Body Image Distortions and Muscle Dysmorphia Symptoms among Asian Men: Do Exercise Status and Type matter?

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ABSTRACT

Theoretical Framework: *Body image distortions and muscle dysmorphia symptoms were assessed among 78 Asian men who engaged in regular resistance training, aerobic training or did not engage in either.* ***Method***: *Body fat and muscularity were measured and participants also completed the Muscle Dysmorphia Disorder Inventory.* ***Results***: *Resistance trained men selected a body shape ideal that was higher in muscularity and lower in body fat. Aerobically trained men also reported higher perceived current Body Fat even though their actual levels were close to their ideal.* ***Conclusion***: *The results suggest that specificity in body image distortion (e.g., perceived current-ideal versus perceived current-actual) when examining body image distortions might reduce conflicting findings in extant research.*

Key words: *Men, Body Image, Muscle Dysmorphia, Exercise, Body Fat.*

INTRODUCTION.

Body image distortions have been related to negative health and behavioural outcomes, such as the risk of developing eating disorders (Cafri et al., 2005). Research on body image and dissatisfaction has been dominated by studies sampling women. However, in recent years, increasing attention has been given to body image concerns among men: while women tend to strive towards a thinner body shape ideal by losing weight, men appear to be more concerned about both losing body fat and gaining muscle mass (Furnham, Badmin, & Sneade, 2002). Such a preoccupation among men increases their risk of developing what is currently termed as muscle dysmorphia (Pope, Gruber, Choi, Olivardia, & Phillips, 1997), which has been correlated with health-risk behaviours, such as anabolic steroid use and eating pathology (Cafri, Olivardia, & Thompson, 2008; Pope et al., 2005).

One of the diagnostic characteristics of muscle dysmorphia is a discrepancy between one's perceived anthropometric (e.g., muscle mass) and actual anthropometric characteristics (Pope et al., 1997). There is evidence to suggest that muscle dysmorphia is more prevalent among men who engage in resistance training. For instance, while the general American college population tend to perceived themselves as more muscular and fatter than actual (Olivardia et al., 2004), men with muscle dysmorphia who engage in resistance training perceived lower muscle mass than actual (Olivardia, Pope, Harrison & Hudson, 2000). Aerobic exercise increases fat loss while resistance training increases muscle mass (Donnelly et al., 2009). Hence, muscle dysmorphia should be more prevalent among individuals who engage in resistance training than those who engage in aerobic/endurance training.

Although the drive for muscularity may be more specific to body image concerns in men than women, choosing to focus on this solely may not yield a full representation of the body image concerns in men. The drive for thinness and the drive for muscularity are not mutually exclusive constructs and can be both present in men (Kelley, Neufeld & Musher-Eizenman, 2010). Currently, the bulk of research on body image concerns and its association with exercise behaviours has focused on body dissatisfaction rather than the accuracy in self-assessment of body characteristics. Two main forms of inaccuracies in self-assessments of body characteristics have been investigated in the current literature: (i) a comparison between perceived current and actual levels of a specific body characteristic such as body fat percentage or body weight (current-actual discrepancy) and (ii) a comparison between perceived current and perceived ideal levels of a specific body characteristic (current-ideal discrepancy).

The current literature on such body self-assessment discrepancies has revealed inconsistent findings as to whether the misperception of one's current weight is related to exercise and whether the relationship between body image discrepancy and exercise is a beneficial or a detrimental one. Cullum and her colleagues (2004) found that current-ideal discrepancy in BMI was not related to exercise frequency among women and men. On the other hand, Steenhuis, Bos and Mayer (2006) found that men who underestimated their current body weight (i.e., were overweight but did not perceive themselves to be so) were more likely to engage in weight loss behaviours and intense physical activity. The authors suggested that perhaps their participants overestimated the fat loss function of their current levels of physical activity. Another study found that an overestimation of current body weight (current-actual discrepancy) among men was significant related to a desire to weigh less and pursue weight control behaviours (Yaemsiri, Slining, & Agarwal, 2011). Another study found that men who over-estimated their current body weight were also more likely to use inappropriate weight control strategies (e.g., laxatives, vomiting; Wharton, Adams & Hampl, 2008). One reason for this inconsistency in research findings could be because body weight was assessed rather than body fat percentage or muscularity (e.g., fat free mass); overweight misperception could stem from a desire to be more muscular while underweight misperception could stem from a desire to be lean, which might be both desirable for men. One study did find that men with eating disorders tend to misperceive greater current levels of body fat than actual when compared to control men though the two groups of men did not differ in their desired ideal levels of body fat (Mangweth et al., 2003). In this paper, we examined whether resistance training and aerobic exercise status differentially predict men's self-assessment accuracy of muscularity and body fat.

Inaccuracies in anthropometric self-assessment and how these relate to exercise behaviours have received little research attention. While college men prefer a more muscular and lean physique and that the greater they perceived their current physical attributes to deviate from this ideal, the more body dissatisfaction they have (Olivardia, Pope, Borowiecki, & Cohane, 2004), it is unclear how this relates to exercise behaviours. Higgins (1987) argued that a larger current-ideal body image discrepancy can lead to an increase in weight control behaviours. A study found that for men, as one's actual body weight deviated positively from one's ideal body weight (actual-ideal discrepancy), the propensity to engage in food restriction increases while exercise frequency decreases. However, the study did not assess perceived current-ideal body self-assessment discrepancy's impact on exercise behaviour. Current-actual accuracy in body self-assessment cannot be assumed given that 48.1% of overweight men have been found to misperceive their weight to be normal (Yaemsiri et al., 2011).

The limited number of studies that have examined body shape self-assessment accuracy and its relationship to exercise behaviours report inconsistent results and require further examination. Furthermore, although research demonstrated that men from both Asian and Caucasian cultures do experience some form of body dissatisfaction (Jung, Forbes, & Chan, 2010), research has largely focused on Caucasian samples, and cultural differences may exist in the experience and manifestation of body image distortion and ideals. For example, Yang, Gray and Pope (2005) found that Taiwanese men had significantly less body dissatisfaction than Western men and were also less pre-occupied with muscularity and size. The researchers argued that this is perhaps due to the weaker emphasis on muscularity and size in the Taiwanese mass media. Similarly, in Jung et al.'s (2010) cross-cultural study of body satisfaction in Caucasian and Asian males, although the Asian male sample had lower global body satisfaction than the Caucasian male sample, they were more satisfied with their levels of muscularity, had a lower drive for muscularity and associated fewer positive attributes with muscularity. They also found that Caucasian men were more likely to engage in exercise and have a history of dieting behaviour as compared to Asian men. Overall, the studies suggest that Asian men are less preoccupied with muscularity and size when compared to their Western counterparts. It is unclear what implications these studies involving Asian participants have for Singaporean men owing to the paucity of research in the Singapore context. Hence, it is unknown whether Singaporean men would report an ideal physique that is more muscular and lean than their current physique, which is a similar result found among American college students (Olivardia, Pope, Borowiecki & Cohane, 2004).

This study aims to identify differences in body image discrepancies and concerns between Singaporean men who engage in two different types of exercise, resistance and aerobic, and compared them with men who do not. We hypothesize that muscle dysmorphia among Singaporean men is less associated with muscularity but may be associated with social impairment and anxiety involving physical appearance. Aerobic exercise status is hypothesized to be associated with concerns involving appearance and body fat levels.

METHOD.

Type o Study

This is an observational cross-sectional study.

Participants

The total sample consisted of 78 male undergraduates from the National University of Singapore. Volunteers were sought throughout the campus via convenience sampling. All participants were Chinese and between the ages of 20 and 25 years old. Thirty-seven participants reported engaging in regular resistance training for at least 1hr/week, and had done so for at least the past 6 months. Eighteen participants reported engaging in only regular aerobic (e.g., jogging, basketball, soccer) exercise at least 1hr/week. Among the participants who did engage in resistance training, 32 engaged in aerobic exercise while 5 did not. Among the participants who did not engage in resistance training, 18 engaged in aerobic exercise while 23 did not. A chi-square test found a significant association between resistance training and aerobic exercise, $\chi^2(1, N = 78) = 15.33$, $p < .001$, $\Phi = .44$: participants who engage in resistance training were likely to engage in aerobic exercise, which is similar in other samples involving resistance trained individuals (e.g., Chandler, Derryberry, Grieve & Pegg, 2009).

To ascertain the suitability for both Resistance Training and Aerobic Training status to be used as covariates, the statistical significance of their interaction term was used to test for the homogeneity of regression coefficients assumption. Resistance Training X Aerobic Training interaction term was non-significant for all the three DVs used in this study: Body Fat Percentage, $F(1, 74) = 0.48$, $p = .49$, partial $\eta^2 = .006$, Muscularity, $F(1, 74) = 0.41$, $p = .52$, partial $\eta^2 = .006$, and MDDI, $F(1, 74) = 0.39$, $p = .85$, partial $\eta^2 = .001$. Within subject interactions involving this interaction term (e.g., Resistance Training X Aerobic Training X Body Fat Percentage) were also non-significant: Body Fat Percentage, Wilks' $\Lambda = .98$, $F(2, 73) = 0.89$, $p = .42$, partial $\eta^2 = .02$, Muscularity, Wilks' $\Lambda = .95$, $F(2, 73) = 1.76$, $p = .18$, partial $\eta^2 = .05$, and MDDI, Wilks' $\Lambda = .99$, $F(2, 73) = 0.30$, $p = .74$, partial $\eta^2 = .008$. Results indicated that the homogeneity of regression coefficients assumption has not been violated, hence, all subsequent analyses used one of the predictors (e.g., Aerobic Training) to statistically control for the other (e.g., Resistance Training) via Type II Sums of Squares (Maxwell & Delaney, 2004; p. 334-335). The non-significant interactions indicated that the covariation between resistance training and aerobic training among our participants did not influence our outcome measures. Hence, significant main effects for resistance and aerobic training can be interpreted.

Measures

Psychological measures:

The Muscle Dysmorphic Disorder Inventory, MDDI (Hildebrandt, Langenbucher & Schlundt, 2004), consists of 13 items rated on a five-point Likert scale. It assesses the cognitive, behavioural and emotional aspects of muscle dysmorphia, in 3 subscales: (1) drive for size (e.g., I think my body is too small), (2) appearance intolerance (e.g., I am very shy about letting people see me with my shirt off), and (3) functional impairment (e.g., I pass up chances to meet new people because of my workout schedule). Each factor demonstrates adequate reliability and construct validity (Hildebrandt et al., 2004).

The Bodybuilder Image Grid, Scaled (BIG-S; Hildebrandt et al., 2004) is a subjective measure of body image that presents figures with varying body fat and muscularity percentages in a 6 × 5 matrix. Participants were asked to give a numerical estimate of their perceived current and ideal body fat percentages.

Anthropometric measures:

Body mass index (BMI) was derived from the participants' height and weight. Height and weight measurements were taken using a Seca weighing scale (Seca gmbh & co. kg, Hamburg). BMI was later computed by dividing the participant's weight in kilograms by the square of his height in metres.

Body fat percentage (BFP) was estimated from measurements of skinfold thickness. The skinfold measurements were taken from four sites on the right side of the body (triceps, biceps, subscapular and suprailiac) as proposed by Durnin and Womersley (1974). Measurements were taken twice and the mean of the skinfold thickness at each site was taken. If the two measurements differed by more than 1 millimetre, a third measurement was taken and the mean of the two closest measurements was used. All participants were measured using the same procedure and equipment (i.e., Harpenden calliper; United BMEC Pte Ltd, Singapore), in accordance with the guidelines in the International Standards for Anthropometric Assessment (Marfell-Jones, Olds, Stewart & Carter, 2006). Body fat percentages as estimated from skinfold measurements were used as indices of participants' actual level of body fat. Body density was first calculated from the skinfold measurements using the Durnin and Womersley's (1974) equation and Body Fat Percentage was estimated using Siri's (1961) equation.

Fat-free mass index (FFMI), used to index actual muscularity among the participants, was estimated from Body Fat Percentage, Height and

Weight (Kouri, Pope, Katz & Olivia, 1995). Perceived current and ideal levels of Fat-free mass was obtained using the BIG-S and this yield a 6 point Likert response. Hence, FFMI was spilt into 6 equal groups with the group that has the lowest FFMI labelled ‘1’ and the highest FFMI group labelled ‘6’.

Procedure

Prior to beginning the study, participants provided informed consent. After which the participants were administered the questionnaires before the physiological measurements were taken. All psychological and physiological data was collected during a single session in the testing laboratory that lasted no more than an hour.

RESULTS.

Alpha level was set at .05. The descriptive statistics are listed in Table 1.

Body Fat Percentage

A multivariate repeated measures GLM was conducted with perceived current, actual and ideal body fat percentage as a three-level repeated measure (‘Bodyfat’) and resistance training and cardiovascular exercise as the two between-subject predictors.

Body Fat Percentage was significantly higher among sedentary individuals (*n* = 28) when compared to who engaged in regular aerobic exercise (*n* = 50), non-pooled $t(76) = 2.18$, $p = .03$, d = 0.50, Mean(*SD*) = 16.34%(4.05) versus 14.19%(4.35) respectively. Resistance Training Status predicted Body Fat Percentage, $F(1, 75) = 4.01$, $p = .049$, partial $\eta^2 = .05$, while Aerobic Exercise status was of borderline significance, $F(1, 75) = 3.48$, $p = .07$, partial $\eta^2 = .04$.

Table 1. Means (*SD*) of Body Fat Percentage, Muscularity, and Muscle Dysmorphia Disorder Inventory (MDDI) as a function of Exercise Status and Type.

Dependent Variable		Body Fat Percentage			Muscularity			Muscle Dysmorphia Disorder Inventory		
Exercise Type		Perceived	Actual (skinfold)	Ideal	Perceived	Actual (FFMI)†	Ideal	Drive for Size	Appearance Intolerance	Functional Impairment
Resistance	Present, *n* = 37	17.19_a (10.38)	14.45_a (4.05)	11.15_b (8.32)	2.76 (0.96)	3.49 (1.35)	3.51 (0.69)	13.89_a (5.76)	8.57_a (3.20)	9.08_a (4.77)
	Absent, *n* = 41	18.30_a (10.96)	$15.43_{a,b}$ (4.59)	15.30_b (12.45)	1.90 (0.83)	2.56 (1.32)	2.93 (0.61)	12.54_a (4.89)	9.29_a (3.26)	5.66_b (1.92)
Aerobic	Present, *n* = 50	18.90_a (12.11)	14.19_b (4.35)	14.91_b (12.50)	2.52 (1.00)	3.16 (1.45)	3.32 (0.71)	13.32_a (5.46)	8.32_a (3.15)	7.74_a (4.30)
	Absent, *n* = 28	15.76_a (7.05)	16.34_a (4.05)	10.50_b (6.14)	1.93 (0.86)	2.71 (1.30)	3.00 (0.67)	12.93_a (5.18)	10.07_b (3.13)	6.46_a (3.05)
Total, *n* = 78		17.77_a (10.63)	14.96_b (4.34)	13.33_b (10.83)	2.31_a (0.98)	3.00_b (1.41)	3.21_b (0.71)	13.18_a (5.33)	8.95_b (3.23)	7.28_c (3.93)

†FFMI = Fat-free Mass Index; within each row and dependent variable, numbers with different subscripts are significantly different at $p < .05$ (see text for details). For MDDI, the pair of means within each MMDI subscale by exercise group is statistically compared.

Those who engage in resistance training have lower perceived current, actual and ideal levels of Body Fat Percentages (Table 1). A significant Bodyfat main effect was also found, Wilks' Λ = .64, $F(2, 74) = 20.73$, $p < .001$, partial $\eta^2 = .36$; participants tend to have a perceived their current Body Fat Percentage as higher than actual or ideal levels. More relevant to the main aims of this study are the significant interactions for Resistance Training Status X Bodyfat, Wilks' Λ = .87, $F(2, 74) = 5.22$, $p = .008$, partial $\eta^2 = .12$, and Aerobic Exercise Status X Bodyfat, Wilks' Λ = .86, $F(2, 74) = 6.22$, $p = .003$, partial $\eta^2 = .14$.

Post hoc analyses using paired-sample t-tests were done to examine the significant patterns for these interactions. For the Resistance Training Status X Bodyfat interaction, participants who engage in resistance training did not have significant body image distortion for their current body fat percentage but set a lower level of body fat as an ideal (Table 1). Participants who did not engage in resistance training regarded themselves as having more body fat than their ideal level though their perceived current level of body fat is not significantly different from actual levels. For the Aerobic Exercise Status X Bodyfat interaction, participants who engage in aerobic exercise had body image distortions with regards to their current level of body fat though their actual level of body fat is close to their perceived ideal. On the other hand, participants who do not engage in aerobic exercise do not have body image distortion of their current level of body fat but set a more stringent body fat ideal.

Muscularity (Fat-free Mass)

A multivariate repeated measures GLM was conducted with perceived current, actual (FFMI) and perceived ideal Fat-free Mass as a three-level repeated measure ('Muscularity') and resistance training and cardiovascular exercise as the two between-subject predictors.

Participants who engaged in regular Resistance Training had significantly higher FFMI than those who did not, non-pooled $t(76) = 3.46$, $p = .001$, d = 0.78, Mean(*SD*) = 19.61(2.32) versus 18.09(1.51) respectively. Non-steroid using amateur weightlifters have a mean FFMI of 21.8 (Kouri, Pope, Katz & Olivra, 1995), which indicates that our sample of participants consisted of recreational weightlifters. A significant Resistance Training Status main effect was found, $F(1, 75) = 13.99$, $p < .001$, partial $\eta^2 = .16$. Those who engage in resistance training had higher perceived current, actual and perceived ideal levels of Muscularity. The main effect of Muscularity was significant, Wilks' $\Lambda = .31$, $F(2, 74) = 74.74$, $p < .001$, partial $\eta^2 = .67$. Participants tend to perceive a lower level of current muscularity even though their actual muscularity is closer to their perceived ideal.

Muscle Dysmorphia Disorder Inventory (MDDI)

A multivariate repeated measures GLM was conducted with the three subscales of the MDDI, Drive for Size, Appearance Intolerance, and Functional Impairment, as a three-level repeated measure ('MDDI') and resistance training and cardiovascular exercise as the two between-subject predictors.

A significant Resistance Training Status main effect was found, $F(1, 75) = 4.63$, $p = .035$, partial $\eta^2 = .06$. Participants who engage in resistance training tend to report high ratings for MDDI. However, there was a significant Resistance Training Status X MDDI interaction as well, Wilks' $\Lambda = .86$, $F(2, 74) = 6.12$, $p = .003$, partial $\eta^2 = .14$. Post hoc analyses indicated that participants who engage in resistance training tend to report significantly more problems with impairment to their social functions due to their dietary or training regime. A significant MDDI main effect was also found, Wilks' $\Lambda = .45$, $F(2, 74) = 45.22$, $p < .001$, partial $\eta^2 = .55$. Post hoc comparisons indicate that participants reported more body size concerns, followed by appearance concerns and then social impairment.

DISCUSSION.

This study examined differences in body image distortions and concerns as a function of exercise type and status among Asian men. Our results indicated that different forms of body image distortions for Body fat Percentage were associated with the status and type of exercise Asian men engaged in. The participants in our study who engaged in resistance training did not appear to have a preoccupation with muscularity or size (MDDI) and neither did they have a greater distorted view of their current muscularity when compared to men who did not engaged in regular resistance training. However, they reported more problems with fulfilling their social functions due to their dietary and training regime and set more stringent muscular and body fat ideals. Participants who engaged in aerobic exercise had greater perceived-actual body image distortions – perceiving themselves have a higher body fat percentage than they actually have. Sedentary individuals reported a more stringent body fat ideal and also reported more dissatisfaction with their physiques.

Regardless of exercise status, participants in this study perceived themselves to be less muscular than actual (i.e., a significant current-actual discrepancy) even though their actual muscularity was not significantly different from their ideal. This is contrary to a previous research that found that men tend to perceive themselves as more muscular than they actually are (McCabe, Ricciardelli, Sitaram & Mikhail, 2006). The contrary results might be because Asians tend to engage in self-effacement (Heine, 2005) and since being muscular might be desirable for men, they might exhibit self-effacement by down-playing their perceived current muscularity. A similar explanation is also relevant for body fat percentage self-assessments – since being lean is aesthetically desirable, Asian men may under-report their perceived current leanness. However, such overall patterns should be interpreted with the type of exercise the participant engaged in.

Singaporean men who engaged in regular resistance training did not report a significant higher drive for muscularity, which is congruent with the results obtained with Taiwanese men (Yang et al., 2005). However, paradoxically, these Singaporean men set a higher muscular ideal. This highlights that verbal self-report assessments of the drive for muscularity may not fully capture men's aim to attain a muscular ideal (Cafri & Thompson, 2004) and perhaps, the drive for muscularity in resistance trained men is visually anchored (BIG-S) rather than attitudinally anchored (MDDI). They also reported significantly more concerns about fulfilling their social roles, which is one aspect of muscle dysmorphia. This result is congruent with studies conducted on Western samples (Cafri et al., 2008). This is unlikely to be confounded by their aerobic exercise status as this has been statistically controlled for. Non-aerobically trained participants, on the other hand, reported significantly greater concerns for appearance intolerance.

Perhaps body image distortions, whether it is a perceived current-actual or perceived current-ideal discrepancy, can be seen within the broader issue of veridical versus non-veridical self-assessment and its impact on behaviour and health (e.g., Why & Huang, 2011). Such concepts refer to a discrepancy between one's perceptions and reality. However, research evidence is still inconsistent as to whether veridical self-assessment is beneficial for health or not (Critcher, Helzer & Dunning, 2011). Self-discrepancy theory (Higgins, 1987) posits that it is the current-ideal body image discrepancy that would drive behaviour to minimise that discrepancy; this appears to be inconsistent with the trend in our findings: though current-ideal discrepancy in body fat percentage was associated with resistance and aerobic training status, this body distortion was also present in the same magnitude among men who did not engage in aerobic training when compared with men who did.

While causal relationships cannot be inferred in our study, previous experimental and prospective research suggests that the relationship between exercise and body image distortions is likely to be bidirectional

(Sorbara & Geliebter, 2002; Teixeira et al., 2006). Nevertheless, it is important to examine whether body image distortions systematically vary as a function of exercise status and type using correlational data in order to devise a targeted experimental manipulation of such body self-assessments (i.e,. which form of body image distortion to manipulate). This can then examine the causal relationship of the specific forms of body self-assessment inaccuracies on exercise behaviours. The pattern of body image distortions could perhaps explain why some men do not engage in exercise: participants who do not engage in exercise might set their ideal body fat percentages at more stringent levels (i.e., a lower ideal body fat percentage) as a form of self-handicapping (Jones & Berglas, 1978). The combination of an accurate current-actual self-assessment for body fat percentage that they might consider satisfactory with a self-handicapping high body fat percentage ideal may contribute to participants not engaging in cardiovascular exercise. That is, these participants might consider losing more body fat as ideal but unnecessary and might not consider that aerobic exercise confers other health benefits (e.g., improve cardiorespiratory fitness) besides fat loss (King, Hopkins, Caudwell, Stubbs & Blundell, 2009). The non-aerobically trained participants differed from the aerobically trained group in that the aerobically trained group perceived their current levels of body fat to be much higher than actual (i.e., unsatisfactory).

This study is not without its limitations. Firstly, the difference in prevalence of muscle dysmorphia symptoms may be underestimated in our study due to our sample characteristics; our study sampled individuals who were recreational weightlifters as seen by their FFMI, so the association between resistance training and muscle dysmorphia symptoms may be weaker in this sample when compared to past studies that have typically sampled amateur or professional body builders (cf., Pickett, Lewis & Cash, 2005). On the other hand, recreational weighlifters cover a broader class of individuals who engage in resistance training in the population than amateur or professional bodybuilders and hence, would increase the generalizability of our findings. Secondly, our sample consisted of healthy Asian male adults who belong to a country where there is mandatory conscription for its male citizens. Hence, their anthropometric measures (e.g., body fat percentage) tend to be low and hence, may inadequately cover values that are considered clinically unhealthy. Thirdly, our data is correlational and previous research has indicated that the causal relationship between body image and exercise is likely to be bidirectional (Sorbara & Geliebter, 2002; Teixeira et al., 2006). Hence, future research might experimentally manipulate different variants of body self-assessments to assess its impact on exercise behaviours. Nevertheless, we believe our study has provided a more detailed distinction in the type of body self-assessment distortions (e.g., current-actual, current-ideal, actual-ideal) than previous research. Such differentiation would make the definition of body image distortion more precise, perhaps aid in the resolution of inconsistent findings and reduce ambiguity in addressing body image distortions.

In conclusion, we found that body image concerns in a group of Asian men involved both leanness and muscularity though body self-assessment distortions varied as a function of exercise status and type for body fat percentage only. Aerobically trained individuals appeared to perceive themselves fatter than actual while non-aerobically trained men set a more stringent body fat ideal. Resistance trained participants had stringent ideals for body fat percentage and muscularity though they did not report a higher drive for muscularity. They also reported more Functional Impairment while non-aerobically trained individuals reported more Appearance Intolerance. Future studies might consider how the type of body image distortions impacts on exercise behaviour.

REFERENCES.

Cafri, G., & Thompson, J. K. (2004). Measuring Male Body Image: A Review of the Current Methodology. *Psychology of Men and Masculinity, 5*, 18-29.

Cafri, G., Thompson, J. K., Ricciardelli, L., McCabe, M., Smolak, L., & Yesalis, C. (2005). Pursuit of the muscular ideal: Physical and psychological consequences and putative risk factors. *Clinical Psychology Review, 25*, 215-239.

Cafri, G., Olivardia, R., & Thompson, J. K. (2008). Symptom characteristics and psychiatric comorbidity among males with muscle dysmorphia. *Comprehensive Psychiatry, 49*, 374-379.

Chandler, C. G., Derryberry, W. P., Grieve, F. G., & Pegg, P. O. (2009). Are Anxiety and Obssessive-Compulsive Symptoms Related to Muscle Dysmorphia? *International Journal of Men's Health, 8*, 143-154.

Critcher, C. R., Helzer, E. G., & Dunning, D. (2011). Self-Enhancement via Redefinition: Defining Social Concepts to ensure Positive View of the Self. In: Alicke MD and Sedikides C (eds.) *Handbook of Self-Enhancement and Self-Protection*. New York: Guilford Press, 69-91.

Cullum, A., McCarthy, A., Gunnell, D., Davey Smith, G., Sterne J. A. C., & Ben-Shlomo, Y. (2004). Dietary restraint and the mis-reporting of anthropometric measures by middle-aged adults. *International Journal of Obesity, 28*, 426-433.

Donnelly, J. E., Blair, S. N., Jakicic, J. M., Manore, M. M., Rankin, J. W., & Smith, B. K. (2009). Appropriate physical activity intervention strategies for weight loss and prevention of weight regain for adults. *Medicine & Science in Sports & Exercise, 41*, 459-471.

Durnin, J. V. G. A., & Womersley, J. (1974). Body fat assessed from total body density and its estimation from skinfold thickness: Measurements on 481 men and women aged from 16 to 72 years. *British Journal of Nutrition, 32*, 77-97.

Furnham, A., Badmin, N., & Sneade, I. (2002). Body image dissatisfaction: Gender differences in eating attitudes, self-esteem, and reasons for exercise. *The Journal of Psychology, 136*, 581-596.

Heine, S. J. (2005). Where Is the Evidence for Pancultural Self-Enhancement? A Reply to Sedikides, Gaertner, & Toguchi (2003) *Journal of Personality & Social Psychology, 89*, 531-538.

Higgins, E. T. (1987). Self-discrepancy: A theory relating self and affect. *Psychological Review, 94*, 319-340.

Hildebrandt, T., Langenbucher, J., & Schlundt, D.G. (2004). Muscularity concerns among men: development of attitudinal and perceptual measures. *Body Image, 1*, 169-181.

Jones, E. E., & Berglas, S. (1978). Control of attributions about the self through self-handicapping strategies: The appeal of alcohol and the role of underachievement. *Personality and Social Psychology Bulletin, 4*, 200-206.

Jung, J., Forbes, G. B., & Chan, P. (2010). Global body and muscle satisfaction among college men in the United States and Hong Kong-China. *Sex Roles, 63,* 104-117.

Kelley, C., Neufeld, J. M., & Musher-Eizenman, D. R. (2010) Drive for thinness and drive for muscularity: Opposite ends of the continuum or separate constructs? *Body Image, 7,* 74-77.

King, N. A., Hopkins, M., Caudwell, P., Stubbs, R. J., & Blundell, J. E. (2009). Beneficial effects of exercise: shifting the focus from body weight to other markers of health. *British Journal of Sports Medicine, 43,* 924-927.

Kouri, E. M., Pope, H. G. J., Katz, D. L., & Olivia, P. (1995). Fat-free mass index in users and nonusers of anabolic-androgenic steroids. *Clinical Journal of Sport Medicine, 5*, 223-228.

Mangweth, B., Hausmann, A., Walch, T., Hotter, A., Rupp, C.I., Biebl, W. et al. (2004). Body fat perception in eating-disordered men. *International Journal of Eating Disorders, 35*, 102-108.

Marfell-Jones, M., Olds, T., Stewart, A., & Carter, L. (2006). *International standards for anthropometric assessment.* Potchetstroom, South Africa: ISAK.

Maxwell, S. E., & Delaney, H. D. (2004). *Designing Experiments and Analyzing Data: A Model Comparison Perspective*. Mahwah, NJ: Lawrence Erlbaum.

McCabe, M. P., Ricciardelli, L. A., Sitaram, G., & Mikhail, K. (2006). Accuracy of body size estimation: Role of biopsychosocial variables. *Body Image, 3*, 163-171.

Olivardia, R., Pope, H. G. Jr, Borowiecki, III J. J., & Cohane, G. H. (2004) Biceps and body image: The relationship between muscularity and self-esteem, depression, and eating disorder symptoms. *Psychology of Men & Masculinity, 5*, 112-120.

Olivardia, R., Pope, H. G. Jr, & Hudson, J. I. (2000). Muscle Dysmorphia in Male Weightlifters: A Case-Control Study. *American Journal of Psychiatry, 157*, 1291-1296.

Pickett, T. C., Lewis, R. J., & Cash, T. F. (2005). Men, muscles, and body image: comparisons of competitive bodybuilders, weight trainers, and athletically active controls. *British Journal of Sports Medicine, 39,* 217-222.

Pope, H. G., Gruber, A. J., Choi, P., Olivardia, R., & Phillips, K. A. (1997). Muscle dysmorphia: An underrecognized form of body dysmorphic disorder. *Psychosomatics, 38,* 548-557.

Pope, C. G., Pope, H. G., Menard, W., Fay, C., Olivardia, R., & Phillips, K. A. (2005). Clinical features of muscle dysmorphia among males with body dysmorphic disorder. *Body Image, 2,* 395-400.

Siri, W. E. (1961) Body composition from fluid space and density. In: Brozek J and Hanschel A (eds.) *Techniques for measuring body composition*. Washington, DC: National Academy of Sciences, National Research Council, 223-244.

Sorbara, M., & Geliebter, A. (2002). Body image disturbance in obese outpatients before and after weight loss in relation to race, gender, binge eating, and age of onset of obesity. *International Journal of Eating Disorders, 31,* 416-423.

Steenhuis, I. H. M., Bos, A. E. R., & Mayer, B. (2006). (Mis)interpretation of body weight in adult women and men. *Journal of Human Nutrition and Dietetics, 19,* 219-228.

Teixeira, P. J., Going, S. B., Houtkooper, L. B., Cussler, E. C., Metcalfe, L. L., Blew, R. M. et al. (2006). Exercise Motivation, Eating, and Body Image Variables as Predictors of Weight Control. *Medicine & Science in Sports & Exercise, 38*, 179-188.

Wharton, C. M., Adams, T., & Hampl, J. S. (2008). Weight loss practices and body weight perceptions among US College students. *Journal of American College Health, 56*, 579-584.

Why, Y. P., & Huang, R. Z. (2011). Positive illusions and its association with cardiovascular functions. *International Journal of Psychophysiology, 81*, 305-311.

Yaemsiri, S., Slining, M. M., & Agarwal, S. K. (2011). Perceived weight status, overweight diagnosis, and weight control among US adults: The NHANES 2003-2008 Study. *International Journal of Obesity, 35*, 1063-1070.

Yang, C. F. J., Gray, P., & Pope, H. G. (2005). Male body image in Taiwan versus the West: Yanggang Zhiqi meets the adonis complex. *American Journal of Psychiatry, 162*, 263-269.

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