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Psychometric Properties of the Drive for Muscularity Scale in Malaysian Men

Viren Swami[1-2], David Barron[3], Poh Li Lau[4], & Jas Laile Jaafar[4]

[1] Department of Psychology, Anglia Ruskin University, Cambridge, UK

[2] Department of Psychology, HELP University College, Kuala Lumpur, Malaysia

[3] Department of Psychology, University of Westminster, London, UK

[4] Department of Educational Psychology and Counselling, University of Malaya, Kuala Lumpur, Malaysia

Address correspondence to: Prof. Viren Swami, Department of Psychology, East Road, Cambridge, Cambridgeshire CB1 1PT, UK. Email: virenswami@hotmail.com. Telephone: +441245493131

Abstract

The Drive for Muscularity Scale (DMS) is a widely used measure in studies of men's body image, but few studies have examined its psychometric properties outside English-speaking samples. Here, we assessed the factor structure of a Malay translation of the DMS. A community sample of 159 men from Kuala Lumpur, Malaysia, completed the DMS, along with measures of self-esteem, body appreciation, and muscle discrepancy. Confirmatory factor analysis supported a two-factor solution, differentiating attitudes from behaviours, which mirrors the parent scale. However, a one-dimensional model where all items loaded onto a single latent variable had poor fit. The subscales of the Malay DMS had excellent internal consistencies and good convergent validity, insofar as significant relationships were reported with self-esteem, body appreciation, muscle discrepancy, and body mass index. These results indicate that the Malay DMS has acceptable psychometric properties and can be used to assess body image concerns in Malay men.

Keywords: Drive for muscularity; Men's body image; Psychometric properties; Malaysia; Translation

Drive for muscularity refers to a desire to enhance one's musculature in order to reduce a perceived discrepancy between actual and ideal levels (McCreary & Sasse, 2000). Higher drive for muscularity has been consistently associated with a range of unhealthy behaviours (e.g., exercise dependence) and psychological outcomes (e.g., anxiety; McCreary, 2012; Morrison, Morrison, & McCann, 2006). In addition, higher drive for muscularity is consistently observed in men compared with men, suggesting that the construct is differentially salient across sex, possibly because of the sociocultural emphasis placed on muscularity in ideals of men's physical attractiveness (Edwards, Tod, Morrison, & Molar, 2012; Swami & Tovée, 2005). Although a number of different drive for muscularity measures exist (Tod, Morrison, & Edwards, 2013), the most widely used is McCreary and Sasse's (2000) Drive for Muscularity Scale (DMS): Tod and Edwards (2013) estimated that approximately 70% of studies of drive for muscularity have used the DMS.

The DMS if a self-report measure consisting of 15 items that are rated on a 6-point scale ranging from 1 (*Strongly agree*) to 6 (*Strongly disagree*). Through factor analysis with data from North American men, the DMS was found to consist of two factors, called Muscularity-Oriented Body Image Attitudes (7 items) and Muscularity-Oriented Behaviours (7 items; McCreary, Sasse, Saucier, & Dorsch, 2004). In this analysis, however, one item (#10, which asks about the extent to which respondents think about using anabolic steroids to increase muscle mass) was found to have very little variability and was omitted from the subscale computations. In some samples, however, this item has sufficient variability and loads onto the Behaviours subscale (McPherson, McCarthy, McCreary, & McMillan, 2010). Both subscales also load onto a single higher-order DMS factor (McCreary et al., 2004) and, for this reason, some scholars have preferred total scores over subscale scores (e.g., Benford & Swami, 2014; Davis, Karvinen, & McCreary, 2005; Swami, Diwell, & McCreary, 2014; Swami et al., 2013). Both subscale and total scores have very good internal consistency

coefficients, test-retest reliability, and patterns of concurrent, convergent, and discriminant validities (McCreary, 2007).

With few exceptions, however, the psychometric properties of the DMS have not been examined outside English-speaking populations. Using confirmatory factor analysis (CFA) with Spanish-speaking Argentinian university students, Compte, Sepúlveda, de Pellegrin, and Blanco (2015) reported that the original two-factor model had good fit, with item #10 loading onto the Behaviours subscale. Total scores and subscale scores both showed good internal consistencies and good patterns of convergent and concurrent validity. Likewise, a German translation of the DMS with data from weight-training men found support for the two-factor model, with item #10 again loading onto the Behaviours subscale (Waldorf, Cordes, Vocks, & McCreary, 2014). Scores on this German translation were also found to have good internal consistency, test-rest reliability, and discriminant validity.

However, not all translation studies have found support for the original two-factor model. Using confirmatory factor analysis (CFA) with a mixed sample of Brazilian men, Campana, Gomes, Swami, & da Silva (2013) found that the two-factor model only achieved adequate fit following the elimination of three items (#7, 9, and 10) that had high residuals. These authors also tested a hypothesised three-factor model, but found that it had poorer fit compared to the modified two-factor model. Using exploratory factor analysis, support has been found for a three-factor model in Mexican university students (Escoto et al., 2013). While the Attitudes subscale mirrored its parent version ($\alpha = .87$), the Behaviours subscale was split into lower-order dimensions reflecting substance intake ($\alpha = .72$) and training adherence ($\alpha = .68$). A CFA with a second sample of men confirmed that this three-factor model had adequate fit (albeit with poor internal consistency for the third factor of training adherence), but also showed that the original two-factor model had acceptable fit.

In addition, French (Rodgers, Ganchou, Franko & Chabrol, 2012), Icelandic (Guðnadóttir & Garðarsdóttir, 2014), and Swedish (Holmqvist Gattario et al., 2015) translations of the DMS appear to have been completed. While the authors of these studies report that total and/or subscale scores had good internal consistency coefficients, they do not appear to have examined the factor structure of the DMS. This is problematic because it should not be assumed that factor structure identified during the development of a measure will necessarily generalise to other populations and linguistic contexts (American Educational Research Association, American Psychological Association, & National Council on Measurement in Education, 2014). Rather, an examination of a measure's factor structure is important when the measure is used with different populations or in new cultural contexts.

Following from this point, we sought to examine the factor structure of the DMS among Malaysian men in Malaysia. As discussed by Swami, Tovée, and Harris (2013), Malaysia is an interesting context in which to examine issues related to body image for a number of reasons. First, rapid liberalisation and industrialisation since the late 1980s have encouraged the deregulation of mass media, allowing for the proliferation of Westernised ideals of beauty (Swami, 2006). Indeed, previous work in urban Malaysia has indicated that muscularity is idealised to a similar extent as in Europe (Swami & Tovée, 2005). In addition, Malaysia typifies a developing country in a nutritional and lifestyle transition, with a high prevalence of obesity along with micronutrient deficiency (e.g., Gan & Zaleha, 2004). This has led to a legitimisation of a fear of fatness and may also contribute to high rates of body dissatisfaction among women and men (Swami, 2006; Swami et al., 2013).

While a number of studies have examined body image issues among men in Malaysia (e.g., Phan, Ang, Maznah, & Norimah, 2009), these studies have typically assumed a sex invariance in the measurement of body image. Typically, models of body image developed to explain body dissatisfaction among women are applied uncritically to explain men's body

image (Swami et al., 2013). A further problem with earlier work is the use of measures of uncertain validity and reliability. Some studies have asked respondents to complete questionnaires in English, rather than the national language of Bahasa Malaysia (Malay), or have assumed that scales developed in Western contexts will retain their factorial validity in Malaysian populations. This is a problematic assumption given evidence of that some body image scales developed among English-speaking samples do not retain their parent factor structure when translated into Malay (e.g., Swami, 2009; Swami & Chamorro-Premuzic, 2008).

In the present study, therefore, we examined the psychometric properties of a Malay translation of the DMS. More specifically, using CFA, we tested two models of the factor structure of the DMS: (i) the original two-factor model consisting of Muscularity-Oriented Body Image Attitudes and Muscularity-Oriented Behaviours (McCreary et al., 2004), and; (ii) a one-dimensional model where all items loaded onto a single latent variable (McCreary et al., 2004). Although three factor models are available for testing (Campana et al., 2013; Escoto et al., 2013), these either do not show adequate fit or have problems associated with stability. For these reasons, we focused on the parent factor structures in the present work. Further, we assessed the internal consistency of the final model and, to examine the scale's convergent validity, we examined associations between drive for muscularity and self-esteem, body mass index (BMI), body appreciation, and current-ideal muscle discrepancy.

Method

Participants

Participants of this study were 159 Malay men recruited from the community in Kuala Lumpur, the national capital and largest city in Malaysia. Participants ranged in age from 18 to 69 years (M = 28.78, SD = 9.35) and in self-reported BMI from 16.42 to 36.33 kg/m^2 (M = 22.93, SD = 2.94). By constitutional law, all ethnic Malays in Malaysia are considered

Muslim. In terms of marital status, the majority of the sample was married (64.2%), while 26.4% were single and the remainder of some other status. A total of 48.4% of the sample had completed minimum secondary schooling, 29.6% had an undergraduate degree, 13.8% had a postgraduate degree, and the remainder had some other qualification.

Measures

Drive for muscularity. Participants completed the 15-item DMS (McCreary & Sasse, 2000). All items were rated on a 6-point scale ranging from 1 (*Always*) to 6 (*Never*) and were reverse-coded prior to analysis so that higher scores reflect greater drive for muscularity. The factor structure and reliability of the DMS is described below.

Self-esteem. We used the 10-item Rosenberg Self-Esteem Scale (RSES; Rosenberg, 1965; Malay translation: Swami, 2011) to measure participants' overall sense of self-worth. The RSES is one of the most widely used measures of self-esteem, with items rated on a 4-point scale ranging from 1 (*Strongly disagree*) to 4 (*Strongly agree*). In its English version, five items are reverse-coded prior to analysis. In the Malay form, however, one of these reverse-coded items (#8) loads negatively, possibly due to interpretation issues; Swami (2011) recommends inclusion of this item in its non-reversed format, which is what we did here. A total RSES score was, therefore computed following reverse-coding of four items, with higher scores reflecting higher self-esteem. The Malay version of the RSES has adequate internal consistency, good test-retest reliability after 5 weeks, and good patterns of convergent and discriminant validity (Swami, 2011). In the present study, Cronbach's α for this scale was .83.

Body appreciation. Participants completed the Body Appreciation Scale (BAS; Avalos, Tylka, & Wood-Barcalow, 2005; Malay translation: Swami & Chamorro-Premuzic, 2008), a 13-item measure of positive body image. Items on the BAS are rated on a 5-point scale, ranging from 1 (*Never*) to 5 (*Always*). A CFA of the Malay BAS has shown that it

consists of two subscales representing General Body Appreciation (8 items) and Body Image Investment (3 items; Swami & Chamorro-Premuzic, 2008). The latter subscale tends to have poor internal consistency and is typically omitted from analyses for this reason (Swami, Kannan, & Furnham, 2011). In the present work, only the General Body Appreciation items were administered and a subscale score was computed as the mean of all 8 items (higher scores on this subscale represent greater body appreciation). The General Body Appreciation subscale has acceptable internal consistency and is negatively correlated with BMI (Swami & Chamorro-Premuzic, 2008). In the present study, Cronbach's α for this subscale was .94.

Muscle discrepancy. To measure current-ideal muscle discrepancy, we used the Muscle Silhouette Measure (MSM; Frederick et al., 2007). This figural rating scale presents 8 line-drawn silhouettes of the male form that increase linearly in muscularity. Participants were asked to rate the figure that they felt best represented their current body and the figure that best represented their ideal muscularity. All ratings were made on an 8-point scale ranging from 1 (*Least muscular figure*) to 8 *(Most muscular figure*). A measure of muscle discrepancy was computed as the difference between absolute (unsigned) current and ideal ratings, so that higher score reflect greater muscle discrepancy. (In practice, only 2.5% wanted to be less muscular, 10.1% wanted no change, and the remainder wanted to be more muscular.) Frederick et al. (2007) reported that the MSM has adequate construct validity.

Procedures

Ethics approval for this study was obtained from the relevant university ethics committee. Potential participants were recruited opportunistically by four research assistants from several large shopping complexes on weekdays between March and September 2015. Potential participants were invited to take part in a study on men's health and were given an information sheet about the study. If they agreed to participate, they were asked to provide written informed consent and were provided with a paper-and-pencil questionnaire, which

they completed in a dedicated quiet area set up for the purposes of the study. The order of presentation of the scales above was pre-randomised for each participant and the questionnaire itself was anonymous. Completed questionnaires were returned to the research assistants and participants were then provided with a debrief sheet containing further information about the study and contact details of the authors. All participants took part of a voluntary basis and were not remunerated for participation.

Analytic Strategy

CFAs were conducted using the Analysis of Moment Structures Program (AMOS v.21; Arbuckle, 2012) to examine the factorial structure of the DMS. The original two-dimensional, model consisting of Muscularity-Oriented Body Image Attitudes and Muscularity-Oriented Behaviours factors was assessed (McCreary et al., 2004). Further, a single-factor model where all items loaded onto a single latent variable was assessed to examine the factorial validity of this model McCreary et al., 2004).

Standard goodness-of-fit indices were selected *a priori* to assess the measurement models (e.g., Brown & Cudeck, 1993; Hu & Bentler, 1999). The normed model chi-square (χ^2_{normed}) is reported with lower values of the overall model chi-square indicate goodness-of-fit. A χ^2_{normed} value of < 3.00 indicates good fit (Hu & Bentler, 1999). The Steiger-Lind root mean square error of approximation (RMSEA) and its 90% confidence interval provide a correction for model complexity. RMSEA values close to .06 indicate a good fit (Hu & Bentler, 1999), with values ranging to .10 representing a mediocre fit (MacCallum et al, 1996). The SRMR is a badness-of-fit index: the smaller the SRMR, the better the model fit. A cut-off value for SRMR is recommended to be “close to” or < .09 (Hu & Bentler, 1999, p. 27). The comparative fit index (CFI) measures the proportionate improvement in fit by comparing a target model with a more restricted, nested baseline model. The CFI reflects a goodness-of-fit index and is recommended to “close to” or > .95 for adequate fit (Hu &

Bentler, 1999, p. 27). Even so, these recommended cut-off values should be considered subjective guidelines (Heene, Hilbert, Draxler, Zeigler, & Bühner, 2011; Marsh et al., 2011). When comparing models, the Akaike information criterion (AIC) provides a better measure to compare factor structures, with the lowest AIC value being preferred (Hair, Anderson, Tatham, & Black, 1998). We also examined standardised parameter estimates. Factor loadings for CFA were interpreted using Comrey and Lee's (1992) recommendations (i.e., > .71 = excellent, > .63 = very good, > .55 = good, > .45 = fair, and > .32 = poor). As a measure of internal consistency, we computed Cronbach's α, with values of .70 and greater considered acceptable (Kline, 1999). Finally, to assess convergent validity, we computed bivariate correlations between DMS-derived scores and self-esteem, body appreciation, muscle discrepancy, and BMI. According to Cohen (1992), correlations of .10 are considered small, correlations of .30 are considered medium, and correlations of .50 are considered large.

Results

Confirmatory Factor Analysis

First, we examined the factorial validity of the two-dimensional model (McCreary et al., 2004). This model had adequate fit with these data: $\chi^2(86, N = 159) = 188.92$, CFI = .932, RMSEA = .087 (low = .070, high = .104), SRMR = .082, AIC = 256.918, $\chi^2_{\text{normed}} = 2.20$. Next, we tested a one-dimensional model in which all items loading onto one latent factor. This model did not fit these data: $\chi^2(87, N = 159) = 376.01$, CFI = .808, RMSEA = .145 (low = .130, high = .160), SRMR = .118, AIC = 442.008, $\chi^2_{\text{normed}} = 4.32$. Therefore, from the two models under examination, the two-factor model (McCreary et al., 2004) had the best overall fit with these data. Further, the standardised estimates of factor loadings for the best-fitting model were all good-to-very good (see Figure 1).

Internal Consistency and Construct Validity

We computed subscale scores for the Attitudes and Behaviours subscales by taking the mean of items associated with each factor. Excellent levels of internal consistency were observed for the Attitudes (α = .91) and Behaviours subscales (α = .90). The two subscales were strongly correlated with each other, $r = .56$, $p < .001$. To examine convergent validity, we computed bivariate correlations between these subscale scores and self-esteem, body appreciation, muscle discrepancy, and BMI. As can be seen in Table 1, both Attitudes and Behaviours scores were significantly and negatively correlated with self-esteem, body appreciation, and BMI, and positively correlated with muscle discrepancy. The strength of the correlations was small for self-esteem and BMI, small-to-moderate for body appreciation, and moderate for muscle discrepancy.

Discussion

The main aim of the present study was to assess the factor structure of a Malay translation of the DMS using CFA on a community sample of Malay men. Our results indicated that the two-factor model proposed by McCreary et al. (2004) had adequate fit in the present sample. This is consistent with previous reports that this two-factor structure had adequate-to-good fit in Argentine (Compte et al., 2015), German, (Waldorf et al., 2014), and Mexican (Escoto et al., 2013). It is also broadly consistent with the derived factor structure in Brazilian men (Campana et al., 2013), although in that study three items were deleted to reach adequate fit. Unlike in the parent study (McCreary et al., 2004) and in Brazilian men (Campana et al., 2013), but consistent with other samples including Scottish men (McPherson et al., 2010), we found that item #10 loaded onto the Behaviours subscale of the DMS. Overall, the present data indicate that the two-factor structure of DMS is appropriate for Malay men.

Our additional analyses indicated that the two DMS subscales were significantly correlated with each other, which is again consistent with previous work. However, when we

tested a one-dimensional model where all items loaded onto a single latent variable, our results indicated poor fit. McCreary et al. (2004) had previously reported that DMS subscale scores loaded onto a single higher-order factor, but other previous studies do not appear to have used CFA to examine the fit of a one-dimensional model. Our data indicate that this one-dimensional model has poor fit and we would, therefore, caution against using total DMS scores for Malay men. In fact, we believe this advice should be considered by scholars using the DMS in other cultural groups: the fact that the two DMS subscale are significant correlated is not *prima facie* evidence of the adequacy of a one-dimensional model. If scholars wish to use total DMS scores in their analyses, they would do well to first examine the fit of a one-dimensional structure in their sample.

The present data also indicated that the DMS subscales had excellent internal consistencies, which is consistent with previous translational reports (e.g., Campana et al., 2013; Compte et al., 2015). In addition, we found significant correlations between both DMS subscales and muscle discrepancy, body appreciation, self-esteem, and respondent BMI. Each of these relationships was in the expected direction, thus providing evidence for the convergent validity of the Malay DMS. Although when taken together the present data provide evidence of good psychometric properties for the Malay DMS, it would be useful to further investigate other indices of validity. For example, it would be informative to examine correlations between DMS subscales and drive for thinness, given previous evidence that these constructs are only weakly correlated (Compte et al., 2015). Likewise, it will be important for future research to examine the test-retest reliability of the Malay DMS.

Another limitation of the present work includes the possibility of sampling biases introduced by our recruitment method. Although our sample does have the benefit of not being limited to university students, it is possible that systematic biases were introduced by only sampling men who frequented our recruitment sites. Likewise, although our sample size

was adequate even by conservative estimates of good sample-to-item ratios (Nunnally, 1978), it would be useful to replicate our findings with larger, more representative samples. In a similar vein, an important next step for future research will be to investigate the factorial validity of the Malay DMS in Malaysian men of other ethnic groups. This is important given that previous studies have indicated significant, albeit small, differences in body image indices in the Malaysian context, at least in women (Swami, Tovée, et al., 2013).

Other limitations of our design concern the use of scales used to establish convergent validity. In terms of body appreciation, for example, it is important to note that that a new version of the BAS is now available (Tylka & Wood-Barcalow, 2015). We were unable to use this revised measure because it has not been validated for use among Malay-speaking populations. Likewise, line-drawn figural rating scales are known to suffer from poor ecological validity (Swami, Salem, Furnham, & Tovée, 2008) and it would, therefore, be useful for future research to use more realistic scales that depict variation in both muscularity and body fat (e.g., Novella, Gosselin, & Danowski, 2015). Finally, while the focus of the present study was on the DMS, it should be noted that other drive for muscularity scales are available (see Tod et al., 2012). Future research could concurrently examine the psychometric properties of alternative drive for muscularity measures, bearing in mind issues of shared conceptual space.

Setting aside these limitations for the moment, the present study adds to the handful of studies that have examined the psychometric properties of the DMS outside English-speaking samples. Our data indicate that, in Malay men from Malaysia, the DMS has a two-factor structure similar to that reported in other cultural settings. This is noteworthy for two reasons. First, it allows for appropriate cross-cultural comparisons of DMS scores, at least at the subscale level. Second, and more broadly, it adds to the growing list of validated body image scales that are available for use among Malay-speaking populations. As such, we hope

that the availability of the DMS will allow for systematic investigations of men's body image concerns in this population.

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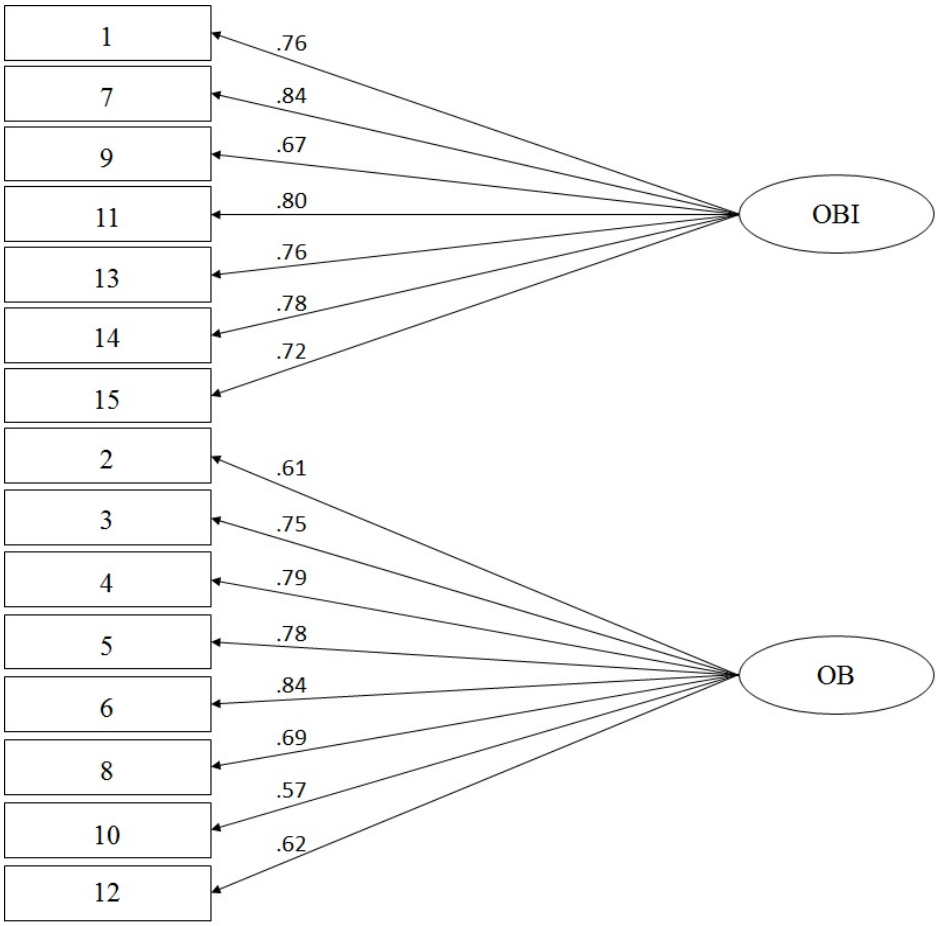
Table 1. *Means, Standard Deviations, and Inter-Correlations between Variables.*

	(1)	(2)	(3)	(4)	(5)	(6)
(1) DMS Attitudes		.56**	-.15*	-.22*	.36**	-.17*
(2) DMS Behaviours			-.16*	-.38**	.42**	-.16*
(3) Self-esteem				.42**	-.08	.11
(4) Body appreciation					-.08	.03
(5) Muscle discrepancy						.09
(6) Body mass index						
M	3.21	2.61	2.64	3.62	1.65	22.93
SD	1.03	0.99	0.25	0.59	1.13	2.94

Note: $N = 159$; DMS = Drive for Muscularity Scale; * $p < .05$, ** $p < .001$.

Figure 1



Model of Best Fit for the DMS with Standardised Estimate Loadings. Note: OBI = Muscularity Oriented Body Image, OB = Muscularity Oriented-Behaviour.