Acute Effects of Low Intensity Resistance Exercise on State Body Image and Affective States in Men with and without Symptoms of Muscle Dysmorphia

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Abstract

Background: A hallmark characteristic of people with muscle dysmorphia (MD) is daily bouts of vigorous resistance exercise (RE). Moreover, these people experience significant tension and distress when forced to miss (i.e., deprivation) or change the structure of (i.e., deviation) of a planned RE session. However, little research has empirically tested these responses, and none has compared them to people without MD.

Methods: Young-adult men (n=20) were separated into an MD group (n=10) and non-MD group (n=10) based on their responses to an MD assessment. Participants first completed a 10-repetition maximum (10-RM) strength test on four exercises and then after at least 48-hours of no RE (i.e., deprivation), completed acute bout of low-intensity RE (50% of 10-RM) (i.e., deviation). State body image was assessed before and after RE while affective valence and psychological arousal were assessed before, during, and after RE and plotted on the circumplex model of affect.

Results: As hypothesized, men in the non-MD group had a more favorable body image response relative to men in the MD group. As evidenced by the circumplex model, men in the non-MD group also had a more pleasurable affective response during and after the session relative to the MD group who experienced more displeasure throughout the session.

Conclusion: Overall, even in a small sample size it appears that even after a period of RE deprivation, low intensity RE had very little therapeutic effect for men in the MD group.

Registration:

Keywords:

Male body image; muscle dysmorphia; resistance exercise; body image; mental health

INTRODUCTION

Resistance exercise (RE), like other forms of exercise, is effective for most people to regulate mental health [1-3]. Most people prefer moderate intensities of exercise, but “some like

it vigorous" [4]. Typically, this is thought to vary randomly across the population; however, there are some groups that have an affinity for vigorous exercise, such as those with muscle dysmorphia (MD) [5, 6].

MD is characterized by a pathological preoccupation with a perceived lack of muscle size [7, 8] and predominately affects men [9]. MD is associated with compulsive and excessive RE [8, 10] with some reports suggesting that these men perform vigorous RE bouts for up to 3 hours a day [11], and when forced to miss (i.e., deprivation) or change the structure of (i.e., deviation) of a planned RE session, experience distress and tension [12]. A mechanism that likely reinforces vigorous RE behaviors is the acute physiological feedback (i.e., muscular strain) and temporary changes in muscle size (i.e., from temporary muscle swelling), or the "muscle pump" [13]. These acute changes in muscle size may act as experiential evidence that one's body is moving towards their ideal [13]. In fact, results from another study demonstrated that men with MD symptoms perceived their muscle size to be greater following high intensity RE compared to moderate intensity [6].

Only one study to date has compared how men with MD symptoms acutely respond to exercise deprivation (i.e., rest day) compared to a training day and found body image to be worse after the rest day [14]. Another study found that after RE, and not cycling and reading, men with MD symptoms perceived their muscularity to increase [13]. The purpose of this study is to build upon these earlier studies and explore the acute effects of low-intensity RE (50% of 10-RM; deviation) on state body image and affective states in men with MD symptoms compared to a control condition of men without MD symptoms following a brief deprivation state (i.e., no RE for 48 hours prior to the study session). We hypothesized that men with MD symptoms would have a less favorable body image and affective response to the RE compared to men without MD symptoms.

METHODS

Experimental Approach to the Problem

Subjects

Young-adult men (18-35 years; n=20) were separated into an MD group (n=10) and non-MD group (n=10) based on their responses to an MD assessment [8]. Men were currently performing RE for ≥3 days per week for >45 minutes each time, and had no medical contraindication to RE [15].

Procedures

Participants were recruited through flyers in local fitness centers and instructed to call a study phone number to be screened. Those who were preliminarily eligible were scheduled for their first of three onsite sessions.

At Session 1, participants were orientated to the study's procedures and risks and provided written informed consent. Eligibility was then reassessed to ensure participants remained eligible, and Session 2 was scheduled.

At Session 2, participants completed a series of 10-RM muscular strength tests using standard procedures [16]. A warmup on a stationary bicycle preceded the testing, which included the chest press, leg extension, shoulder press, and biceps curls, in that order. Upon completion, Session 3 was scheduled at least 48 hours later, and participants were instructed not to perform any exercise.

Session 3 consisted of low-intensity RE (50% of 10-RM) which included 3 sets of 10 repetitions of each of the exercises tested at Session 2. State body image, affective valence, and perceived activation (i.e., psychological arousal) were assessed before (PRE), immediately after (POST), 15 minutes post (POST-15), and 30 minutes post (POST-30). Affective valence and perceived activation were also assessed during (MID) RE.

During the POST period, participants sat quietly in the weight room out of sight of any mirrors and were provided a non-fitness related magazine (e.g., National Geographic).

Participants were then compensated with $50. This study was approved by the college's Institutional Review Board (IRB).

Measures

Descriptives

Participant's age, gender, race/ethnicity, living situation, education, employment, income, and sexual orientation were queried.

Screening for Symptoms of Muscle Dysmorphia

Four questions were used to screen for MD symptoms [8]. These questions were asked both over the phone and at Session 1. To be included, participants had to answer "Yes" to at least one of the two questions that represent the cognitive domain (Questions 2 and 3), and at least one of the two questions that represent the behavioral domain (Questions 1 and 4). Men with any other combination of responses were ineligible, and men who answered "No" to all four questions were designated to the non-MD group. These criteria have recently been used to identify and compare those with and without MD symptoms [17] and included:

1. Do you frequently give up important social, occupational, or recreational activities because of a need to maintain your workout schedule?
2. Do you avoid social situations where you have to take your shirt off, for example, at a pool or beach?
3. Does your body size cause you stress in social, occupational, or other areas of your life?
4. Do you continue to work out when you are sick or injured despite the knowledge of negative consequences?

State Body Image

Body image was assessed using the Body Image States Scale (BISS) [18]. The BISS is a 6-item, 9-point, bipolar, Likert-type scale and was coded from 1 “Extremely dissatisfied” to 9 “Extremely satisfied”.

Affective Valence and Perceived Activation (affective states)

The Feeling Scale (FS) [19] is a single-item measure of affective valence (i.e., pleasure/displeasure with exercise). The FS is an 11-point bi-polar measure that ranges from -5 “very bad” to 0 “neutral” to +5 “very good”. Perceived Activation was measured using the Felt Arousal Scale (FAS) [20]. The FAS is a 6-point single-item measure that ranges from 1 “low arousal” to 6 “high arousal”.

Statistical Analysis

Descriptive statistics are reported as mean (standard deviation) for continuous data, and percentages (n) for categorical data. Repeated measures analysis of variance (ANOVA) was used to measure changes in body image, affective valence, and perceived activation before, during, and after RE. If the assumption of sphericity was violated, the appropriate epsilon-correction estimate (i.e., Huynh-Feldt or Greenhouse Geisser) was used [21]. All analyses were conducted using IBM SPSS 23, Bonferroni correction was used post-hoc to adjust for multiple comparisons [21], and statistical significance was set *a priori* at $p<.05$.

RESULTS

Sample Characteristics

The mean age of total sample was 26.6 (4.4) years and half of the sample self-reported as being White. Sample characteristics divided by group are presented in Table 1.

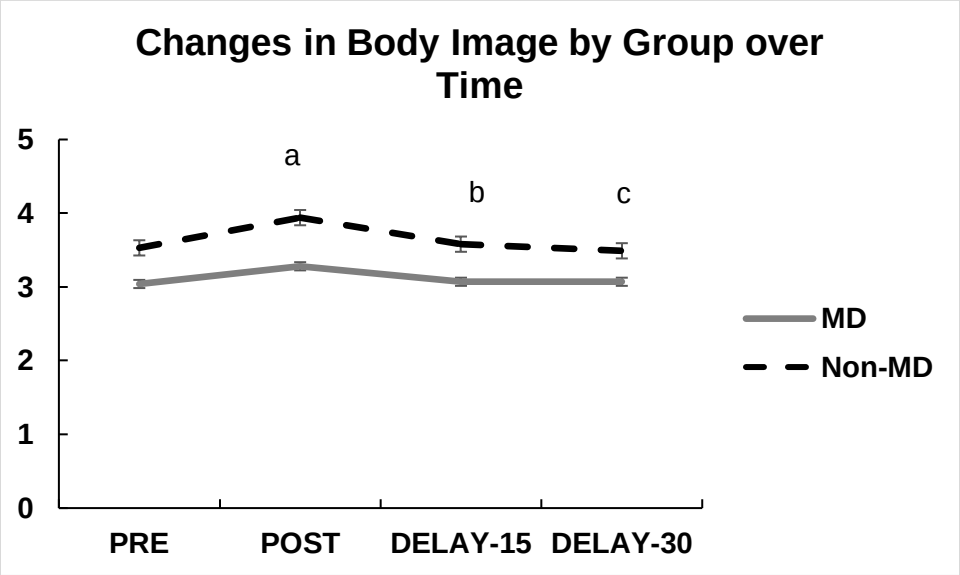
Table 1. Participant characteristics divided by group.

	MD Group (*n*=10)	Non-MD Group (*n*=10)
Age (years)	*M*= 26.7 *SD*= 4.7	*M*= 26.4 *SD*= 4.1
	n(%)	*n*(%)
Race		
Asian	3(30%)	4(40%)
Black or African American	2(20%)	0(0%)
White	5(50%)	5(50%)
Other	0(0%)	1(10%)
Ethnicity		
Hispanic or Latino	2(20%)	3(30%)
Living Arrangement		
Living alone	5(50%)	1(10%)
Living with a romantic partner	0(0%)	5(50%)
Living with roommate(s)	4(40%)	4(40%)
Living with a family member	1(10%)	0(0%)
Education		
High school graduate	8 (40)	1(10%)
Some Vocational School/College	2(20%)	1(10%)
Completed college	1(10%)	3(30%)
Some graduate school	4(40%)	0(0%)
College graduate (masters)	2(20%)	4(40%)
College graduate (doctoral)	1(10%)	1(10%)
Employment		
Full time	3(30%)	4(40%)
Student	7(70%)	6(60%)
Income		
< $11, 500	3(30%)	3(30%)
$15,001-$40,000	3(30%)	1(10%)
$40,001-$60,000	1(10%)	2(20%)
$60,001-$80,000	1(10%)	1(10%)
$80,001-$100,000	0(0%)	1(10%)
Do not know	0(0%)	1(10%)
Do not want to answer	2(20%)	1(10%)
Sexual Orientation		
Heterosexual	9(90%)	9(90%)
Homosexual	0(0%)	1(10%)
Bisexual	1(10%)	0(0%)

Body Image

Due to a violation of the Mauchly's test of sphericity, degrees of freedom were corrected using Greenhouse-Geisser Epsilon estimates (ε = .73). The results for state body image (i.e., BISS scores) showed a significant effect for time $F(2.19, 39.42)=6.01$, $p=.004$, and group $F(1, 18)=7.42$, $p=.014$. However, the time x group interaction was not significant, $F(2.19, 39.42)=.62$, $p=.57$. Mean time x group changes are presented in Figure 1.

Figure 1.



Non-MD Group

a. Significant change from PRE to POST*
b. Significant change from POST to POST-15*
c. Significant change from POST to POST-30*

*Significance at p<.01

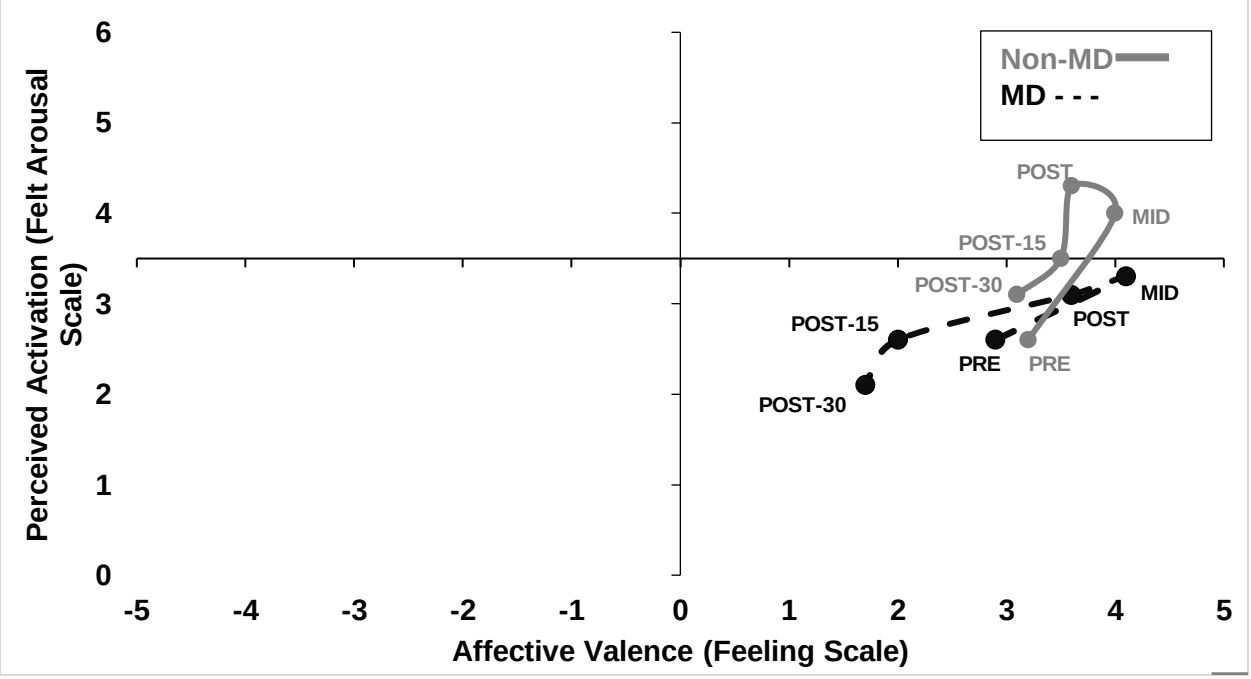
Affective Valence

The results for affective valence (i.e., FS scores) showed a significant effect of time $F(4, 72)=5.10$, $p=.001$. However, there were no significant effects of group $F(1,18)=3.75$, $p=.07$, or time x group interaction $F(4.00, 72.00)=.33$, $p=.85$. Mean changes in FS scores are presented by group in Figure 2.

Perceived Activation

The results for perceived activation (i.e., FAS scores) showed a significant effect of time $F(4, 72)=38.3$, $p<.001$. However, there were no significant effects of group $F(1,18)=.69$, $p=.42$, , or time x group interaction $F(4,72)=2.35$, $p=.06$. Mean changes in FAS scores are presented by group in Figure 2.

Figure 2.



Shows mean PRE, MID (for affective valence and perceived activation), and all POST session data by Group. Feeling Scale and Felt Arousal scores for the non-MD group (dotted line) and MD group (solid line). The Feeling Scale is plotted on the X-axis and the Felt Arousal Scale is plotted on the Y-axis. On average, both groups started in a state of positive affect and neutral activation and at the MID point of RT session, reported an increase in positive affect and activation with effect sizes in favor of the non-MD group (Cohen's d = .86 vs .54, respectively, for affective valence, and 1.52 vs 1.04, respectively, for perceived activation). Throughout the POST session period, men in the non-MD group remained in a state of positive affect and activation. Comparatively, men in the MD group experienced a steady decrease in positive affect and activation (i.e., displeasure) through the POST session period.

DISCUSSION

We explored and compared the acute effects of low intensity RE after a brief deprivation period of no RE (i.e., 48 hours) on state body image and affective states in men with and without MD symptoms. As hypothesized, men in the non-MD group had a more favorable body image and affective response relative to men in the MD group, possibly due to a lack of physiological feedback (i.e., muscle pump) experienced by men in the MD group that is theorized to improve beliefs that one's body is increasing in muscle size.

The results from this study help support an earlier study that found body image to be worse on a rest day (deprivation) compared to after a training day [14], and another study that found perceived muscle size to be higher after RE compared to cycling or reading [13]. Despite a lack of evidence to support a change in state body image from PRE to POST in the MD group, there was a small to medium effect size (Cohen's d = 0.42) suggesting that there was some benefit to the session. This may be because of the deprived state which may suggest that any type of RE could have been mildly effective in that mental state.

As evidenced by the circumplex model in Figure 4, both groups started in a state of positive affect and neutral activation and at the MID point, reported an increase in positive affect and activation with effect sizes in favor of the non-MD group (Cohen's d = .86 vs .54, respectively, for affective valence, and 1.52 vs 1.04, respectively, for perceived activation). Throughout the POST period, men in the non-MD group remained in a state of positive affect and activation whereas men in the MD group experienced a steady decrease in positive affect and activation (i.e., displeasure) throughout the POST period. Theoretically, deprivation from, and a deviation to, an accustomed RE session should result in increased felt tension and even urges and cravings for exercise [22]. Recent qualitative evidence suggests that men with MD place unrealistic importance on making progress in the gym and experience worse mood and

anxiety after an inadequate or missed workout [12]. Results from the current study show that although men in the MD group did not enter a state of tension or distress, they did experience a steady decrease in pleasure.

It is possible that subsequent workouts following RE deprivation and/or a deviation could be of longer duration or higher intensity to compensate for the lack of progress made during the previous workout. Similarly, the lack of perceived progress may reinforce the perception that high intensity RE is necessary to achieve one's goals. Future studies that monitor participants following RE sessions of varying intensities to explore their subsequent feelings and RE behaviors would be an informative next step.

Strengths and Limitations

The inclusion of young men who met empirically supported MD criteria commonly used to help identify men at risk for MD, and the use of a brief RE deprivation and hypothesized deviation from the normal RE routine are some strengths to this study. Limitations include having a small sample of men without a clinical diagnosis of MD. Overall, it appears that even after a period of RE deprivation, low intensity RE had very little therapeutic effect for men in the MD group. Overall, additional studies with larger samples on how men acutely respond to varying RE intensities will help MD care providers co-develop coping strategies to overcome the distress experienced when RE is missed or deviates from their pre-determined routine

PRACTICAL APPLICATIONS

There are several practical applications for members of the sports medicine team. First, continuing education on the signs and symptoms of MD is beneficial to help identify individuals at risk for MD. Individuals who display low mood or agitation during a "deload" or recovery training block (i.e., lower training volume; intensity) may be showing signs of MD, as these lower intensity training blocks may be perceived as further distancing themselves from their ideal

physique. Second, sports medicine staff who get to know their athletes on a personal level, may help with more quickly identifying when athletes who appear dysregulated during lower intensity training blocks.

Contributions

Contributed to conception and design: NSB, JWW, SN

Contributed to acquisition of data: NSB

Contributed to analysis and interpretation of data: NSB, JWW, SN, MASK

Drafted and/or revised the article: NSB, JWW, SN, MASK

Approved the submitted version for publication: NSB, JWW, SN, MASK

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Data and Supplementary Material Accessibility

https://osf.io/4rdhu/

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