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Assessing the Measurement Invariance of Two Positive Body Image Instruments in Adults from Malaysia and the United Kingdom

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**Abstract**

Despite the growth of positive body image research in recent years, our understanding of the construct across different national contexts remains limited. Here, we investigated measurement invariance of the Body Appreciation Scale-2 (BAS-2) and the Functionality Appreciation Scale (FAS) across ethnically homogenous groups of adults from Malaysia (*n* = 815, women *n* = 403) and the United Kingdom (UK; *n* = 596, women *n* = 416). Using multi-group confirmatory factor analysis, partial scalar invariance was supported for scores on both measures after fixing the intercepts for BAS-2 Items 6 and 8, and FAS Item 4. Next, we examined differences in latent scores across nationality and gender. The results of an analysis of covariance (with age and body mass index as covariates) indicated a significant nationality by gender interaction: Malaysian women had higher scores than Malaysian men on both the BAS-2 and FAS, but UK men had higher scores than UK women. There were also significant main effects of nationality (Malaysian participants had significantly higher body appreciation and functionality appreciation than UK participants) and gender (men had significantly higher body appreciation than women). These findings are discussed in terms of cross-national and gendered understandings of positive body image.

*Keywords:* Positive body image, Cross-national, Body appreciation, Functionality appreciation, Gender invariance

**1. Introduction**

Tylka (2018, p. 9) defined *positive body image* as an “overarching love and respect for the body” that includes appreciation of the body and its functions, acceptance of the body despite its imperfections, and body-protective behaviours. Positive body image is a multidimensional construct, with *body appreciation* (i.e., the extent to which individuals feel respect and appreciation for their bodies; measured using the Body Appreciation Scale-2 [BAS-2]; Tylka & Wood-Barcalow, 2015) and *functionality appreciation* (i.e., the extent to which an individual is appreciative of the body’s functions; measured using the Functionality Appreciation Scale [FAS]; Alleva et al., 2017) forming core facets (Swami et al., 2020). In tandem with the growth of research on positive body image, there is increasing interest in examining differences in latent scores across different populations (Swami, 2018). However, a prerequisite of any meaningful comparison of latent scores across groups is ensuring that the measure is capturing the same construct (i.e., *measurement invariance*) across those groups (Chen, 2008).

To date, much of the available body appreciation literature has focused on establishing measurement invariance across gender within specific national groups (e.g., partial scalar invariance across gender was found for BAS-2 scores in Malaysia; Swami, Mohd. Khatib et al., 2019), which has allowed for examinations of gender differences in latent scores (see He et al., 2020). In contrast, only two studies have examined measurement invariance across national groups and both were limited to adolescents. First, a study of adolescents from Denmark, Portugal, and Sweden established partial scalar invariance of the 1-dimensional model of BAS-2 scores (Lemoine et al., 2018). Comparison of latent scores indicated that cross-national differences were negligible. A more recent study of adolescents from Argentina, Colombia, and Mexico established full measurement invariance of BAS-2 scores (Góngora et al., 2020). Comparison of latent scores indicated significantly higher mean scores in the Colombian group, followed by the Mexican group, and the Argentinian group, but the effect size was small.

Beyond adolescent samples, a number of studies have examined latent mean differences in body appreciation scores in adults from different national settings (e.g., Jung & Hwang, 2015; Swami & Ng, 2015; Swami et al., 2016), but these studies did not first establish measurement invariance across groups. In contrast, the construct of functionality appreciation has received scant attention outside North America and Western Europe. To date, only one psychometric assessment of the FAS has been conducted with a non-English-speaking sample: Swami, Todd and colleagues (2019) found FAS scores to be 1-dimensional in a sample of Malaysian adults. As this finding is consistent with the factor structure of FAS reported in samples from the United States (Alleva et al., 2017), it is possible that the FAS may be invariant across English- and Malay-speaking samples, which could facilitate a meaningful between-group comparison. To summarise, the extant research examining facets of positive body image across national groups remains very limited in terms of the BAS-2 and is currently non-existent in terms of the FAS.

As a contribution to this literature, we examined whether BAS-2 and FAS scores would demonstrate measurement invariance across adults from Malaysia and the United Kingdom (UK). These sites were chosen primarily because comparable data is available for analyses, but also because they represent distinct national and cultural groups (Malaysia: Eastern, newly industrialised market economy, undergoing a nutrition transition; UK: Western, high-income economy, Westernised pattern of diets). As a preliminary hypothesis based on previous research (e.g., Góngora et al., 2020), we expected to be able to demonstrate full measurement invariance (at the configural, metric, and scalar levels) for both measures. To the extent that measurement invariance was supported, we intended to examine group differences in latent BAS-2 and FAS scores across nationality and gender. This aspect was more exploratory, although previous research (Góngora et al., 2020; Lemoine et al., 2018) led us to expect negligible-to-small differences.

**2. Method**

**2.1. Participants and Procedures**

 Data (i.e., BAS-2 and FAS scores, as well as demographic data consisting of gender, age, ethnicity, and body mass index [BMI]) for the present study were obtained from two published studies utilising online samples: Todd and colleagues (2019) and Swami, Todd and colleagues (2019). We included participants who self-identified as being of British White ancestry from Todd and colleagues (2019; *N* = 596, women *n* = 416 or 69.7%) and participants who self-identified as being of Malaysian Malay ancestry from Swami, Todd and colleagues (2019; *N* = 815, women, *n* = 403 or 49.4%). These subsamples were selected to represent the majority ethnic group in each national context. Full procedural information is available in the parent studies.

**2.2. Measures**

**2.2.1. Body appreciation.** Participants completed the 10-item Body Appreciation Scale-2 (BAS-2; Tylka & Wood-Barcalow, 2015) in either English or Malay (Malay translation: Swami, Mohd. Khatib et al., 2019). The BAS-2 assesses the extent to which individuals respect and appreciate for their bodies, and hold positive opinions about their bodies regardless of actual physical appearance. BAS-2 items were rated from 1 (*never*) to 5 (*always*), and an overall score was computed as the mean of all items (higher scores indicated greater body appreciation). BAS-2 items have been found to reduce to a single factor, are invariant across gender, and have adequate internal consistency, as well as good patterns of convergent and discriminant validity in both English- (Tylka & Wood-Barcalow, 2015) and Malay-speaking samples (Swami, Mohd. Khatib et al., 2019). In this study, ω for BAS-2 scores in the total sample was .96 (95% CI = 92, .97; Malaysian sample: .92, 95% CI = .91, .93; UK sample: .97, 95% CI = .95, .98).

**2.2.2. Functionality appreciation.** Participants completed the 7-item Functionality Appreciation Scale (FAS; Alleva et al., 2017) in either English or Malay (Malay translation: Swami, Todd et al., 2019). The FAS assesses the extent to which an individual is appreciative of their body for the functions it can perform or is capable of performing. FAS items were rated from 1 (*strongly disagree*) to 5 (*strongly agree*) and an overall score was computed as the mean of all items (higher scores indicated greater functionality appreciation). FAS items have been found to reduce to a single factor, are invariant across gender, have adequate internal consistency, and good patterns of convergent and incremental validity in both English- (Alleva et al., 2017) and Malay-speaking samples (Swami, Todd et al., 2019). In this study, ω for FAS scores in the total sample was .93 (95% CI = .90, .95; Malaysian sample: .91, 95% CI = .89, .93; UK sample: .92, 95% CI = .91, .93).

**3. Results**

**3.1. Preliminary Analyses**

There were significant differences across national groups in age, *t*(1409) = 9.90, *p* < .001, *g* = 0.53, and BMI, t(1409) = 8.03, *p* < .001, *g* = 0.43, with the UK sample being both significantly older (*M* = 39.32, *SD* = 11.77, versus *M* = 33.89, *SD* = 8.80) and higher in BMI (*M* = 27.29, *SD* = 6.04, versus *M* = 24.81, *SD* = 5.48) than the Malaysian sample. Therefore, we included age and BMI as covariates in later analyses.

**3.2. BAS-2 Measurement Invariance**

The BAS-2 data were neither univariate (Shapiro Wilk’s *p* < .001) nor multivariate normal (Mardia’s skewness = 1525.24, *p* < .001; Mardia’s kurtosis = 55.86, *p* < .001). Therefore, parameter estimates were obtained using the robust maximum likelihood method with the Satorra-Bentler correction (Satorra & Bentler, 2001). We used indicative fit indices summarised by Swami and Barron (2019) to assess the baseline model fit. In addition, we used ΔCFI < .01 as an indicator of metric invariance (Cheung & Rensvold, 2002). For scalar invariance, Chen (2007) suggested that invariance is supported when ΔCFI < .01 and ΔRMSEA < .015 *or* ΔSRMR < .030, although other scholars have suggested that ΔCFI < .01 is sufficient (Cheung & Rensvold, 2002; Meade et al., 2008). Because full scalar invariance may be an unrealistic goal (Davidov et al., 2014), we also allowed for partial scalar invariance, which involves freeing constraints that are not equivalent between groups at any previous stage. Partial scalar invariance allows for comparison of latent means across groups (Davidov et al., 2012).

The fit of the 1-factor model for the total sample was acceptable across all indices: SB*χ*²(35) = 138.21, SB*χ*²normed = 3.94, robust RMSEA = .077 (90% CI = .068, .086), SRMR = .023, robust CFI = .975, robust TLI = .968, BL89 = .974. The fit for each of the national samples was also acceptable, UK: SB*χ*²(35) = 135.97, SB*χ*²normed = 3.88, robust RMSEA = .076 (90% CI = .062, .089), SRMR = .030, robust CFI = .976, robust TLI = .969, BL89 = .976; Malaysia: SB*χ*²(35) = 150.05, SB*χ*²normed = 4.29, robust RMSEA = .081 (90% CI = .068, .094), SRMR = .035, robust CFI = .969, robust TLI = .958, BL89 = .958.

Next, we tested for measurement invariance across the UK and Malaysian participants using multi-group confirmatory factor analysis (Chen, 2007). As can be seen in Table 1, configural and metric invariance were supported, but scalar invariance was not. After fixing the intercepts for Items #6 and 8, partial scalar invariance was supported across UK and Malaysian adults.

**3.2. FAS Measurement Invariance**

The FAS data were neither univariate (Shapiro Wilk’s *p* < .001) nor multivariate normal (Mardia’s skewness = 2769.94, *p* < .001; Mardia’s kurtosis = 93.57, *p* < .001), so parameter estimates were again obtained using the robust maximum likelihood method with the Satorra-Bentler correction (Satorra & Bentler, 2001). The fit of the 1-factor model for the total sample was acceptable across all indices: SB*χ*²(14) = 38.52, SB*χ*²normed = 2.75, robust RMSEA = .048 (90% CI = .030, .067), SRMR = .017, robust CFI = .992, robust TLI = .988, BL89 = .991. The fit for each of the national samples was also acceptable, UK: SB*χ*²(14) = 28.65, SB*χ*²normed = 2.05, robust RMSEA = .054 (90% CI = .025, .082), SRMR = .027, robust CFI = .989, robust TLI = .983, BL89 = .988; Malaysia: SB*χ*²(14) = 31.21, SB*χ*²normed = 2.23, robust RMSEA = .057 (90% CI = .030, .083), SRMR = .021, robust CFI = .989, robust TLI = .983, BL89 = .985.

Next, we tested for measurement invariance across the UK and Malaysian participants (see Table 1 for full metrics). As can be seen, configural and metric invariance were supported, but scalar invariance was not. After fixing the intercept for Item 4, partial scalar invariance was supported across UK and Malaysian adults.

**3.3. Latent Mean Comparisons**

Because full or partial measurement invariance across gender has previously been established for both the BAS-2 (Swami, Mohd. Khatib et al., 2019; Tylka & Wood-Barcalow, 2015) and FAS (Alleva et al., 2017; Swami, Todd et al., 2019), we proceeded to examine latent mean scores using 2 x 2 ANCOVAs. BAS-2 and FAS scores, respectively, were entered as dependent variables, national group (UK versus Malaysian) and gender (women versus men) were entered as between-subjects variables, and BMI and age entered as covariates. As a measure of effect size, we used Cohen’s (1988) benchmarks, where ηp2 of .01 is small, .06 is medium, and .14 is large.

In terms of the BAS-2, results indicated that BMI, *F*(1, 1405) = 65.94, *p* < .001, ηp2 = .05, and age, *F*(1, 1405) = 6.32, *p* = .012, ηp2 < .01, were significant covariates. The interaction between national group and gender was significant, *F*(1, 1405) = 17.53, *p* < .001, ηp2 = .01, with Malaysian women reporting greater body appreciation than Malaysian men, but UK men reporting greater body appreciation than UK women. In addition, there were significant main effects of national group, *F*(1, 1405) = 395.48, *p* < .001, ηp2 = .22, and gender, *F*(1, 1405) = 6.79, *p* = .009, ηp2 = .01, with Malaysian participants reporting greater body appreciation than UK participants, and men’s mean body appreciation greater than women’s mean body appreciation (see Table 2).

For functionality appreciation, the results indicated that BMI was a significant covariate, *F*(1, 1405) = 7.27, *p* = .007, ηp2 = .01, whereas age was not, *F*(1, 1405) = 2.63, *p* = .105, ηp2 < .01. The interaction between national group and gender was significant, *F*(1, 1405) = 4.84, *p* = .028, ηp2 < .01, with Malaysian women reporting greater functionality appreciation than Malaysian men, but UK men reporting greater functionality appreciation than UK women. The main effect of national group was significant, *F*(1, 1405) = 102.18, *p* < .001, ηp2 = .07 (Malaysian participants had significant higher functionality appreciation than UK participants), but the main effect of gender was not, *F*(1, 1405) = 0.70, *p* = .402, ηp2 < .01 (see Table 2).

**Discussion**

The present study is the first to examine measurement invariance of two positive body image facets in adults from different national and culturally distinct groups. We found that both BAS-2 and FAS scores evidenced partial scalar invariance across the two national groups. In broad outline, this is consistent with previous cross-national work with adolescents, where either partial measurement invariance (Lemoine et al., 2018) or full measurement invariance (Góngora et al., 2020) was established. This allowed us to compare latent mean scores across nationality and gender, which showed that UK men had higher body and functionality appreciation than UK women, whereas Malaysian women had higher scores on both facets compared to Malaysian men. While the former result is consistent with the research conducted in North America (Alleva et al., 2017; Tylka & Wood-Barcalow et al., 2015; see also He et al., 2020), the latter requires some commentary.

One possibility is that the lived experiences of Malaysian Malay women – such as cultural and religious conservatism, greater religiosity, more traditional family values, and a de-emphasised ethos of working on the body (Swami, 2015) – help to promote positive body image. Another possibility is that Malaysian Malay men are less attuned to care and respect their bodies, as well as the functionality of their bodies, because masculinity norms focus men’s attention elsewhere (e.g., the attainment of psychological well-being through non-corporeal means, such as occupational success). Of course, in the absence of further data, our explanations remain conjecture. It should also be noted that the effect sizes of the interactions were negligible-to-small, and any differences in latent mean scores do not reflect meaningful, real-world differences.

Between-group comparisons indicated a main effect of nationality, with Malaysian participants having higher BAS-2 and FAS scores than UK participants. Again, a de-emphasised ethos of body work in the developing context of Malaysia may facilitate positive body image, although we again suggest more work needs to be done to better understand this difference. Effects sizes in this case were medium (i.e., FAS) and large (i.e., BAS-2) by Cohen’s (1988) standards and, indeed, were larger than the negligible-to-small effect sizes reported in previous cross-national comparisons (Góngora et al., 2020; Lemoine et al., 2018). One reason for the larger cross-national differences reported in the present study may be that previous studies utilised culturally- or geographically similar populations, whereas we utilised two national groups that were substantively different both in terms of geographic location (i.e., Eastern versus Western) and socio-economic development (i.e., newly-industrialised versus high-income).

While a strength of the present study was the cross-national comparison of two geographically distinct populations, it is not clear whether our findings are generalisable to ethnic minority groups in Malaysia and the UK, given that both samples were ethnically homogenous. We also cannot rule out the possibility that cross-sample differences in un-measured constructs (e.g., degree of acculturation, socioeconomic status) affected our results, and the finding that BMI (and age in the case of the BAS-2) emerged as a significant covariate certainly adds to the complexity of interpreting our findings. Nevertheless, the present work makes an important contribution to knowledge on positive body image across diverse national contexts. As research on positive body image continues to grow, we encourage greater attention to issues of measurement invariance and latent mean comparisons across national groups. Such research is likely to provide important insights into the construct of positive body image across diverse social identity groups.

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Table 1.

*Measurement Invariance Across National group for the Body Appreciation Scale-2 and the Functionality Appreciation Scale*

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Measure | Model | SB*χ*² | *df* | Robust CFI | Robust RMSEA | SRMR | Model Comparison | ΔSB*χ*² | Δ*df* | ΔRobust CFI | ΔRobust RMSEA | ΔSRMR |
| BAS | Configural | 287.66 | 70 | .968 | .079 | .030 |  |  |  |  |  |  |
|  | Metric | 356.65 | 79 | .961 | .082 | .062 | Configural vs metric | 68.99\* | 9 | .007 | .003 | .032 |
|  | Scalar | 717.12 | 88 | .917 | .113 | .101 | Metric vs scalar | 360.47\* | 9 | .044 | .031 | .039 |
|  | Partial scalar: Item 6 | 499.08 | 87 | .944 | .093 | .075 | Metric vs partial scalar | 142.43\* | 8 | .017 | .011 | .013 |
|  | Partial scalar 2: Items 6 and 8 | 474.41 | 86 | .951 | .092 | .072 | Metric vs partial scalar 2 | 117.76\* | 7 | .010 | .010 | .010 |
| FAS | Configural | 60.07 | 28 | .989 | .055 | .021 |  |  |  |  |  |  |
|  | Metric | 87.95 | 34 | .980 | .063 | .049 | Configural vs metric | 27.88\* | 6 | .009 | .008 | .028 |
|  | Scalar | 150.51 | 40 | .962 | .080 | .062 | Metric vs scalar | 62.56\* | 6 | .018 | .017 | .013 |
|  | Partial scalar: Item 4 | 123.66 | 39 | .974 | .072 | .056 | Metric vs partial scalar | 35.71\* | 5 | .006 | .009 | .007 |

*Note. N* = 1411; United Kingdom= 596 (women *n* = 416, men *n* = 180), Malaysia = 815 (women *n* = 403, men *n* = 412); CFI = comparative fit index; RMSEA = Steiger-Lind root mean square error of approximation; SRMR = standardised root mean square residual; SB = Satorra-Bentler. \* *p* < .001.

Table 2.

*Descriptive Statistics for the Analyses of Variance.*

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Variable | National group | Gender | *N* | *M* | *SD* |
| Body appreciation | United Kingdom | Women | 416 | 3.03 | 0.84 |
|  |  | Men | 180 | 3.37 | 0.85 |
|  |  | Total | 596 | 3.14 | 0.86 |
|  | Malaysian | Women | 403 | 4.17 | 0.67 |
|  |  | Men | 412 | 4.08 | 0.76 |
|  |  | Total  | 815 | 4.12 | 0.72 |
|  | Total | Women | 819 | 3.59 | 0.95 |
|  |  | Men | 592 | 3.87 | 0.85 |
|  |  | Grand average | 1411 | 3.71 | 0.92 |
| Functionality appreciation | United Kingdom | Women | 416 | 3.94 | 0.69 |
|  |  | Men | 180 | 4.07 | 0.62 |
|  |  | Total | 596 | 3.98 | 0.67 |
|  | Malaysian | Women | 403 | 4.43 | 0.61 |
|  |  | Men | 412 | 4.38 | 0.71 |
|  |  | Total | 815 | 4.40 | 0.66 |
|  | Total | Women | 819 | 4.18 | 0.70 |
|  |  | Men | 592 | 4.28 | 0.70 |
|  |  | Grand average | 1411 | 4.23 | 0.70 |