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Brief research report

An examination of the factor structure and sex invariance of a French translation of the Body Appreciation Scale-2 in university students

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ABSTRACT

The Body Appreciation Scale-2 (BAS-2) is a measure of positive body image that has been found that have a one-dimensional factor structure in a number of different cultural groups. Here, we examined the factor structure and sex-based measurement invariance of a French translation of the BAS-2. A total of 652 university students (age $M = 21.33$, $SD = 3.18$) completed a newly-translated French version of the BAS-2. Exploratory factor analyses with a randomly selected split-half subsample revealed that the BAS-2 had a one-dimensional factor structure in both sexes. Confirmatory factor analyses with a second split-half subsample indicated that the one-dimensional factor structure had adequate fit following modifications and was invariant across sex. French BAS-2 scores had adequate internal consistency and men had significantly higher body appreciation than women ($ds = .16–.23$). These results provide preliminary support for the factorial validity of the French BAS-2.

1. Introduction

Body appreciation refers to favourable opinions of one's body, bodily acceptance and respect, and protective cognitive styles that reject unrealistic appearance ideals (Tylka & Wood-Barcalow, 2015a). Traditionally, the construct has been measured using the Body Appreciation Scale (BAS; Avalos, Tylka, & Wood-Barcalow, 2005), but this scale lacks cross-cultural factorial equivalence (e.g., Ng, Barron, & Swami, 2015; for review, see Swami, 2017; Webb, Wood-Barcalow, & Tylka, 2015). Motivated in part by this issue, as well developments in the conceptualization of positive body image, Tylka and Wood-Barcalow (2015b) prepared a revision of the scale, the 10-item BAS-2. In U.S. college and community samples, Tylka and Wood-Barcalow (2015b) reported that BAS-2 scores had a one-dimensional factor structure using both exploratory and confirmatory factor analyses. They also reported that BAS-2 scores were invariant across sex, had good test-retest reliability up to three weeks, and had good patterns of convergent, discriminant, and incremental validity.

Scholars have begun to examine the factor structure of the BAS-2 in different national and linguistic groups. Studies using exploratory factor analyses (EFAs) have indicated that all 10 items of the BAS-2 load onto the same latent dimension in Cantonese-speaking college students (Swami & Ng, 2015), Persian-speaking college students (Atari, 2016), Dutch-speaking college women (Alleva, Martijn, Veldhuis, & Tylka, 2016), as well as Serbian-speaking (Jovic, Sforza, Jovanovic, & Jovic, 2016) and Icelandic-speaking community samples (Pálmarsdóttir & Karlsdóttir, 2016). In these studies, BAS-2 scores also had adequate internal consistency coefficients and good patterns of convergent validity. Likewise, Swami, Ng, and Barron (2016) prepared a Standard Chinese translation of the scale and reported, using confirmatory factor analysis (CFA), that the one-dimensional factor structure had adequate fit in a mixed college staff-and-student sample. Swami et al. (2016) also reported that BAS-2 scores were invariant across sex and had adequate indices of convergent validity. Finally, a Portuguese translation of the BAS-2 has been prepared (Marta-Simões, Ferreira, & Mendes, 2016), but its factor structure has not been examined (a one-factor solution was assumed).

Taken together, these studies provide evidence for the factorial equivalence of the BAS-2 in different linguistic groups. As a contribution to this literature, we examined the factor structure and sex-based measurement invariance of a French translation of the BAS-2 in Parisian university students. Based on the aforementioned literature, we expected that French BAS-2 scores would have a one-dimensional factor structure using both EFA and CFA. In addition, we expected that the one-dimensional structure would

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be invariant across respondent sex. Previous studies that have compared BAS-2 across sex have reported that men have significantly higher body appreciation than women, although effect sizes mostly been small (*ds* = .15–.58; Atari, 2016; Swami & Ng, 2015; Tylka & Wood-Barcalow, 2015b). Likewise, we hypothesised that men in the present study would have significantly higher body appreciation than women, but that the magnitude of the effect would be small.

2. Method

2.1. Participants

Participants of this study were 350 female and 302 male university students from the Pantheon Sorbonne University in Paris, France. Participants ranged in age from 17 to 51 years (M = 21.33, SD = 3.18) and in self-reported BMI from 14.53 to 40.54 kg/m^2 (M = 21.82, SD = 3.28).

2.2. Measures

2.2.1. Body appreciation. Participants completed a French translation of BAS-2 (Tylka & Wood-Barcalow, 2015b). English and French items of the BAS-2 are presented in Supplementary Table 1. All items were rated on a 5-point scale, ranging from 1 (*Never*) to 5 (*Always*).

2.2.2. Demographics. Participants provided their demographic details consisting of sex, age, height, and weight. Self-reported BMI was computed using weight and height data as kg/m^2.

2.3. Procedures

Once ethics approval was obtained, we prepared a French translation of the BAS-2 from the parent English version using the standard back-translation technique (Brislin, 1970). The first author translated the scale into French from English and an independent translator unaffiliated with the study then back-translated the scale into English, with minor discrepancies settled through consensus. The study was advertised on campus locations in November 2016 and invited participation for a study on health and appearance from French nationals. Those who agreed to participate provided written informed consent and individually completed an anonymous paper-and-pencil version of the questionnaire in a laboratory setting. Participation was voluntary and respondents did not receive any remuneration for participation. Upon return of the completed questionnaires, participants were given a written debriefing.

2.4. Statistical analyses

We used a two-step procedure to examine the factor structures of the BAS-2 (DeVellis, 2003). First, data from one split-half of the sample (n = 326) were randomly selected via a computer-generated random seed. The factor structure of the BAS-2 was assessed in this sample using principal-axis EFA in IBM SPSS Statistics v.23. This method allowed us to test for the best-fitting model for our dataset, without a priori limitations in terms of modelling. The sample size met conservative sample size requirements for EFA (Tabachnick & Fidell, 2013). Because we expected a single, orthogonal factor, a quartimax rotation was used (Pedhazur & Schmelkin, 1991). The number of factors to be extracted was determined by factor eigenvalues (λ) above 1.0 (the EGV1 criterion) and examination of the scree-plot, which are adequate criteria when a single factor is expected (Preacher & MacCallum, 2003). Factor loadings were interpreted using Tabachnick and Fidell's (2013) recommendations (i.e., >.71 is excellent, >.63 is very good, >.55 is good, >.45 is fair, and >.32 is poor).

Data from the second split-half subsample (n = 326) were subjected to CFA using Analysis of Moment Structures (AMOS v.23). Hypothesised modelling was based on the results of the earlier EFA. Standard goodness-of-fit indices were selected a priori to assess the measurement models (Hu & Bentler, 1999). The normed model chi-square (X^2_{normed}) is reported with lower values of the overall model χ^2 indicating goodness-of-fit. A X^2_{normed} value of <3.00 indicates good fit. 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, with values ranging to .10 representing a mediocre fit. The standardised root mean square residual (SRMR) assesses the mean absolute correlation residual and 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. 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.

To determine whether the BAS-2 was invariant across sex, we tested for invariance at the configural (i.e., whether similar factors are measured), factor loading (i.e., whether the magnitude of factor loadings is the same), and intercept (i.e., whether the intercept of the regression relating each item to its factor is the same) levels (Chen, 2007). We also examined sex differences in body appreciation scores in each split-half subsample, respectively, using independent-samples t-tests. For both subsamples, internal consistency coefficients were computed using Cronbach's α.

3. Results

3.1. Exploratory factor analyses

3.1.1. Female sample (n = 174). Descriptive statistics at the item level are presented in Table 1. All data passed standard criteria for item distribution, average correlation with other items, and item-total correlations (Clark & Watson, 1995). The Kaiser–Meyer–Olkin (KMO) measure of sampling adequacy was .91 and Bartlett's test of sphericity was significant, $\chi^2(45) = 1013.85$, $p < .001$. The results of principal-axis EFA for women indicated that only one factor had an eigenvalue >1.0 (λ = 5.77). This factor explained 57.7% of the total variance and all 10 items loaded adequately onto the primary factor adequately (see Table 1). Internal consistency in women was adequate (Cronbach's α = .92).

Table 1
Means (*SD*s) and item-factor loadings for women and men in the first split-half sample (n = 362).

Item	Male sample		Female sample		t	Sex effect d
	M (*SD*)	Loading	M (*SD*)	Loading		
1	3.66 (0.99)	.77	3.64 (0.99)	.64	0.19	0.02
2	3.53 (1.03)	.81	3.25 (1.00)	.82	2.47*	0.28
3	4.00 (0.81)	.72	3.78 (0.89)	.79	2.24*	0.22
4	3.71 (1.00)	.87	3.34 (0.98)	.81	3.38*	0.37
5	3.47 (1.06)	.71	3.35 (1.13)	.55	1.01	0.12
6	3.03 (1.18)	.70	2.80 (1.06)	.81	1.88	0.23
7	3.34 (1.07)	.70	2.97 (1.10)	.77	3.06*	0.37
8	3.34 (1.11)	.69	3.32 (1.06)	.63	0.17	0.02
9	3.61 (1.04)	.72	3.27 (1.03)	.83	2.97*	0.34
10	3.56 (1.03)	.74	3.24 (1.15)	.71	2.61*	0.32

* Significant at Bonferroni-corrected $p < .005$.