009; Olivardia, 2001). Chandler and colleagues (2009) found that obsessive-compulsive features are highly correlated with several factors related to Muscle Dysmorphia, including high level of body focus, increased social physique anxiety, and debilitating preoccupation with a focus on increased muscularity. A traditional training environment is typically lined with mirrors to check for correct form and physique symmetry, but an individual with Muscle Dysmorphia will have a compulsion to constantly check his or her reflection in the mirror to criticize and reinforce that they need to spend more time in the gym. Several studies indicate that male bodybuilders with Muscle Dysmorphia can typically exercise strictly and compulsively, sometimes skipping important functions in order to work out (Mossley, 2009; Pope et al., 1993; Pope, Phillips, & Olivardia, 2000). The recent trend adopted by traditional training environments is to provide 24-hour access, which can help perpetuate the urge and occurrence of excessive time in the gym for individuals suffering from Muscle Dysmorphia.

Social physique anxiety, a type of anxiety experienced when others observe or evaluate one's physique, is another core characteristic of Muscle Dysmorphia (Williams & Cash, 2001). Over the last 20 years, researchers have found that a significant amount of male bodybuilders hide their bodies—avoiding public places such as beaches, locker

rooms, and swimming pools for fear their physique would be criticized by others (Olivardia, 2001; Pope et al., 1993; Thomas, Tod, Edwards, & McGuigan, 2014). A traditional weight room is conducive to individual training by the inherent layout of limited free weights, space, and machines. Additionally, 24-hour access provides the opportunity to work out at hours with little traffic. During times when avoidance is not possible, an individual with Muscle Dysmorphia may wear loose sweatshirts and/or experience extreme distress and anxiety, but continue the workout in order to gain desired musculature.

CrossFit™ and Muscle Dysmorphia

Although the current literature concerning Muscle Dysmorphia is comprised primarily of individuals who train in a traditional strength-training environment, it has yet to be elucidated whether individuals with Muscle Dysmorphia psychopathology prefer a particular training environment to another. In recent years, group high-intensity functional training (HIFT) facilities such as CrossFit™ have become a popular, nontraditional training environment that uses a barbell to combine aerobic and resistance exercises with a focus on functional movements (Smith, Sommer, Starkoff, & Devor, 2013). Despite the popularity of CrossFit™, there is a lack of knowledge concerning its potential behavioral and psychological effects on the population. For the current study, the marked differences in training environment between a traditional training environment and a CrossFit™ facility are of particular interest, as these differences could have contrasting implications for body image concerns related to Muscle Dysmorphia.

Instead of following a strict, high volume training program often implemented at a traditional gym, members of a CrossFit™ facility are given a workout of the day

(WOD). These workouts vary from day to day and merge powerlifting, gymnastics, Olympic lifting, and endurance activities (Weisenthal, Beck, Maloney, DeHaven, & Giordano, 2014). CrossFit™ defines its program as “constantly varied, high intensity functional movements” with the stated goal to improve fitness (Glassman, 2010). Often using a barbell, this program shifts the focus of training from aesthetics to functional fitness, leading to fitness gains such as an increased VO2 Max, metabolic capacity, and favorable changes in body composition (Smith et al., 2013). Additionally, a 2014 study evaluated differences in motivation between men and women in a CrossFit™ setting and found that individuals are motivated by either mastery (self-improvement) or performance (competitive drive) to continue a CrossFit™ program instead of the motivational factors related to aesthetics that are present in a typical weight room (Partridge, Knapp, & Massengale, 2014).

The unpredictability of the WOD is a more flexible way to increase fitness (Glassman, 2010). In recent studies, HIFT has been found to provide fitness and health improvements in less time per week than the current recommended exercise guidelines, which is counterintuitive to someone who is compulsive about the goals of the training program (such as someone with Muscle Dysmorphia) and the excessive amount of time it takes to achieve the desired musculature (Babraj, Vollaard, Keast, Guppy, Cottrell, & Timmons, 2009; Burgomaster, Howarth, Phillips, Rakobowchuk, MacDonald, McGee, & Gibala, 2008). Additionally, unlike a traditional gym, most CrossFit™ facilities are mirror-free to instill a focus on what proper form and functionality feels like to the athlete, making the CrossFit™ training environment non-conducive to obsessive compulsions such as mirror-checking.

Rather than having a focus on individual training, HIFT environments such as a CrossFit™ facility are often conducted in an open space with a focus on communal workouts, personal instruction, form critique, and encouragement from other members in order to give a motivational push to those who are training (Glassman, 2010).

Considering the likely increased incidence of social physique anxiety, it appears a CrossFit™ training environment would not be preferred by an individual suffering from Muscle Dysmorphia.

Limitations of the Current Research and the Present Study

Although there is a growing body of research concerning Muscle Dysmorphia, there is limited research concerning correlates of muscle dysmorphia, such as training environment. Research needs to be conducted to determine if men and women who display a high number of Muscle Dysmorphia symptoms prefer to train in an environment that is more conducive to the symptomology that supports the facilitation of Muscle Dysmorphia.

Focus of the Present Study

The aim of the present study was to examine cross-sectional associations of CrossFit™ and traditional strength training with multiple facets of body image issues related to Muscle Dysmorphia in a sample of men and women with subclinical levels of Muscle Dysmorphia symptoms. The specific hypothesis being examined in the present study is that men and women with higher scores on the MDQ will prefer to train at a traditional training environment rather than at a CrossFit™ box—a training environment that is potentially less conducive to facilitating and perpetuating Muscle Dysmorphia symptomology.

Method

Participants

Emails were sent to the managers of three CrossFit™ facilities and five traditional facilities in South Central Kentucky asking for a list of members to contact for a study on weightlifting and body image. The link to the survey was also placed on CrossFit™ group pages and weightlifting group pages on social media. Participants were 376 men ($N = 84$) and women ($N = 292$), aged 33.7 ± 8.6 years old, who met the inclusion criteria of participating in weight training for a period of six months or more, at least four times per week. This frequency of workouts reflected an amount of training associated with the pursuit of increased musculature (ACSM, 2009). Although participants did not have to participate exclusively in weight training, individuals who reported a preference for endurance training were thanked for participating and were directed to the end of the survey, as individuals with the desire to increase musculature were the focus of the study. In effort to fully explore any relationship between training environment and Muscle Dysmorphia, participants were prompted to select a preferred training environment from a variety of training environments including traditional gym (TRAD), cross-fit (HIFT), both ST and CF (BOTH), home gym (HOME), or other (OTHER). Because individuals with Muscle Dysmorphia hold a firm belief they have insufficient musculature (Pope et al., 1997), it is expected that many do not seek professional help. Hence, for the present explorative study, individuals did not have to be clinically diagnosed in order to be included in the study. Refer to Table 1 for demographic characteristics of the participants organized by training environment.

Table 1

Demographic Characteristics of Participants

Characteristic	ST	CF	ST/CF	Home	Other
Age (yrs.)	30.71±7.57	36.07±9.07	30.62±6.39	32.33±7.39	37.04±8.63
Height (in.)	65.99±4.23	66.77±3.89	66.39±4.20	66.81±3.03	66.58±3.03
Weight (lbs.)	159.92±33.19	169.91±36.67	174.55±39.54	167.33±47.79	164.78±29.80
BMI	25.77±4.45	26.70±4.99	27.73±5.59	26.19±6.39	26.05±4.02

Note. BMI is the body mass index of the participant.

ST = Traditional Strength Training; CF = CrossFit™ ST/CF=Both

Measures

The 376 participants completed the following online assessments (Qualtrics Survey Software) chosen to reflect Muscle Dysmorphia psychopathology.

Demographics: Each participant completed a demographics survey. Participants reported their age, gender, height, weight, and typical weekly workout schedule including type of training and frequency of training (See Appendix A)

Muscular Dysmorphia Questionnaire (MDQ): Grieve and colleagues (2012) established the psychometric properties of the MDQ—a 34-item inventory used to assess factors of Muscle Dysmorphia, including body anxiety, compulsivity, illusory correlations, inadequacy, inappropriate eating, increased muscularity, muscularity drive, persistence, preoccupation, and social sacrifice. The answers are on a six-point Likert-type scale ranging from 1 (*Strongly Disagree*) to 6 (*Strongly Agree*). Higher scores are associated with higher levels of Muscle Dysmorphia symptoms. The MDQ has a Cronbach’s alpha of .87 (Short, 2005), which indicates good internal consistency. The

MDQ has been shown to have a high level of test-retest reliability, $r = .59$ (Cubberely, 2009). The MDQ for this study had a Cronbach's alpha of .86, indicating good internal consistency. The MDQ has good concurrent validity, while demonstrating poor predictive validity (Cubberely, 2009). (See Appendix B)

Procedure

The present study was a cross-sectional design. Data were collected via an online survey and managed using Qualtrics Survey Software hosted at Western Kentucky University. Participants recruited for the study were prompted to read and accept the informed consent approved by the University Institutional Review Board. Participants were unable to proceed with the survey unless they accepted the informed consent. The participants were asked to complete a demographics survey, and only those who reported participating in at least four weightlifting workouts per week for the last six months were allowed to participate in the study. If unable to meet this criterion, participants were thanked for their interest, informed they did not meet the study criteria, and unable to proceed with the Qualtrics survey. The remaining participants completed the MDQ. This procedure was completed online, taking the participants approximately 10 minutes to complete.

Results

Preliminary Analysis

Cronbach's alpha was calculated for the 34-item MDQ to ensure internal consistency ($\alpha = .86$). The MDQ yielded scores for ten subscales: Inadequacy, Illusory Correlations, Inappropriate Eating, Preoccupation, Muscularity Drive, Increased Muscularity, Compulsivity, Body Anxiety, Social Sacrifice, and Persistence. The subscale scores were then summed to create a total MDQ score as a measure of Muscle Dysmorphia symptomology ($M = 106.00$, $SD = 20.44$) with scores ranging from 51 to 176 (See Table 2).

Table 2

Means and Standard Deviations for MDQ

Subscale	M	SD
Body Anxiety	9.07	2.14
Compulsivity	13.42	3.42
Illusory Correlations	4.66	2.49
Inadequacy	14.06	5.90
Inappropriate Eating	14.12	4.31
Increased Muscularity	14.81	2.94
Muscularity Drive	14.22	4.28
Persistence	10.44	3.56
Preoccupation	6.49	3.41
Social Sacrifice	4.58	2.36

Hypothesis Testing

A one-way ANOVA compared effect of training environment on MDQ scores among HIFT, traditional strength training facilities (TRAD), both HIFT and traditional facilities (BOTH), home gym (HOME), and gym environments reported as “other” (OTHER). There was a significant effect of training environment on MDQ for the five environments [$F(4, 345) = 3.765, p = .005, \eta_p^2 = .0418$] (See Table 3). Bonferroni post hoc comparisons indicated the mean score for TRAD ($M = 111.73, SD = 20.39, 95\% CI [107.78, 115.68]$) was significantly higher than HIFT ($M = 102.20, SD = 19.59, 95\% CI [99.17, 105.23]$). However, the total MDQ score for BOTH ($M = 107.06, SD = 18.01, 95\% CI [100.77, 113.34]$), HOME ($M = 108.89, SD = 22.80, 95\% CI [99.86, 117.90]$), and OTHER conditions ($M = 108.19, SD = 22.43, 95\% CI [97.97, 118.40]$) did not significantly differ from the HIFT or TRAD (See Table 4). Data analyses were performed using IBM SPSS software version 21.

Table 3

Significant Differences on MDQ Scores When Analyzed by Training Environment

	Sum of Squares	df	Mean Square	F	Sig.	η_p^2
Between Groups	6099.53	4	1524.88	3.765	.005**	.0418
Within Groups	139719.22	345	404.98			
Total	145818.75	349				

Note. MDQ = Muscle Dysmorphia Questionnaire

** $p < .01$

Table 4

Bonferroni Post Hoc Multiple Comparisons by Training Environment

TE	TE	Mean	SE	Sig.	95% CI	
					LL	UL
HIFT	TRAD	-9.52	2.51	.002**	-16.63	-2.41
	BOTH	-4.85	3.79	1.00	-15.56	5.86
	HOME	-6.68	4.18	1.00	-18.49	5.10
	OTHER	-5.98	4.66	1.00	-19.16	7.19
TRAD	HIFT	9.52	2.51	.002**	2.41	16.63
	BOTH	3.97	1.00	-6.54	15.89	4.67
	HOME	2.84	4.34	1.00	-9.42	15.11
	OTHER	3.54	4.81	1.00	-10.04	17.13
BOTH	HIFT	4.85	3.79	1.00	-5.86	15.56
	BOTH	-4.67	3.97	1.00	-15.89	6.54
	HOME	-1.83	5.18	1.00	-16.48	12.82
	OTHER	-1.13	5.58	1.00	-16.91	14.64
HOME	HIFT	6.68	4.18	1.00	-5.13	18.49
	TRAD	4.34	1.00	-15.11	9.42	2.84
	BOTH	1.83	5.18	1.00	-16.48	16.48
	OTHER	.69	5.85	1.00	-15.84	17.24
OTHER	HIFT	5.98	4.66	1.00	-7.19	19.16
	TRAD	-3.54	4.81	1.00	-17.13	10.04
	BOTH	1.13	5.58	1.00	-14.64	16.91
	HOME	-.69	5.85	1.00	-17.24	15.84

Note. CI = Confidence Interval, LL = Lower Limit, UL = Upper Limit, HIFT = High Intensity Functional Training, TRAD = Traditional Strength Training, BOTH = High Intensity Functional Training and Traditional Strength Training, OTHER = Other
 ** p < .01

Discussion

The present study aimed to examine cross-sectional associations of CrossFit™ and traditional strength training with multiple facets of body image issues related to Muscle Dysmorphia in a sample of men and women with subclinical Muscle Dysmorphia. The results of this study suggest a correlation exists between training environment and levels of Muscle Dysmorphia symptomology. Specifically, males and females with higher levels of Muscle Dysmorphia symptoms prefer to train in a traditional training environment, which is potentially more conducive to facilitating and perpetuating the symptomology associated with the disorder. The results of this study provide insight into the social physique anxiety associated with Muscle Dysmorphia, as participants with higher levels of Muscle Dysmorphia symptoms do not prefer to train in a HIFT environment where training occurs communally and other gym members provide extrinsic motivation. Additionally, the results of this study further our understanding into the psychopathology of Muscle Dysmorphia. Seemingly, the motivating factors related to aesthetics (high level of body focus) potentially associated with a traditional environment take precedence over the motivating factors relating to self-improvement and increasing functional fitness that is potentially associated with a HIFT training environment.

There are limitations to the current study. The MDQ, which was used to collect the data for this study, is a self-report questionnaire. Although Schwarz and colleagues (1999) found that self-report measures could be valid research tools when participants answer questions honestly, it is possible that participants could have difficulty understanding questions, misread questions, or deliberately answered the questions dishonestly. This limitation was accounted for in the design of the anonymous online

survey. This allowed the participants to answer questions both anonymously and in a secure and comfortable setting.

Furthermore, it is important to note that Vitousek and Hollon (1990) found that eating disorder symptoms are severely underreported when using self-report measures; however, the high scores yielded from the MDQ suggest that this was not the case in this study. Again, due to the sensitive nature of the questions on the MDQ, the survey was designed to be anonymous, online, as well as smart phone compatible. This helped to ensure the participant could answer the survey in an environment free from anxiety related to the sensitive material that comprised the survey. Additionally, participants were given the opportunity to withdraw from the study at any time.

The present study illustrates that training environment could potentially play an important role in the facilitation of the clinical features associated with Muscle Dysmorphia. Through these findings, it is relevant to ask whether or not a HIFT, or CrossFit™ environment could potentially address the contributing factors in the development of Muscle Dysmorphia previously postulated in Grieve's (2007) model. Specifically, a prominent factor in Grieve's model is that body dissatisfaction influences the onset of Muscle Dysmorphia, and media pressure, ideal body internalization, low self-esteem, negative affect, body distortion, and perfectionism are responsible for the increased body dissatisfaction associated with Muscle Dysmorphia. The media portrayal of the ideal body image for men is muscular—often synonymous with power and success (Grossbard et al., 2009). CrossFit™ founder, Greg Glassman, claims that CrossFit™ training is meant to bring about the fitness level and physique that nature would select for at an evolutionary level, and that this physique is specific to each individual who

undergoes CrossFit™ training. Reinforcement of this idea could lead to a decreased body dissatisfaction, as those who train in a CrossFit™ facility are trained to harness a unique, physically fit body for the use of optimal health and wellness instead of chasing the disproportioned, unrealistic media ideal. Further, in Grieve's model, negative affect acts as the motivational foundation for the behavioral symptoms associated with Muscle Dysmorphia (Grieve, 2007). Negative affect is represented by low self-esteem, body distortion, and other symptoms of Muscle Dysmorphia (Grieve, 2007). Individuals with Muscle Dysmorphia often set unrealistic goals in training, appearance, as well as diet, and if these goals are not met, then negative affect may increase.

The findings of the present study provide useful knowledge in the formation of optimal treatment programs and more favorable treatment outcomes in individuals with clinical Muscle Dysmorphia. There is currently a lack of research concerning Muscle Dysmorphia in women. Considering the high mean MDQ score of the current study, as well as taking into account that the majority of our sample were women ($n = 292$), it stands within reason that Muscle Dysmorphia symptoms are not absent in this population—warranting future research. Although HIFT has received much attention from researchers in recent years, future research regarding the potential physiological, cognitive, and psychological benefits of CrossFit™ training is worth investigating. Specifically, future research in the form of randomized experimental trials, needs to primarily focus on the effect training environment has on the facilitation of Muscle Dysmorphia symptomology.

Based on the findings of this study, there are a variety of changes that could be made to the traditional training environment that could potentially ameliorate Muscle

Dysmorphia symptoms in this population. The current study has many implications for personal trainers as well as traditional gym owners and operators. Many traditional gyms offer an introductory personal training session with new memberships in order to give the client an overview of how to use the weight machines, free weights, and cardio machines safely and effectively. Based on the findings of the current study, these sessions could also include short screenings in the form of questionnaires and/or observations with the aim to identify individuals with body image disturbances and tailor training sessions accordingly. Traditional training environments could also offer high intensity functional training classes in areas without mirrors where lifters are encouraged to lift communally and focus on personal improvements across a variety of fitness domains. Future research could focus on how these changes to the traditional training environment impact the levels of Muscle Dysmorphia symptoms in a clinical population.

Future experimental research could also seek to alleviate levels of Muscle Dysmorphia symptomology in a sample of the clinical population by implementing CrossFit™ training as an element to the existing multipronged approach to therapy. Although there is a lack of research concerning Muscle Dysmorphia treatment at present (Grieve, Truba, & Bowersox, 2009), several studies indicate that exercise can have a positive impact on body image (Depcik & Williams, 2003; Fisher & Thompson, 1994; Furnham et al., 1994) and social physique anxiety (Williams & Cash, 2001). If a CrossFit™ intervention could potentially shift the focus of training from aesthetics to functional fitness, while allowing for the patient to regularly exercise in a comfortable training environment, it is an approach worth investigating as it can lead to more

effective therapies for muscle dysmorphia with enhanced treatment outcomes for a clinical population.

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Appendix A
Demographics Survey

Demographics Survey

Please answer the following questions in an honest manner. DO NOT include your name or any other identifying information.

1. I am at least 18 years old. Y/N
2. Which type of exercise training do you prefer? Weight training or aerobic training
3. On average do you weight train at least 4 times per week without long periods of off training? Y/N
4. Have you weight trained for at least 6 months? Y/N
5. Where do you workout?
CrossFit™ Box, Traditional Gym, Both CrossFit™ Box and Traditional Gym, Home, Other
6. On average, how long does each of your weight training sessions last?
<30 minutes, 30-35 minutes, 45-60 minutes, 60-90 minutes, >90 minutes
7. Do you have a scheduled time to lift weights?
8. What time or times of day do you typically lift weights?
4-8 am, 8-12 pm, 12-4 pm, 4-8 pm, 8-12am, 12-4am
9. Do you ever lift weights multiple times per day? Y/N
10. On average, how many sessions per day?
11. Age: _____
12. Gender: M/F
13. Height (inches): _____
14. Weight (pounds): _____

Appendix B
Informed Consent

INFORMED CONSENT DOCUMENT

Project Title: The Effect of Training Environment on Exercise Motivation

Investigator: Michelle Bubnis. Department of Kinesiology, Recreation & Sport. (207) 691-0541

You are being asked to participate in a project conducted through Western Kentucky University. The University requires that you give your signed agreement to participate in this project.

The investigator will explain to you in detail the purpose of the project, the procedures to be used, and the potential benefits and possible risks of participation. You may ask him/her any questions you have to help you understand the project. A basic explanation of the project is written below. Please read this explanation and discuss with the researcher any questions you may have.

If you then decide to participate in the project, please accept this informed consent form and proceed to the survey.

1. Nature and Purpose of the Project: The aim of the present study is to examine the effect of training environment on motivation of exercise.

2. Explanation of Procedures: During participation you will be asked to complete a section about your age, ethnicity, height, weight, and workout schedule. Also, you will be asked to complete one short measure. This survey should take approximately 10-12 minutes to complete.

3. Discomfort and Risks: The risks to participation appear to be small. There is always a slight chance that any item could cause discomfort. Please know you can withdraw your participation at any time.

4. Benefits: Benefits include a sense of having contributed to science and a sense of accomplishment by providing data that will be beneficial to this area of study. Upon completion of the survey, participants will also have the option to be entered into a

drawing to receive a gift card. If participant chooses to enter the survey, they will be redirected to a separate survey to enter in contact information, which will not be connected, to their responses.

5. Confidentiality: Any information about you obtained from this research will be anonymous. Data will be collected via an online survey and managed using Qualtrics Survey Software hosted at Western Kentucky University.

6. Refusal/Withdrawal: Refusal to participate in this study will have no effect on any future services you may be entitled to from the University. Anyone who agrees to participate in this study is free to withdraw from the study at any time with no penalty.

You understand also that it is not possible to identify all potential risks in an experimental procedure, and you believe that reasonable safeguards have been taken to minimize both the known and potential but unknown risks.

THE DATED APPROVAL ON THIS CONSENT FORM INDICATES THAT
THIS PROJECT HAS BEEN REVIEWED AND APPROVED BY
THE WESTERN KENTUCKY UNIVERSITY INSTITUTIONAL REVIEW BOARD
Paul Mooney, Human Protections Administrator
TELEPHONE: (270) 745-2129

Appendix C
Recruitment Flyer

Enter for a chance to win a 25.00 Starbucks gift card!

Researchers at Western Kentucky University want to explore the effect of training environment on exercise motivation. This research study is for male and female weight lifters at least 18 years of age.

Research is always voluntary!

Would the study be a good fit for me?

This study might be good for you if:

- You have lifted weights for at least 6 months.
- You lift on average 4 days per week.
- You prefer weight training to aerobic training.

What do I have to do to participate?

- Visit the link below and take a brief survey!
- The survey takes approximately 10 minutes to complete.
- Survey is anonymous.

To take part in the study, please tear off a tab below with the link to the survey!

Appendix D
Muscle Dysmorphia Questionnaire (MDQ)

Muscle Dysmorphia Questionnaire

Instructions: Please respond to each of the following statements. Circle the response choice that best describes you.

	Strongly Disagree	Somewhat Disagree	Slightly Disagree	Slightly Agree	Somewhat Agree	Strongly Agree
1. When I see my reflection in the mirror or a window, I feel badly about my body size or shape	1	2	3	4	5	6
2. Working out causes problems in my job	1	2	3	4	5	6
3. I eat specific foods at specific times throughout the day in order to gain muscle mass	1	2	3	4	5	6
4. When I see muscular men, it makes me feel badly about my body shape or size	1	2	3	4	5	6
5. I am inclined to continue to work out when I am sick	1	2	3	4	5	6
6. I am ashamed of my body shape or size	1	2	3	4	5	6
7. I have difficulty maintaining relationships because of thoughts about my body	1	2	3	4	5	6
8. I am inclined to continue to work out when I am injured	1	2	3	4	5	6
9. I have difficulty maintaining relationships because of thoughts of working out	1	2	3	4	5	6
10. I believe bad things happen in my life when I do not have a specific level of muscularity	1	2	3	4	5	6
11. Working out causes problems in my romantic relationships	1	2	3	4	5	6

*12. I believe I am more muscular than others	1	2	3	4	5	6
13. I feel badly when I do not get to work out	1	2	3	4	5	6
14. I eat by myself	1	2	3	4	5	6
15. I am inclined to continue to work out against doctor's orders	1	2	3	4	5	6
*16. I am inclined to participate in activities that require wearing swimsuits	1	2	3	4	5	6
17. I do not believe I am as muscular as others	1	2	3	4	5	6
	Strongly Disagree	Somewhat Disagree	Slightly Disagree	Slightly Agree	Somewhat Agree	Strongly Agree
18. I want to be more muscular than I currently am	1	2	3	4	5	6
19. I think I look better when I have large muscles	1	2	3	4	5	6
20. Working out causes problems in my friendships	1	2	3	4	5	6
*21. I am muscular enough	1	2	3	4	5	6
22. If I could increase my muscle mass, I would	1	2	3	4	5	6
23. I have difficulty focusing on schoolwork because of thoughts about my body	1	2	3	4	5	6
24. I am not muscular enough	1	2	3	4	5	6
25. Others feel that I am way too focused on my body shape or size	1	2	3	4	5	6
26. I have difficulty focusing on schoolwork because of thoughts of working out	1	2	3	4	5	6
27. I feel insecure about my body	1	2	3	4	5	6

28. I use legal or illegal supplements (creatine or anabolic steroids) to help develop my muscles	1	2	3	4	5	6
29. I am inclined to participate in activities that require minimal clothing	1	2	3	4	5	6
30. The less clothing I wear, the more anxious I become	1	2	3	4	5	6
31. I eat a large amount of protein in order to increase my muscularity	1	2	3	4	5	6
32. I feel anxious when I deviate from my diet	1	2	3	4	5	6
33. I believe bad things happen to me when I do not keep my workout schedule	1	2	3	4	5	6
34. I feel anxious when I miss a workout	1	2	3	4	5	6