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Abstract

The study examined the cross-cultural validity of the short form of the Physical Self-Inventory (PSI-S) among samples of adolescents speaking French, Dutch, Turkish, Italian, and Arab. A total of 4867 adolescents (1173 Belgian Flemish, 598 French, 1222 Italian, 643 Turkish, 646 Kuwaiti, and 585 Tunisian) completed the original PSI-S version, and a revised version including a positively-worded reformulation of the three negatively-worded PSI-S items. The results supported the factor validity and reliability of revised PSI-S version across all cultural groups, and its superiority when compared to the original version. Compared to confirmatory factor analyses (CFA), relying on an exploratory structural equation modeling (ESEM) measurement model further resulted in superior solution, and more cleanly differentiated factors. PSI-S responses proved to be fully invariant across cultural groups, and presented no evidence of differential item functioning (DIF) as a function of age, gender, body mass index (BMI), and sport involvement. However, the results revealed meaningful mean level differences as a function of gender, age, sport involvement, and BMI that were mostly consistent with the results from previous studies.

Key words: physical self-concept, physical self-inventory, short form, exploratory structural equation modeling, ESEM, cross-cultural, French, Dutch, Turkish, Arab, Italian.

Highlights

- We assess the psychometric properties of a revised Physical Self Inventory-Short (PSI-S)
- This assessment relies on Exploratory Structural Equation Modeling (ESEM)
- Results support the psychometric properties of the French, Dutch, Turkish, Italian and Arab PSI-S
- No evidence of differential item functioning (age, gender, sport, body-mass index)
- Latent means differences across gender, age, sport and body-mass index

Physical self-concept has long been established as a critically important determinant and outcome of involvement, performance, and enjoyment in sports and physical activities, making it critical for sport and exercise researchers to be able to rely on strong short measures of this construct for inclusion in a variety of research settings (e.g., Babic et al., 2014; Marsh & Cheng, 2012; Sonstroem, Harlow, & Joseph, 1994). In Fox and Corbin's (1989) multidimensional and hierarchical physical self-concept model, the upper level is occupied by global self-worth (GSW), referring to the positive or negative way people feel about themselves as a whole. The intermediate level is occupied by physical self-worth (PSW), depicting general feelings of satisfaction and pride in one's physical self. The lowest level is then occupied by four more specific constructs: sport competence (SC; self-perceived athletic abilities and skills), physical condition (PC; self-perceived fitness, stamina, etc.), physical attractiveness (PA; self-perceived physical attractiveness), and physical strength (PS; self-perceived muscular strength).

To operationalize this model based on the aforementioned definitions, Fox and Corbin (1989) developed the *Physical Self-Perception Profile* (PSPP). Since then, the PSPP has been cross-validated in English-speaking adult samples (e.g., Hagger, Aşçı, & Lindwall, 2004), and cross-culturally adapted to several non-English European and Middle Eastern countries (e.g., Atzienga, Balaguer, Moreno, & Fox, 2004; Fonseca & Fox, 2002; Marsh, Aşçı, & Marco, 2002; Van de Vliet et al., 2002). However, a variety of concerns have been expressed about the PSPP. First, it assesses GSW using items from the Rosenberg Self-Esteem Inventory (RSEI; Rosenberg, 1965), which is associated with substantial method effects[1] due to the reliance on a mixture of negatively- and positively-worded items (Marsh, Scalas, & Nagengast, 2010). Second, many have argued that its structured alternative response scale (i.e., paired forced-choice rated on a 4-point scale) tended to be confusing for young respondents (Biddle, Page, Ashford, Jennings, Brooke, & Fox, 1993; Marsh, Richards, Johnson, Roche, & Tremayne, 1994), and to also be associated with method effects (Eiser, Eiser, & Haversmans, 1995; Marsh, Aşçı, et al., 2002; Marsh, Bar-Eli, Zach, & Richards, 2006). These criticisms have led to the development of an improved PSPP, specifically designed for North-American youth (Eklund, Whitehead, & Welk, 1997), which has been validated in non-English European countries (e.g., Aşçı, Eklund, Whitehead, Kirazci, & Koca, 2005; Moreno, Cervellò, Vear, & Ruiz, 2007). However, this version still relies on a structured alternative format answer scale.

Marsh, Richards, Johnson, Roche, and Tremayne's (1994) Physical Self-Description Questionnaire (PSDQ) provides a strong alternative for the assessment of multidimensional self-conceptions across a wide variety of cultures, age groups, and languages (for a review, see Marsh & Cheng, 2012). However, although it covers a few additional dimensions (health, coordination, body fat, flexibility) the PSDQ remains much longer (70 items) than the PSPP (30 items), making it impractical for large-scale studies seeking to maximize the amount of information collected with short instruments. Although a shorter 40-item version of the PSDQ (PDSQ-S) has been developed (Maïano, Morin, & Mascret, 2015; Marsh, Martin, & Jackson, 2010), it remains relatively long (i.e., 12 minutes) for research requiring a shorter measure.

Based on the PSPP and Fox and Corbin's (1989) conceptualization, the French Physical Self-Inventory (PSI) was developed to address these limitations (Ninot, Delignières, & Fortes, 2000). The original PSPP response format was replaced by a 6-point Likert scale (1: *not at all* to 6: *entirely*). Furthermore, the original GSW and PSW subscales were respectively replaced by five items from Coopersmith's (1967) Self-Esteem Inventory, and by five items from the Self-Description Questionnaire-III (Marsh & O'Neill, 1984). Maïano et al. (2008) then developed a short form of this instrument (PSI-S; 18 items, with 3 items per dimension), specifically for adolescents, and established support for the factor validity and reliability of this instrument in a sample of 1018 French adolescents (11-16 years). Maïano et al.'s (2008) study relied on Confirmatory Factor Analyses (CFA) performed in two independent subsamples, and demonstrated the scale score and test-retest reliability of the PSI-S subscales, the factorial validity of the PSI-S measurement model, and its invariance across gender. Their results also revealed meaningfully latent mean differences, showing that females presented a lower level than males on most PSI-S dimensions (GSW, PSW, SC, PA, and PS), confirming the results from prior research (Hagger, Biddle, & Wang, 2005; Marsh et al., 2006; Marsh, Hau, Sung, & Yu, 2007). More recently, Maïano et al. (2015) also demonstrated the convergent validity of the PSI-S with matching subscales from the PDSQ-S, supporting the idea that they taped into identical content, but relying on a different number of items.

As one of the shortest (i.e., 4-5 minutes) validated measures of multidimensional physical self-perceptions, the PSI is the only non-English instrument included in Marsh and Cheng's (2012) review of physical self-concept measures. Marsh and Cheng (2012) noted the importance of the PSI-S for applied research, but reinforced that research needed to address two critical limitations related to: (a) the high factor correlations between the PSI-S subscales, and (b) the fact that its applicability remained limited to French-speaking settings. The current study addresses these two limitations.

Factor Correlations, Discriminant Validity, and Cross-Loadings

Regarding the first limitation, the factor correlations reported by Maïano et al. (2008) are high enough to call into question their discriminant validity (r = .50 to .91). However, this issue is not limited to the PSI-S: High factor correlations seem to be the norm with PSPP-based instruments (e.g., Atzienga et al., 2004; Fox & Corbin, 1989; Hagger et al., 2004, 2005; Marsh et al., 1994, 2006). Initial interpretations of this result invoked the PSPP's structured alternative response scale (e.g., Marsh et al., 1994, 2006). However, this interpretation does not apply to the PSI-S, which uses Likert-type ratings. Furthermore, recent research suggests that structured alternative responses may perform better than previously anticipated when analyzed with proper measurement models (Arens & Morin, 2016).

Indeed, researchers have recently questioned the Independent Cluster Model (ICM) inherent in CFA, which forces all items to load on a single factor, for the assessment of conceptually-related constructs such as multidimensional self-concepts (Marsh, Morin, Parker, & Kaur, 2014; Morin, Marsh, & Nagengast, 2013). In psychometric terms, ICM restrictions force each item to be associated with one, and only one, source of true score variance (factors). At the core of classical test theory lies the notion that the indicators (items) used in psychometric measures tend to include more than one source of true score variance. In particular, whenever multiple conceptually-related constructs are assessed within the same model, items may also be expected to present at least some degree of true score association with non-target constructs (Morin, Arens, & Marsh, 2016). When ICM restrictions force these additional associations (i.e., cross-loadings) to be zero, the only way for them to be expressed is through the inflation of the factor correlations. This interpretation has been supported by statistical research (for a recent review, see Asparouhov, Muthén, & Morin, 2015) showing that measurement models allowing for the free estimation of cross-loadings tended to provide more exact estimates of the underlying true factor correlations whenever cross loadings were present in the population model, yet remained unbiased for population models corresponding to ICM assumptions. Because the meaning of constructs lies in their relation with other constructs, these results suggest that ICM-CFA may fundamentally bias construct definition.

Interestingly, Exploratory Factor Analyses (EFA) allowing for the free estimation of cross-loadings have recently been integrated with CFA and Structural Equation Modeling into the Exploratory Structural Equation Modeling (ESEM) framework (Asparouhov & Muthén, 2009; Morin et al., 2013). Furthermore, target rotation (Asparouhov & Muthén, 2009) makes it possible to adopt a "confirmatory" approach to the estimation of EFA/ESEM models. With target rotation, target loadings are pre-specified in a confirmatory manner, while cross-loadings are targeted to be as close to zero as possible.

To assess whether these considerations might explain the high factor correlations associated with the PSI-S, Morin and Maïano (2011) used ESEM to cross-validate the PSI-S among a sample of 2029 French adolescents aged between 11 and 18 years. Their results supported the factor validity, reliability, and convergent validity (with measures of disturbed eating attitudes and behaviors, social physique anxiety, fear of negative appearance evaluation, physical self-image congruence, and body image avoidance) of the PSI-S. Their results also showed that, when compared to ICM-CFA (r = .52 to .93), ESEM provided a better fit to the data and resulted in the estimation of more acceptable factor correlations (r = .16 to .51). However, ESEM also revealed problems with the three negatively-worded items included in the PSI-S (one GSW item, and two PA items) that could not be controlled by methodological controls. This observation is consistent with prior research on the impact of negatively-worded items in self-concept measures (DiStefano, & Motl, 2006; Lindwall, Aşçı, & Hagger, 2011; Marsh, Scalas et al., 2010). Importantly, research suggests that negatively worded items tend to be harder to properly adapt in the context of cross-cultural or cross-linguistic studies (Aşçı, Fletcher, & Çağlar, 2009; Schmitt & Alik, 2005; Watkins & Cheung, 1995). These observations led Morin and Maïano (2011) to propose a positive reformulation of these items, and to encourage future users to compare the original and revised version of the PSI-S to determine "*whether the psychometric properties of the original PSI-S can be preserved, and even improved, with the proposed reformulations of these items*" (p. 550).

Morin and Maïano (2011) demonstrated the measurement invariance of this ESEM solution across gender, age categories (early or late adolescents), weight categories (underweight, overweight, or obese), and parental origin (French or other). Their results also replicated Maïano et al.'s (2008) results in showing that females presented a lower level than males on all PSI-S dimensions (GSW, PSW, PC, SC, PA, and PS). They also replicated results obtained with other physical self-concept instruments (Griffiths, Parsons, & Hill 2010; Hau, Sung, Yu, Marsh, & Lau, 2005; Marsh et al., 2007; Sung, Yu. So, Lam, & Hau, 2005), showing that overweigh/obese participants had lower GSW, PSW, and PC than underweight and normal weight participants, whereas PS scores increased as a function of participants' body mass index (BMI). Although prior research led them to expect some decrease in physical self-perceptions as a function of age (e.g., Hagger et al., 2005; Marsh et al., 2007), their results failed to identify any mean-level differences between samples of early (11-14 years) versus late (15-18 years) adolescents. However, a key limitation of Morin and Maïano (2011) study is the reliance on a rough categorization of BMI and age into a limited number of subgroups, knowing that such categorization is associated with a substantial decrease in the statistical power to detect mean differences (Marsh, Nagengast, & Morin, 2013).

In a more recent ESEM study focusing on an English version of the PSI-S, Morin, Maïano et al. (2016) contrasted the psychometric properties of the original PSI-S with those of the revised PSI-S (including the positive reformulation of the negatively-worded items) among samples of 1368 English-speaking and 224 French-Speaking adolescents aged between 12 and 14. Their results supported the superiority of the revised PSI-S and its measurement invariance across samples of French- and English-speaking respondents. Results from this study also replicated prior results (Maïano et al., 2008; Morin & Maïano, 2011) showing that males presented higher levels than females on all of the PSI-S factors, and failing to identify any age-related differences in PSI-S scores. Although this study relied on a continuous measure of age, the limited age range (12 to 14) could explain the lack of mean-level differences. Their results showed that BMI levels were associated with decreases GSW, PSW, PC, SC, PA, but to increases in PS. Finally, this study extended Morin and Maïano's (2011) in showing positive relations between adolescents' involvement in physical activity and all physical dimensions of the PSI-S (PSW, PA, PS, PC, and SC, with the sole exception of GSW) in accordance with previous results obtained with other instruments (e.g., Bowker, 2006; Findlay & Bowker, 2007; Schmalz & Davison, 2006).

In the current study, we verify whether Morin and Maïano's (2011) and Morin, Maïano et al.'s (2016) results can generalize to a variety of cultural groups through the use of ESEM. In addition, we extend these prior results by contrasting the original (including the initial pool of 18 items) and revised version (in which the three reversed-keyed items have been replaced by their positively-worded reformulations) of the PSI-S, and considering a wider age range.

Cross-Cultural Adaptation of the PSI-S

A second limitation noted by Marsh and Cheng (2012) is related to the fact that only a French version of the PSI-S was available at the time their review was written. Although an English version is now available, this remains a severe impediment to the more widespread use of the PSI-S in international and cross-national research. In this study, we propose Italian, Dutch, Turkish, and Arab versions of the original and revised versions of the PSI-S in order to contrast them with the French version. These specific languages were selected based on the fact that they are an official language in several countries (Belgium, Canada, the Netherlands, Algeria, Morocco, etc.), or the first and second most common language among immigrants in several countries (France, Italy, etc.). Additionally, previous cross-cultural research (Oyserman, Coon, & Kemmelmeier, 2002; Oyserman & Lee, 2008), suggests that global self-concepts tended to be higher among people from countries embracing more individualistic, relative to collectivistic, values. We retained these languages to recruit samples from countries characterized by these two different cultural orientations: Individualistic (Belgium, France, and Italy) versus collectivistic (Tunisia, Turkey, Kuwait) countries.

A key challenge is to develop measures with comparable psychometric properties across languages or cultures (measurement invariance). Regrettably, only limited research has looked at the extent to which the properties of physical self-concept measures generalize across cultures, although preliminary evidence suggest that this might be the case (Marsh, Marco, & Aşçı, 2002; Marsh, Martin et al., 2010; Scalas, Morin, Marsh, & Nagengast, 2014). Morin and Maïano's (2011) study supported the measurement invariance of PSI-S ratings as a function of parents' ethnic background, and Morin, Maïano, et al. (2016) similarly supported the measurement invariance of revised PSI-S ratings across samples of English- and French-speaking participants. In the current study, we extend those previous results by verifying the extent to which the measurement structure of the revised PSI-S would generalize to samples of Italian-, Dutch-, Turkish-, Arab-, and French- speaking adolescents.

The Present Study

The present study examines the cross-cultural validity of the French, Dutch, Turkish, Italian, and Arab linguistic versions of the original and revised PSI-S. We first contrast the factor validity and reliability of the original and revised PSI-S separately in each cultural sample using CFA and ESEM. We then test the measurement invariance of the PSI-S across cultural samples. Finally, we test for the presence of differential item functioning (DIF) and possible latent mean differences on the PSI-S as a function of gender, age, BMI, and sport involvement. This last objective aims to replicate Morin and Maïano (2011) and Morin, Maïano et al., (2016) results regarding the relations between physical self-concept levels and participants' age, gender, BMI, and sport involvement without relying on a suboptimal categorisation of continuous age, BMI, and sport involvement. In addition, it extends these results to test whether these relations generalize to each of the samples considered here.

Method

Samples and Procedures

The Dutch-speaking sample included 1173 Belgian Flemish adolescents (12-21 years; *M* = 16.11; 45.6% males) attending two middle schools (*middelbare scholen*) and two high schools (*Hogescholen*) located in Limburg. Although the spoken Dutch language may slightly differ across countries such as Belgium and the Netherlands, the written language is identical.

The Italian-speaking sample included 1222 adolescents (13-21 years; *M* = 16.95; 46.2% males) attending 20 secondary schools (*Scuole Superiori*) located in Cagliari, Italy.

The Turkish-speaking sample included 643 adolescents (12-20 years; *M* = 14.98; 52.6% males) attending three middle schools (*ortaokul*) and three high schools (*lise*) located in Ankara, Turkey.

The French-speaking sample included 598 adolescents (11-20 years; *M* = 14.71; 43% males) attending four middle schools (*Collèges*), two high schools (*Lycée*), and one combined middle and high school located in Southern France.

The Arab-speaking sample includes 646 Kuwaiti adolescents (14-17, *M* = 15.24; 61.6% males) attending three high schools (مدرسة ثانوية) and seven sport clubs located in Moubarek El Kabir, Hawalli, and Koweit City, and 585 Tunisian adolescents (12-18 years, *M* = 15.44; 40.7% males) attending 2 middle schools (المدرسة المتوسطة) and three high schools (المدرسة الثانوية) located in northern and central Tunisia. Samples from two countries were recruited to maximize the generalizability of the Arab sample to North Africa and the Middle East. These samples (*N* = 1231; 12-18 years, *M* = 15.34; 51.7% males) were combined for the analyses, after ascertaining the measurement invariance of responses to the Arab PSI-S across the Kuwait and Tunisian samples (Table S10 of the online supplements).

This project met ethical requirements for research with human participants in all countries. Authorization to perform the study was first obtained from schools. Appropriate consent procedures were then followed, and permission was obtained from parents prior to the data collection. All participants were voluntary and answered the questionnaire anonymously. This project was designed as a cross-cultural study aiming to validate the PSI-S. However, data collection were first conducted in Italy and Belgium, after which it was decided to add information related to height, weight, and sport participation to the questionnaires.

Measures.

Demographic Information. Participants self-reported their gender and age. French, Turkish, and Arab participants were also asked to report their height, weight, and the frequency (number of sessions) to which they participated in organized sport activities each week, outside of their physical education classes (French: *M* = 1.67 weekly sessions, *SD* = 1.83; Turkish: *M* = 0.66, *SD* = 1.40; Arab: *M* = 1.19; *SD* = 1.54). Height and weight were used to calculate participants Body Mass Index [BMI = Weight/(Height^2)]. Because self-reported height and weight might be biased they were corrected using formulas provided by Brettschneider, Schaffrath Rosario, Wiegand, Kollock, and Ellert (2015; see equations 7, 9, 13, 14). BMI values based on corrected height and weight range are: 13.3-41.6 (*M* = 20.5) for French, 11.2-34.1 (*M* = 20.3) for Turkish, and 13.4-34.3 (*M* = 22.3) for Arab adolescents.

PSI-S. Italian, Dutch, Turkish, and Arab versions of the original (Maïano et al., 2008) and revised (Morin & Maïano, 2011) PSI-S were developed for this study through a classical translation and back translation process by independent bilingual translators (e.g., Hambleton, 2005). Discrepancies were resolved through discussions involving at least one of the authors who was also a native speaker of the language. French participants completed the validated French versions. All versions included 18 items, rated on a six point scale (1- *Not at all* to 6- *Entirely*), and assessing six 3-item subscales (GSW, PSW, PA, PS, PC, SC). The original version included 3 negatively-worded items, replaced by positively-worded reformulations in the revised version. Items are presented in Table S1 of the online supplements.

Analyses

All analyses were conducted with Mplus 7.31 (Muthén & Muthén, 2015), robust weight least square estimator using diagonal weight matrices (typically referred to as WLSMV). WLSMV estimation is naturally suited to the ordered-categorical nature of the response scales used in the present study (for a review, Finney & DiStefano, 2013). Research also showed that such ordered-categorical methodologies was better suited to the assessment of the psychometric properties of physical self-concept measures (Freund, Tietjens, & Strauss, 2013). A key limitation of WLSMV is the reliance on a slightly less efficient way of handling missing data (i.e., pairwise present) than ML/MLR (Asparouhov & Muthén, 2010), which is not an issue given the very low level of missing data (.23% to 1.19%; M = .57%).

First, the a priori factor structure of the original and revised PSI-S was tested separately in each cultural sample with CFA and ESEM. In CFA, it was hypothesized that: (i) answers to the PSI-S would be explained by six correlated factors; (ii) each item would have a non-zero loading on the factor it was designed to measure, and zero loadings on all other factors; and (iii) error terms would be uncorrelated. The a priori ESEM model was estimated using confirmatory target rotation in which it was hypothesized that PSI-S responses would be explained by six correlated factors, and all cross-loadings were targeted to be as close to zero as possible. Composite reliability was computed using omega: $\omega = (\Sigma|\lambda i|)^2 / ([\Sigma|\lambda i|]^2 + \Sigma\delta ii)$ where λi are the factor loadings and δii, the error variances (McDonald, 1970). Compared with alpha, ω has the advantage of taking into account the strength of association between items and constructs (λi) as well as item-specific measurement errors (δii).

Second, the measurement invariance of the PSI-S across the five cultural samples was tested in the following sequence adapted to WLSMV estimation (Guay, Morin, Litalien, Valois, & Vallerand, 2015; Morin, Moullec, Maïano, Layet, Just, &Ninot, 2011): (i) configural invariance (the same measurement model is estimated in all samples) ; (ii) weak invariance (invariance of the factor loadings); (iii) strong invariance (invariance of the factor loadings and item thresholds); (iv) strict invariance (invariance of the factor loadings, item thresholds, and items uniquenesses); (v) variance/covariance invariance (invariance of the factor loadings, item thresholds, items uniquenesses, and latent variances and covariances); and (vi) latent means invariance (invariance of the factor loadings, item thresholds, items uniquenesses, latent variances and covariances, and latent means).

Third, associations between the PSI-S factors and the demographic (gender, age, BMI) and sport involvement predictors were assessed using multiple indicators multiple causes (MIMIC) models (Morin et al., 2013). Given the complexity of estimating ESEM models across five cultural samples, it was not possible to further divide these samples to estimate whether the PSI-S measurement model remained invariant across subsamples formed on the basis of combinations between the demographic/sport involvement predictors and culture. In MIMIC models latent variables are regressed on observed predictors, and can be extended to test for the presence of DIF in relation to the predictors. DIF is a form of measurement non-invariance characterized by direct relations between predictors and item responses over and above the effects of the predictors on the latent factor. MIMIC models can test DIF in relation to multiple continuous (age, BMI, sport involvement) and categorical (gender) predictors without having to recode continuous predictors into a smaller number of discrete groups.

We relied on a hybrid MIMIC multiple-group approach in which a separate MIMIC model was estimated within each cultural sample, starting from the most invariant multiple-group model identified previously (Marsh et al., 2013). These models were estimated in sequence (Morin et al., 2013): (a) a null effects model in which the paths from the predictors to the PSI-S factors and item responses were constrained to be zero; (b) a factors-only model in which the paths from the predictors to the latent factors, but not the item responses, were freely estimated; and (c) a saturated model in which the paths from the predictors to the item responses, but not the factors, were freely estimated. An improved fit associated with the factors-only and saturated models relative to the null effects model supports the presence of relations between the predictors and PSI-S ratings, whereas an improved fit associated with the saturated model relative to the factors-only model supports the presence of DIF. These models were first estimated with all associations freely estimated (or equally constrained to be zero) across samples. Then, the retained model was contrasted to an alternative model in which these associations were constrained to be equal (or invariant) across culture. Because BMI and sport involvement were only assessed in three (French, Turkish, Arab) out of five samples, two series of MIMIC models had to be estimated, one for age and gender, and one for BMI and sport involvement. Age, BMI, and sport involvement were standardized.

Given the oversensitivity of the chi-square test of exact fit to sample size and minor misspecifications (Marsh, Hau, & Grayson, 2005), model fit was assessed using: the comparative fit index (CFI), the Tucker-Lewis index (TLI), and the root mean square error of approximation (RMSEA) with its 90% confidence interval. Values greater than .90 and .95 for the CFI and TLI respectively indicate adequate and excellent fit, while values smaller than .08 or .06 for the RMSEA respectively support acceptable and excellent fit (Yu, 2002). In comparing nested models, models differing by less than .01 on the CFI and TLI, or .015 on the RMSEA, can be considered to provide an equivalent level of fit to the data (Chen, 2007).

Results

Factor Structure of the Original and Revised PSI Versions

The goodness-of-fit of the ESEM and CFA models for the original and revised PSI-S versions in the various cultures are reported in Table 1. With the exception of the Turkish sample in which the CFA model of original PSI-S failed to achieve an acceptable level of fit to the data, the ESEM and CFA solutions of both PSI-S versions achieved a satisfactory fit to the data across all samples. Still, ESEM systematically resulted in a higher level of fit to the data for both PSI-S versions, in all but the Arab sample according the ΔCFI and ΔTLI (-.001 to +.004 in the Arab sample but +.015 to +.148 in the other samples). The ΔRMSEA supported these conclusions (-.085 to -.049), but also revealed an increase in fit for ESEM in the Arab sample for the revised (-.023), but not the original (+.006), PSI-S. Because the original and revised PSI-S are not based on the same items, their goodness-of-fit indices cannot be directly compared. For this reason, their relative adequacy needs to be determined based on parameter estimates. Still, it is noteworthy that the CFA generally suggested the superiority of the revised PSI-S, whereas the ESEM converged on similar fit to the data for both versions. For illustrative purposes, we present the parameter estimates of the CFA and ESEM solutions for the Dutch sample in Tables 2 (original) and 3 (revised). Parameter estimates were similar in the other samples (see Tables S2-S9 of the online supplements).

The CFA revealed well-defined factors for both the original (λ = -.013 to .970; M_λ = .770) and revised versions (λ = .613 to .971; M_λ = .838). However, CFA results obtained with the original version confirmed the suboptimal performance of the negatively-worded PSI-S items (GSW2, PA1, and PA3) in the Dutch (λ = .274 to .482), French (λ = 242 to .465), Turkish (λ =

-.013 to .160), but not the Italian (λ = .402 to .662) or Arab (λ = .751 to .820) samples. In contrast, the reformulated version of these items performed well in all samples (λ =.613 to .959). As a result, CFA-based composite reliability associated with GSE and PA were much higher for the revised (GSW: ω = .769 to .868, M_ω = .849; PA: ω = .828 to .925, M_ω = .866) relative to the original (GSW: ω = .527 to .830, M_ω = .727; PA: ω = .247 to .854, M_ω = .560) PSI-S in all samples. In contrast, the CFA-based composite reliability associated with the remaining subscales were satisfactory for the revised (PSW: ω = .787 to .944, M_ω = .894; PS: ω = .734 to .938, M_ω = .842; PC: ω = .790 to .961, M_ω = .894; SC: ω = .790 to .965, M_ω = .903) and original (PSW: ω = .788 to .945, M_ω = .894; PS: ω = .732 to .938, M_ω = .842; PC: ω = .791 to .961, M_ω = .894; SC: ω = .790 to .965, M_ω = .903) PSI-S for all samples.

Although ESEM did not reveal weaker target loadings associated with the negatively-worded items of the original PSI-S, it revealed problematic GSW and PA factors. Indeed, rather than the a priori PA factor, ESEM revealed the presence of a negatively-worded item factor, characterized by high target loadings for the negatively-worded PA items (PA1 and PA3: λ = .390 to .878) and a high cross-loading for the negatively-worded GSW item (GSW2: λ = .275 to .541). In contrast, rather than the a priori GSW factor, ESEM revealed a positively-worded GSW/PA factor mainly defined by the positively-worded GSW items (GSW1 and GSW3: λ = .168 to .858) and a cross-loading from the remaining PA item (PA2: λ = .094 to .571). Although the ESEM results associated with the revised PSI-S revealed some additional concerns (to be discussed shortly), they revealed more adequately-defined GSW and PA factors. In accordance with the CFA results, the ESEM-based composite reliability of GSW and PA was higher in all samples for the revised PSI-S (GSW: ω = .541 to .805, M_ω = .737; PA: ω = .768 to .879, M_ω = .822) than for the original PSI-S (GSW: ω = .412 to .773, M_ω = .632; PA: ω = .500 to .814, M_ω = .605). For the other subscales, ESEM-based composite reliability was fully satisfactory in all samples for the revised (PSW: ω = .678 to .876, M_ω = .792; PS: ω = .614 to .853, M_ω = .771; PC: ω = .697 to .908, M_ω = .848; SC: ω = .739 to .940, M_ω = .854) and original PSI-S (PSW: ω = .659 to .886, M_ω = .794; PS: ω = .648 to .839, M_ω = .776; PC: ω = .704 to .884, M_ω = .842; SC: ω = .789 to .939, M_ω = .868).

Following Morin and Maïano (2011), we also verified if the suboptimal performance of these negatively-worded items could be related to the presence of an unmodeled method factor. The results from these models are reported in Tables S11 to S16 of the online supplements, and showed that the addition of a method factor, although associated with a slight increase in model fit, was not sufficient to explain the poor performance of these items. Taken together, these results support the superiority of the revised PSI-S, when compared to the original PSI-S. The revised PSI-S was thus retained for further analyses.

As noted above, the revised PSI-S ESEM solution resulted in a substantial increase in model fit relative to the CFA solution. However, a detailed examination of parameter estimates is critical to the decision to select ESEM versus CFA (Morin et al., 2013; Morin, Arens, et al., 2016). So far, we have presented evidence showing that both the CFA and ESEM solutions resulted in well-defined factors, and satisfactory composite reliability. Statistical simulation studies and studies of simulated data (for a review, see Asparouhov et al., 2015) suggest that ESEM tends to result in more accurate estimates of factor correlations whenever cross-loadings are present in the population model, yet remains unbiased otherwise. The observation of reduced factor correlations associated with ESEM, relative to CFA, would thus provide strong evidence in favor of ESEM. The revised PSI-S factor correlations proved to be much lower with ESEM (r = .130 to .700; M_r = .382) relative to CFA (r = .380 to .950; M_r = .708). This observation, combined with the higher level of fit of the ESEM solution, supports the superiority of the ESEM solution, which was retained for further analyses.

The revised PSI-S ESEM solution resulted in fully satisfactory parameter estimates and composite reliability coefficients, but also revealed some concerning observations. First, as noted by Morin and Maïano (2011), some GSW (GSW1: *I have a good opinion of myself*), PA (PA1*: I am really pleased with the appearance of my body*), and PSW (PSW3: *I'm confident about my physical self-worth*) items contributed as much to the definition of their own a priori factor as to the definition of the GSW (PSW3, PA1), PA (GSW1, PSW3), and PSW (GSW1) factors. These observations are consistent with the wording of these items, with the hierarchical nature of these subscales (i.e., specific items may contribute to the definition of more global constructs), and with the critical importance of PA in global self-concept formation during adolescence (Harter, 2012). Second, the results suggested that the Turkish version of the item PC1 (*I would be good at physical stamina exercises*) may be problematic, and that the Italian and Dutch versions of this item might be suboptimal. Still, it remains possible that such variations across samples in the size of specific parameter estimates might only reflect random sampling variations, rather than meaningful cross-cultural differences. For this reason, systematic tests of measurement invariance are necessary.

Measurement Invariance across Linguistic Groups

We then examined the measurement invariance of the retained ESEM representation of the revised PSI-S across the five cultural samples. These results are reported in the top section of Table 4, and support the adequacy of the measurement model (CFI/TLI ≥ .95; RMSEA ≤ 08), as well as the invariance of the factor loadings, thresholds, uniquenesses, and latent variances and covariances (ΔCFI/TLI < .010; ΔRMSEA < .015) across cultures. These results attest to the cross-cultural equivalence of ratings on the revised PSI-S. Furthermore, the results suggest the presence of latent mean differences across cultures (ΔCFI = .010). Given that exploration of cross-cultural latent mean differences was not a key objective of this study, these differences are presented at the end of the online supplements.

DIF and Latent Mean Differences: Gender, Age, BMI, and Sport

The results from the MIMIC models are reported in the bottom section of Table 4. These models were estimated starting from the most invariant measurement model (6-5: invariance of the latent variances and covariances). Both types of models (Age-Gender, or BMI-Sport) resulted in similar conclusions. First, the null effects model resulted in an adequate level of fit according to the CFI and TLI (≥ .95), but failed to meet acceptable standards according to the RMSEA (≥.110). When compared to the null effects model, both the saturated model and the factors-only model resulted in a substantial improvement in model fit (ΔCFI/TLI ≥ .01; ΔRMSEA ≥ .015), supporting the idea that the predictors have an effect on PSI-S responses. However, the saturated model resulted in an almost identical level of fit to the data than the more parsimonious factors-only model (ΔCFI/TLI ≤ .01; ΔRMSEA ≤ .015), supporting the idea that the relations between the predictors and the PSI-S responses can be explained by their effects on the latent factors. Finally, starting with the factors-only model, relations between the predictors and the PSI-S factors were constrained to be equal across cultures, resulting in an almost identical level of fit to the data than the model in which these relations were freely estimated in all samples. This result supports the equivalence of the relations between age, gender, BMI, and sport participation and PSI-S ratings across cultures.

The results from these final models are reported in Table 5 and revealed a systematic, yet small, negative association between age and all PSI-S factors, showing that for each 1 *SD* increase in age, physical self-perceptions decreased by .045 to .146 *SD*. Systematic effects of gender were also observed for all PSI-S factors, showing physical self-perceptions to be higher among males. Gender differences were particularly marked for PS, PC, and SC, approaching .5 *SD*. The effects of BMI were limited to PS and SC, showing that increases of 1 SD in BMI were accompanied by large increases in PS (.184 to .422 *SD*), and smaller increases in SC (.053 to .098 *SD*). Finally, sport involvement outside of physical education lessons was associated with an increase on most PSI-S dimensions, with the exception of PA. These effects were particularly marked for PS, PC, and SC, corresponding to almost 1 *SD* increase in physical self-perceptions for every 1 *SD* increase in sport involvement. Still, the effects of sport involvement on GSW and PSW also remained large (approaching .5 *SD*).

Discussion

The PSI-S shows great promise as a short comprehensive measure of multidimensional physical self-conceptions for adolescents (Maïano et al., 2008; Morin & Maïano, 2011; Morin, Maïano et al., 2016). Yet, critical examinations have led to the identification of challenges to its more widespread use related to: (a) the high levels of correlations among the PSI-S factors, (b) the suboptimal performance of its negatively-worded items, and (c) the need to cross-culturally validate this instrument. This study addressed these challenges.

The first challenge is not specific to the PSI-S but to most PSPP-based instruments and stems from the observation of factor correlations that are high enough to call into question the discriminant validity of the subscales (Marsh & Cheng, 2012). This challenge was first addressed by Morin and Maïano (2011) who, relying on ESEM, obtained strong support for the factor and discriminant validity of the PSI-S. However, their results also revealed a second challenge related to the suboptimal performance of the three negatively-worded items, leading them to propose a positively-worded reformulation of these items. Recently, Morin, Maïano et al. (2016) replicated Morin and Maïano's (2011) results among samples of French- and English-speaking adolescents, and demonstrated the superiority of the revised PSI-S version.

Our results essentially replicate these previous results among five distinct cultural samples. Our results showed that ESEM provided a more optimal representation of the data, resulted in reduced factor correlations (r = .130 to .700; M_r = .382) providing a clear support to the discriminant validity of the PSI-S subscales, and confirmed the challenges posed by the negatively-worded items. Our results also supported the superiority of the revised PSI-S, which resulted in satisfactory estimates of composite reliability across samples (M_ω = .804).

ESEM also revealed the need to account for cross-loadings, the most important of which being consistent with the observation that PA plays a determining role in how adolescents define their more global GSW and PSW (Fox & Corbin, 1989; Harter, 2012; Marsh & Redmayne, 1994). In addition to showing that GSW, PSW, and PA share some common indicators, ESEM revealed that the Turkish, Dutch, and Italian version of item PC1 (*I would be good at physical stamina exercises*) might be suboptimal. The performance of this item should thus be re-examined in the future studies using similar methodologies. Still, the observation of strict measurement invariance suggests that variations in the performance of this item may reflect random sampling variations, rather than meaningful cultural differences.

The third challenge facing the PSI-S is related to the need to move beyond French and English versions (Marsh & Cheng, 2012). We thus proposed Dutch, Turkish, Italian, and Arab versions of the PSI-S, and tested whether these versions retained the psychometric properties of the French version. Our results supported the complete measurement invariance (i.e., loadings, thresholds, uniquenesses, and latent variance-covariance matrix) of the revised PSI-S across samples of French-, Dutch-, Turkish-, Italian-, and Arab-speaking participants.

To test the extent to which our linguistic adaptations would preserve the properties of the French PSI-S, we investigated the effects of gender, age, BMI, and sport involvement on PSI-S responses. We relied on a multiple-group MIMIC approach, allowing us to test for the presence of possible measurement biases (DIF) in item responses as a function of these covariates as well as for latent mean differences while allowing us to test the extent to which the results generalized across cultures (Marsh et al., 2013). Our results revealed that PSI-S responses presented no bias (DIF) in relation to gender, age, BMI, or sport involvement.

Furthermore, our results supported prior research showing that physical self-perceptions tended to be higher among males relative to females (Hagger et al., 2005; Marsh et al., 2006, 2007; Morin & Maïano, 2011; Morin, Maïano et al., 2016), and among participants involved in more frequent sport practice (Bowker, 2006; Findlay & Bowker, 2007; Morin, Maïano et al., 2016; Schmalz & Davison, 2006). Contrasting with Morin and Maïano (2011) and Morin, Maïano et al. (2016) results, but supporting prior research (e.g., Hagger et al., 2005; Marsh et al., 2007), our results also revealed a systematic, yet relatively small, negative association between age and physical self-perceptions. The relatively small size of these relations may explain why previous studies were unable to identify similar relations when they roughly dichotomized age into early (11-14 years) versus late (15-18 years) adolescents (Morin & Maïano, 2011) or considered a more limited age range (12 to 14: Morin, Maïano et al., 2016). Finally, our results partially support prior research (Griffiths et al., 2010; Hau et al., 2005; Marsh et al., 2007; Morin & Maïano, 2011; Morin, Maïano et al., 2016; Sung et al., 2005) showing that higher BMI levels were associated with increases in PS and smaller increases in SC. However, no other effects of BMI were noted on the remaining PSI-S factors. This result is consistent with the observation that, in this age group, high levels of BMI might not only be a function of body fat, but also of muscular or bone structure (Morin & Maïano, 2011). Thus, future research would do well to investigate the relation between physical self-conceptions and objective measures of body fat and physical fitness. Importantly, all of these relations proved to be equivalent across cultural groups, attesting to their generalizability.

Some limitations must be taken into account. For instance, we relied on convenience sample of normally achieving adolescents, which cannot be considered to be representative of the targeted populations or equivalent across linguistic groups. The fact that the Arab version proved to be strictly invariant across samples of Kuwait and Tunisian adolescents suggests that the results can be expected to generalize (see the online supplements). Still, future research is needed to establish the conditions in which these linguistic versions will preserve their psychometric properties. Still, the use of this instrument should for the moment be limited to normally achieving adolescents from the targeted linguistic groups from cultural backgrounds similar to that of the current participants. The next step in evaluating the generalizability of the PSI-S should be to test its adaptation to additional cultural samples (e.g., Chinese, Spanish, German). In addition, although we provided some evidence of the criterion-related validity of the PSI-S in relation to age, gender, BMI, and sport involvement, additional tests remain to be conducted in relation to other physical self-concept instruments, and a variety of external criterions (physical fitness, body fat, body image disturbances, etc.). Furthermore, the reliance on a cross-sectional sample precluded tests of the developmental stability of the PSI-S, which has been demonstrated so far by Maïano et al. (2008) across a two-week interval and by Morin, Maïano et al. (2016) over a much longer 7-8 month period. A far more complete test of the PSI-S construct validity would involve testing whether physical self-concept levels as assessed by the PSI-S follow the same patterns of continuity and change observed in the physical self-concept literature.

Footnote

[1] Essentially, measurement models (e.g., confirmatory factor analyses) aim to explain the complete covariance observed among a set of indicators through a reduced number of factors. A method effect occurs when one additional source of covariation, typically due to wording effects or informants, is present for a subset of indicators.

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Table 1

Goodness-of-Fit Statistics of the Measurement Models for the Various Linguistic Versions

Sample	Model	χ^2 (*df*)	CFI	TLI	RMSEA	90% CI
Dutch	1-1. CFA (Original)	1935.100 (120)*	.947	.933	.114	.109-.118
	1-2. CFA (Revised)	1629.579 (120)*	.960	.949	.104	.099-.108
	1-3 ESEM (Original)	213.855 (60)*	.996	.989	.047	.040-.054
	1-4. ESEM (Revised)	313.453 (60)*	.993	.983	.060	.054-.067
French	2-1. CFA (Original)	861.933 (120)*	.965	.956	.102	.095-.108
	2-2. CFA (Revised)	691.729 (120)*	.976	.969	.089	.083-.096
	2-3. ESEM (Original)	179.312 (60)*	.994	.986	.058	.048-.067
	2-4. ESEM (Revised)	207.180 (60)*	.994	.984	.064	.055-.074
Arab	3-1. CFA (Original)	700.148 (120)*	.995	.994	.063	.058-.067
	3-2. CFA (Revised)	670.904 (120)*	.995	.994	.061	.057-.066
	3-3. ESEM (Original)	413.178 (60)*	.997	.993	.069	.063-.076
	3-4. ESEM (Revised)	164.456 (60)*	.999	.998	.038	.031-.045
Turkish	4-1. CFA (Original)	1484.434 (120)*	.867	.830	.133	.127-.139
	4-2. CFA (Revised)	884.965 (120)*	.935	.917	.100	.093-.106
	4-3. ESEM (Original)	150.152 (60)*	.991	.978	.048	.039-.058
	4-4. ESEM (Revised)	160.895 (60)*	.991	.978	.051	.042-.061
Italian	5-1. CFA (Original)	1805.009 (120)*	.968	.960	.107	.103-.112
	5-2. CFA (Revised)	1641.841 (120)*	.974	.966	.102	.098-.106
	5-3. ESEM (Original)	379.125 (60)*	.994	.985	.066	.060-.072
	5-4. ESEM (Revised)	412.626 (60)*	.994	.984	.069	.063-.076

Note. CFA = confirmatory factor analytic model; ESEM = exploratory structural equation modeling; χ^2 = robust weighed least square (WLSMV) chi-square; *df* = degrees of freedom; CFI =comparative fit index; TLI = Tucker-Lewis index; RMSEA = root mean square error of approximation; 90% CI: 90% confidence interval of the RMSEA; *p<.01.

Table 2

Standardized Parameters Estimates from the Confirmatory Factor Analytic and Exploratory Structural Equation Models of the PSI-S (Original) in the Dutch-Speaking Sample

	Confirmatory factor analysis							Exploratory structural equation modeling						
Standardized factor loadings (λ) and uniquenesses (δ)														
Items	GSW (*λ*)	PSW (*λ*)	PA (*λ*)	PS (*λ*)	PC (*λ*)	SC (*λ*)	*δ*	GSW (*λ*)	PSW (*λ*)	PA (*λ*)	PS (*λ*)	PC (*λ*)	SC (*λ*)	*δ*
GSW1	.764						.416	.622	.160	.048	.071	*.027*	*-.014*	.447
GSW2	.482						.767	.330	-.077	.541	*.004*	*.022*	*.021*	.490
GSW3	.784						.385	.612	.111	.174	*-.024*	*.016*	.089	.397
PSW1		.899					.191	.165	.677	*.010*	.058	.096	.138	.148
PSW2		.886					.214	.183	.630	.055	.077	.083	.141	.187
PSW3		.888					.211	.243	.356	.064	.291	.200	.122	.224
PA1			.278				.923	-.045	*-.004*	.672	*.030*	*-.008*	*-.006*	.567
PA2			.889				.210	.486	.054	.138	.053	.124	.156	.487
PA3			.264				.930	*-.047*	.076	.525	*-.019*	*.008*	*-.014*	.727
PS1				.871			.241	*.004*	.281	-.087	.407	.127	.193	.400
PS2				.828			.314	*.023*	.071	.053	.865	*.025*	*.031*	.135
PS3				.644			.585	*.007*	-.071	*-.028*	.692	*.032*	.115	.459
PC1					.958		.082	-.074	.422	.062	.106	.373	.244	.207
PC2					.846		.284	.057	*.017*	*.013*	*.014*	.933	.044	.028
PC3					.797		.366	*-.005*	.072	*.017*	.064	.693	.101	.336
SC1						.837	.300	*.026*	.062	.033	.098	.078	.747	.211
SC2						.721	.481	.228	*-.006*	*-.046*	.143	.095	.512	.452
SC3						.925	.145	*.005*	.288	.037	.066	.160	.566	.187
ω	.724	.921	.498	.828	.902	.869		.647	.832	.500	.795	.875	.797	

Factor correlations (95% confidence intervals)										
Factor	PSW	PA	PS	PC	SC	PSW	PA	PS	PC	SC
GSW	.72 (.68-.76)	.84 (.77-.91)	.39 (.32-.45)	.45 (.40-.51)	.56 (.51 -.61)	.39 (.35-.43)	.34 (.30-.38)	.21 (.17-.25)	.22 (.18-.26)	.32 (.28-.36)
PSW		.65 (.58-.71)	.76 (.73-.79)	.83 (.81-.85)	.87 (.85 -.89)		.13 (.08-.17)	.38 (.35-.41)	.48 (.44-.51)	.55 (.52-.58)
PA			.41 (.34-.47)	.49 (.43-.56)	.57 (.50 -.63)			.04 (.00-.09)	.11 (.06-.15)	.09 (.04-.14)
PS				.65 (.62-.69)	.76 (.72 -.79)				.31 (.28-.35)	.45 (.42-.49)
PC					.82 (.80 -.85)					.49 (.46-.53)

Note. GSW = global self-worth; PSW = physical self-worth; PC = physical condition; SC = sport competence; PA = physical attractiveness; PS = physical strength; Greyscale = main loadings; non-significant parameters are in italics. All correlations are statistically significant ($p \leq .01$).

Table 3

Standardized Parameters Estimates from the Confirmatory Factor Analytic and Exploratory Structural Equation Models of the PSI-S (Revised) in the Dutch-Speaking Sample

	Confirmatory factor analysis							Exploratory structural equation modeling						
Standardized factor loadings (λ) and uniquenesses (δ)														
Items	GSW (*λ*)	PSW (*λ*)	PA (*λ*)	PS (*λ*)	PC (*λ*)	SC (*λ*)	*δ*	GSW (*λ*)	PSW (*λ*)	PA (*λ*)	PS (*λ*)	PC (*λ*)	SC (*λ*)	*δ*
GSW1	.742						.449	.293	.328	.323	.089	*-.012*	-.111	.474
GSW2	.862						.258	.603	.223	.243	.071	.053	-.144	.238
GSW3	.878						.229	.908	*.004*	.031	*-.003*	.024	.118	.077
PSW1		.897					.195	.060	.685	.089	.042	.104	.181	.141
PSW2		.888					.211	.173	.599	.043	.073	.104	.190	.190
PSW3		.889					.210	.122	.388	.144	.292	.199	.115	.228
PA1			.917				.158	.565	.044	.365	*.032*	.064	.067	.208
PA2			.805				.352	*.032*	.034	.811	*.017*	.077	.079	.190
PA3			.613				.625	.124	-.058	.584	*.020*	*.010*	.098	.540
PS1				.871			.242	-.117	.275	.083	.407	.125	.203	.400
PS2				.831			.310	*.017*	.052	.055	.847	.032	.035	.161
PS3				.641			.589	*.029*	-.071	*-.036*	.718	*.032*	.095	.445
PC1					.957		.084	*-.020*	.370	*.011*	.100	.398	.270	.216
PC2					.849		.280	.038	*.007*	.067	*.018*	.920	.036	.046
PC3					.795		.369	*.012*	.050	*.023*	.065	.712	.089	.327
SC1						.835	.303	*-.001*	.046	.155	.109	.076	.715	.200
SC2						.727	.472	.169	.057	.065	.176	.087	.450	.484
SC3						.922	.150	.079	.242	*.025*	.081	.185	.562	.189
ω	.868	.921	.828	.828	.902	.870		.805	.833	.768	.794	.875	.774	

Factor correlations (95% confidence intervals)										
Factor	PSW	PA	PS	PC	SC	PSW	PA	PS	PC	SC
GSW	.70 (.67-.73)	.93 (.91-.95)	.38 (.33-.44)	.44 (.39-.49)	.54 (.49-.59)	.36 (.33-.40)	.54 (.51-.57)	.16 (.12-.20)	.18 (.14-.22)	.17 (.14-.21)
PSW		.69 (.65-.73)	.76 (.73-.79)	.83 (.81-.85)	.87 (.85-.89)		.35 (.31-.38)	.38 (.35-.41)	.45 (.42-.49)	.48 (.45-.51)
PA			.44 (.39-.50)	.51 (.46-.56)	.61 (.56-.65)			.23 (.19-.27)	.26 (.22-.30)	.28 (.23-.32)
PS				.65 (.62-.69)	.76 (.72-.79)				.32 (.28-.35)	.43 (.40-.47)
PC					.82 (.80-.85)					.48 (.45-.51)

Note. GSW = global self-worth; PSW = physical self-worth; PC = physical condition; SC = sport competence; PA = physical attractiveness; PS = physical strength; Greyscale = main loadings; non-significant parameters are in italics. All correlations are statistically significant ($p \leq .01$).

Table 4

Goodness-of-Fit Statistics of the Models used to Test Measurement Invariance (MI) and Differential Item Functioning (DIF)

	Model	χ^2 (*df*)	CFI	TLI	RMSEA	90% CI	CM	$\Delta W\chi^2(df)$	ΔCFI	ΔTLI	ΔRMSEA
MI	6-1. Configural invariance	2497.978 (436)*	.992	.986	.070	.067-.072	–	–	–	–	–
	6-2. Weak (λ) invariance	4442.922 (724)*	.986	.985	.073	.071-.075	6-1	2185.549 (288)*	-.006	-.001	+.003
	6-3. Strong (λ, ν) invariance	5721.686 (852)*	.981	.983	.077	.075-.079	6-2	1549.477 (128)*	-.005	-.002	+.004
	6-4. Strict (λ, ν, δ) invariance	8128.909 (924)*	.972	.977	.090	.088-.091	6-3	2068.355 (72)*	-.009	-.006	+.013
	6-5. Full (λ, ν, δ, ξ/φ) invariance	9090.596 (1008)*	.969	.976	.091	.089-.092	6-4	2054.820 (84)*	-.003	-.001	+.001
	6-6. Latent mean (λ, ν, δ, ξ/φ, η) invariance	11786.415 (1032)*	.959	.969	.103	.102-.105	6-5	1229.132 (24)	-.010	-.007	+.012
DIF:	7-1. MIMIC Null Model	15213.222 (1188)*	.949	.959	.110	.109-.112	–	–	–	–	–
Gender	7-2. MIMIC Factors-only	9274.688 (1128)*	.970	.975	.086	.085-.088	7-1	3009.563 (60)*	+.021	+.016	-.024
and age	7-3. MIMIC Saturated	8457.186 (1008)*	.973	.974	.087	.085-.089	7-2	1646.638 (120)*	+.003	-.001	+.001
	7-4. MIMIC Factors-only (invariance)	7565.323 (1176)*	.967	.974	.075	.073-.077	7-2	450.282 (48)*	-.003	-.001	-.011
DIF: BMI	8-1. MIMIC Null Model	7241.000 (642)*	.962	.966	.112	.109-.114	–	–	–	–	–
and sport involvement	8-2. MIMIC Factors-Only	3543.426 (606)*	.983	.984	.077	.074-.079	8-1	1625.515 (36)*	+.021	+.018	-.035
	8-3. MIMIC Saturated	3004.985 (534)*	.986	.985	.075	.072-.078	8-2	678.647 (72)*	+.003	+.001	-.002
	8-4. MIMIC Factors-Only (invariance)	3340.951 (630)*	.984	.986	.072	.070-.075	8-2	293.472 (24)*	+.001	+.002	-.005

Note. BMI = body mass index; CFA = confirmatory factor analytic model; ESEM = exploratory structural equation modeling; MIMIC = multiple indicators multiple cause models; χ^2 = robust weighed least square (WLSMV) chi-square; *df* = degrees of freedom; CFI = comparative fit index; TLI = Tucker-Lewis index; RMSEA = root mean square error of approximation; 90% CI = 90% confidence interval of the RMSEA; λ = factor loadings; ν = thresholds; δ = Uniquenesses; ξ = factor variances; φ = factor covariances; η = factor means; CM = comparison model; $\Delta W\chi^2$ = WLSMV chi square difference test (calculated with the Mplus DIFFTEST function); Δdf = change in degrees of freedom; ΔCFI = change in CFI; ΔTLI = change in TLI; ΔRMSEA = change in RMSEA;*p<.01.

Table 5

Relations between the PSI-S Latent Factors and the Predictors

		Sample-specific standardized coefficients.				
	b (*s.e.*)	*β* (Dutch)	*β* (French)	*β* (Arab)	*β* (Turkey)	*β* (Italy)
Age						
Global self-worth	-.061 (.020)**	-.060	-.060	-.060	-.060	-.060
Physical self-worth	-.155 (.016)**	-.145	-.146	-.146	-.146	-.146
Physical attractiveness	-.045 (.016)**	-.045	-.045	-.045	-.045	-.045
Physical strength	-.052 (.017)**	-.046	-.046	-.046	-.046	-.046
Physical condition	-.078 (.016)**	-.069	-.069	-.069	-.069	-.069
Sport competence	-.137 (.015)**	-.125	-.126	-.126	-.126	-.126
Gender						
Global self-worth	.250 (.044)**	.123	.123	.124	.124	.123
Physical self-worth	.646 (.034)**	.302	.301	.304	.304	.304
Physical attractiveness	.264 (.034)**	.130	.129	.131	.131	.130
Physical strength	1.035 (.035)**	.457	.456	.459	.459	.458
Physical condition	1.064 (.033)**	.465	.465	.468	.468	.468
Sport competence	.813 (.031)**	.370	.370	.373	.373	.373
Body mass index						
Global self-worth	.049 (.045)		.044	.039	.047	
Physical self-worth	-.005 (.031)		-.004	-.004	-.005	
Physical attractiveness	-.031 (.045)		-.030	-.029	-.030	
Physical strength	.642 (.156)**		.279	.184	.422	
Physical condition	.079 (.064)		.044	.031	.059	
Sport competence	.126 (.064)*		.074	.053	.098	
Sport involvement						
Global self-worth	.929 (.344)**		.435	.595	.277	
Physical self-worth	.974 (.151)**		.451	.615	.288	
Physical attractiveness	-.442 (.369)		-.224	-.333	-.136	
Physical strength	(1.102)*					
	4.016 *		.901	.928	.827	
Physical condition	2.875 (.484)**		.835	.915	.675	
Sport competence	2.685 (.434)**		.818	.903	.653	

Note. * $p \leq .05$; ** $p \leq .01$; *b* = unstandardized regression coefficient taken from the factors-only models (7-4; 8-4) invariant across samples; *s.e.* = standard error of the coefficient; *β* = sample-specific standardized regression coefficient (although the relations are invariant across samples, the standardized coefficients may still show some variation as a function of within-samples estimates of variability). Because age, body-mass index, and sport involvement were standardized prior to these analyses and that the PSI-S factors are estimated based on a model of latent variance-covariance invariance in which all latent factors have a *SD* of 1, all unstandardized coefficients can be directly interpreted is *SD* units.

Online Supplements for:

Cross-Cultural Validation of the Short Form of the Physical Self-Inventory (PSI-S)

Table S1

English, French, Dutch, Turkish, Italian, and Arabic Back-Translated Items from the PSI-S.

Items	English Items	French Items	Dutch items	Turkish Items	Italian Items	Arabic Items
GSW1	I have a good opinion of myself	J'ai une bonne opinion de moi-même	Ik heb een goed gedacht van mezelf	Kendimle ilgili olumlu düşüncelere sahibim	Ho una buona opinione di me stesso	لديّ انطباع جيّد عن نفسي.
PSW1	Globally, I'm proud of what I can do physically	Globalement, je suis satisfait(e) de mes capacités physiques	In het algemeen ben ik trots op wat ik fysiek kan	Fiziksel olarak yapabildiklerimle gurur duyarım	Globalmente, sono soddisfatto/a delle mie capacità fisiche	أنا راضٍ- راضية عن قدراتي الجسديّةً بالإجمال.
PA1*	I don't like very much the appearance of my body	Je n'aime pas beaucoup mon apparence physique	Ik hou niet erg van mijn uiterlijk	Vücudumun görünüşünden pek hoşlanmam	Il mio aspetto fisico non mi piace molto	لا أحبّ كثيراً مظهري الخارجي.
PS1	I'm physically stronger than most people	Je suis physiquement plus fort(e) que les autres	Ik ben fysiek sterker dan de meeste mensen	Birçok kişiden fiziksel olarak daha güçlüyüm	Sono fisicamente più forte della media	أظنّ أنّني أقوى من المعدّل.
GSW2*	There are many things in myself that I would change	Il y a des tas de choses en moi que j'aimerais changer	Er zijn veel dingen aan mezelf die ik zou willen veranderen	Kendimle ilgili değiştirmek istediğim çok şey var	Ci sono molte cose che vorrei cambiare di me stesso	أودّ تغيير أشياء كثيرة في شخصي.
PSW2	I am happy with what I can do physically	Je suis content(e) de ce que je peux faire physiquement	Ik ben blij met wat ik fysiek kan	Fiziksel olarak yapabildiklerimden memnunum.	Sono contento/a di quello che posso fare fisicamente	أنا راضٍ- راضية عن قدراتي الجسديّةً.
PC1	I would be good at physical stamina exercises	Je serais bon(ne) dans une épreuve d'endurance	Ik ben goed in oefeningen die fysieke uithouding vragen	Fiziksel dayanıklılık gerektiren egzersizlerde iyi olabilirim	Sarei bravo/a in esercizi di resistenza fisica	أنا جيّد- جيّدة في اختبار لقياس قدرة التّحمّل.
SC1	I find that I'm good in all sports	Je trouve que je suis bon(ne) dans tous les sports	Ik vind mezelf goed in alle sporten	Tüm sporlarda kendimi iyi bulurum	Credo di essere bravo/a negli sport	أجد أنّني جيّد في كافة الأنشطة الرّياضيّة.
PA2	I have a nice body to look at	J'ai un corps agréable à regarder	Ik heb een mooi lichaam om naar te kijken	Güzel görünen bir vücuda sahibim	Ho un corpo bello da guardare	أتمتّع بمظهر خارجيّ جميل.
PS2	I would be good at exercises that require strength	Je serais bon(ne) dans une épreuve de force	Ik zou goed zijn in oefeningen die kracht vereisen	Kuvvet gerektiren egzersizlerde iyi olabilirim	Sarei bravo/a in esercizi che richiedono forza fisica	أنا جيّد- جيّدة في اختبار لقياس القوّة.
PSW3	I'm confident about my physical self-worth	Je suis confiant(e) vis-à-vis de ma valeur physique	Ik heb vertrouwen in mijn fysieke zelfwaarde	Fiziksel yeterliliğim konusunda kendime güvenirim	Ho fiducia nel valore del mio fisico	ثقتي عميقة بالنّسبة لقيمتي الجسديّة.

Table S1 (Continued)

Items	English Items	French Items	Dutch items	Turkish Items	Italian Items	Arabic Items
PC2	I think I could run for a long time without tiring	Je pense pouvoir courir longtemps sans être fatigué(e)	Ik denk dat ik lang kan lopen zonder moe te worden	Yorulmadan uzun süre koşabileceğimi düşünürüm	Penso che potrei correre a lungo senza stancarmi	أظنّ أنّني أستطيع الجري لمدّة طويلة دون الشّعور بالتّعب.
SC2	I can find a way out of difficulties in all sports	Je me débrouille bien dans tous les sports	Ik kan een oplossing vinden bij problemen in alle sporten	Bütün sporlarda zorlukların üstesinden gelebilecek yolları bulabilirim	Me la cavo bene in tutti gli sport	أتدبّر أمري جيّداً في كافّة الأنشطة الرّياضيّة.
A3*	Nobody find me good-looking	Personne ne me trouve beau(belle)	Niemand vindt dat ik er goed uit zie	Hiç kimse görünüşümü güzel bulmaz	Nessuno mi trova bello/a	لا أحد يجدني وسيماً- جميلة.
PS3	Faced with a situation requiring physical strength, I'm the first to offer assistance	Face à des situations demandant de la force, je suis le(la) premier(ière) à proposer mes services	In een situatie die kracht vereist ben ik de eerste om te helpen	Fiziksel kuvvet gerektiren durumlarda yardım etmeyi öneren ilk kişiyimdir	Di fronte a una situazione che richiede forza fisica, sono il primo ad offrire assistenza	أنا أوّل من يبادر إلى المساعدة في حالات تتطلّب قوّة جسديّة.
PC3	I could run five kilometers without stopping	Je pourrais courir 5 km sans m'arrêter	Ik zou 5 kilometer kunnen lopen zonder stoppen	Durmadan 5 km. koşabilirim	Potrei correre 5km senza fermarmi	أستطيع الجري 5 كيلوميترات دون توقّف.
SC3	I do well in sports	Je réussis bien en sport	Ik ben goed in sporten	Sporları iyi yaparım	Sono bravo/a negli sport	أنجح في الأنشطة الرّياضيّة.
GSW3	I would like to stay as I am	Je voudrais rester comme je suis	Ik zou willen blijven zoals ik ben	Kendim gibi kalmak isterim	Vorrei restare come sono	أودّ البقاء كما أنا.
GSW2R	Overall I am satisfied with being the way I am	Globalement, je m'accepte tel que je suis	In het algemeen ben ik tevreden zoals ik ben	Bulunduğum halimden memnunum	Complessivamente, sono soddisfatto di come sono	أنا راضٍ- راضية عمّا أنا عليه.
PA1R	I am really pleased with the appearance of my body	J'aime beaucoup mon apparence physique	Ik ben echt tevreden met mijn lichaam	Vücudumun görünüşünden gerçekten memnunum	Sono molto contento/a del mio aspetto fisico	أحبّ كثيراً مظهري الخارجي.
PA3R	Everybody thinks that I am good-looking	Tout le monde me trouve beau(belle)	Iedereen vindt dat ik er goed uit zie	Herkes güzel göründüğümü düşünür	Tutti pensano che io abbia un bell'aspetto	الجميع يجدني وسيماً- جميلة.
Answer Scale	1- Not at all; 2- Very little; 3- Some;4- Enough; 5- A lot; 6- Entirely	1-Pas du tout; 2- Très peu; 3- Un peu; 4- Assez; 5- Beaucoup; 6- Tout à fait	1- Helemaal niet; 2- Zelden; 3- Eerder niet; 4- Eerder wel; 5- Meestal juist; 6- Altijd juist	1- Hiç; 2- Çok Az; 3- Biraz; 4- Yeterince; 5- Çok; 6- Tamamen	1- Per niente; 2- Pochissimo; 3- Un pó; 4- Abbastanza; 5- Molto; 6- Moltissimo	**1-أبدا / 2-نادراً** **3-قليلاً / 4-نوعاً ما** **5-كثيراً / 6-تماماً**

Note. * negatively-worded; R = reformulated version; GSW = global self-worth; PSW = physical self-worth; PC = physical condition; SC = sport competence; PA = physical attractiveness; PS = physical strength.

Table S2.

Standardized Parameters Estimates from the Confirmatory Factor Analytic and Exploratory Structural Equation Models of the PSI-S (Original) in the French-Speaking Sample

	Confirmatory factor analysis							Exploratory structural equation modeling						
Standardized factor loadings (λ) and uniquenesses (δ)														
Items	GSW (λ)	PSW (λ)	PA (λ)	PS (λ)	PC (λ)	SC (λ)	δ	GSW (λ)	PSW (λ)	PA (λ)	PS (λ)	PC (λ)	SC (λ)	δ
GSW1	.887						.213	.480	.182	.161	.084	*.058*	.141	.389
GSW2	.465						.783	.422	.173	.302	*-.042*	-.086	*-.087*	.583
GSW3	.757						.428	.632	.305	*.034*	-.084	*-.003*	*.041*	.334
PSW1		.863					.256	.147	.503	.099	.079	.135	.224	.249
PSW2		.863					.255	*.038*	.733	.102	.103	.060	.139	.121
PSW3		.884					.219	.381	.244	.071	.254	.194	.156	.211
PA1			.327				.893	-.146	*.021*	.878	*-.015*	*.013*	*-.007*	.300
PA2			.967				.065	.571	*.026*	.130	.210	.116	.115	.321
PA3			.242				.941	.380	-.230	.390	*-.032*	*-.035*	*-.003*	.650
PS1				.858			.264	*.077*	.167	*-.048*	.592	.099	.114	.331
PS2				.881			.223	*-.011*	.055	.047	.832	.077	.069	.127
PS3				.777			.397	*.002*	*.047*	*.010*	.613	*.062*	.169	.404
PC1					.888		.211	*.029*	.277	*-.038*	.060	.626	.083	.259
PC2					.914		.164	*-.015*	.120	.060	.082	.846	*.033*	.072
PC3					.823		.322	.059	-.100	*.052*	.093	.700	.195	.290
SC1						.906	.179	*.013*	.078	*.026*	.191	.190	.622	.174
SC2						.887	.212	*-.006*	.187	.081	.081	*.008*	.744	.146
SC3						.918	.157	.124	.142	*.038*	.095	.166	.608	.182
ω	.757	.903	.554	.877	.908	.931		.643	.790	.606	.828	.884	.886	

Factor correlations (95% confidence intervals)										
Factor	PSW	PA	PS	PC	SC	PSW	PA	PS	PC	SC
GSW	.82 (.78-.86)	.80 (.72-.89)	.47 (.39-.54)	.47 (.40-.54)	.61 (.55-.67)	.42 (.36-.48)	.38 (.28-.48)	.21 (.14-.28)	.18 (.12-.25)	.28 (.22-.33)
PSW		.75 (.67-.83)	.76 (.72-.81)	.77 (.73-.80)	.88 (.86-.91)		.20 (.14-.27)	.37 (.32-.43)	.38 (.33-.44)	.52 (.47-.58)
PA			.53 (.44-.61)	.49 (.41-.58)	.59 (.51-.68)			.10 (.02-.17)	.11 (.04-.19)	.18 (.11-.26)
PS				.70 (.65-.75)	.80 (.76-.83)				.42 (.38-.47)	.52 (.48-.56)
PC					.78 (.74-.81)					.49 (.45-.52)

Note. GSW = global self-worth; PSW = physical self-worth; PC = physical condition; SC = sport competence; PA = physical attractiveness; PS = physical strength; Greyscale = main loadings; non-significant parameters are in italics. All correlations are statistically significant ($p \leq .01$).

Table S3.

Standardized Parameters Estimates from the Confirmatory Factor Analytic and Exploratory Structural Equation Models of the PSI-S (Revised) in the French-Speaking Sample

	Confirmatory factor analysis							Exploratory structural equation modeling						
Standardized factor loadings (λ) and uniquenesses (δ)														
Items	GSW (λ)	PSW (λ)	PA (λ)	PS (λ)	PC (λ)	SC (λ)	δ	GSW (λ)	PSW (λ)	PA (λ)	PS (λ)	PC (λ)	SC (λ)	δ
GSW1	.848						.281	.388	.148	.294	*.048*	*.040*	.141	.386
GSW2	.853						.273	.796	.118	*.046*	.072	*-.001*	.048	.155
GSW3	.813						.338	.621	.146	.246	-.091	*.023*	*.031*	.272
PSW1		.858					.263	.108	.520	.124	*.050*	.103	.228	.248
PSW2		.859					.263	.155	.719	*-.039*	.111	.042	.141	.118
PSW3		.894					.201	.265	.254	.209	.220	.176	.149	.227
PA1			.944				.108	.414	.210	.470	.057	.074	*-.015*	.130
PA2			.863				.255	.110	.104	.704	.074	*.038*	.081	.197
PA3			.690				.523	*.048*	-.073	.689	.103	.065	.065	.400
PS1				.863			.255	*-.048*	.178	.163	.561	.079	.099	.331
PS2				.877			.231	*.015*	.062	*.033*	.823	.080	.060	.125
PS3				.775			.399	*.045*	*.009*	*.026*	.616	.075	.163	.400
PC1					.890		.208	-.091	.342	.097	*.042*	.598	*.056*	.246
PC2					.916		.160	*-.002*	.155	*.030*	.086	.808	*.033*	.096
PC3					.823		.323	.099	-.144	*.028*	.107	.730	.197	.255
SC1						.902	.186	-.151	.141	.166	.149	.154	.640	.132
SC2						.890	.208	.072	.174	*.041*	.098	*.021*	.693	.175
SC3						.919	.155	.191	.108	*-.031*	.121	.187	.612	.160
ω	.876	.904	.876	.877	.909	.930		.800	.790	.827	.824	.884	.890	

Factor correlations (95% confidence intervals)

Factor	CFA PSW		PA		PS		PC		SC	
GSW	.83	(.79-.86)	.91	(.89-.93)	.48	(.41-.56)	.47	(.40-.54)	.62	(.56-.67)
PSW			.83	(.80-.86)	.76	(.72-.81)	.76	(.73-.80)	.88	(.86-.91)
PA					.62	(.56-.68)	.57	(.51-.63)	.65	(.60-.70)
PS							.70	(.65-.75)	.80	(.76-.83)
PC									.78	(.74-.81)

Factor	ESEM PSW		PA		PS		PC		SC	
GSW	.47	(.42-.52)	.51	(.47-.55)	.16	(.11-.21)	.15	(.10-.21)	.27	(.22-.32)
PSW			.39	(.35-.44)	.38	(.33-.43)	.40	(.36-.45)	.53	(.49-.57)
PA					.33	(.28-.38)	.29	(.24-.34)	.32	(.28-.37)
PS							.40	(.36-.45)	.50	(.46-.54)
PC									.46	(.42-.50)

Note. GSW = global self-worth; PSW = physical self-worth; PC = physical condition; SC = sport competence; PA = physical attractiveness; PS = physical strength; Greyscale = main loadings; non-significant parameters are in italics. All correlations are statistically significant ($p \leq .01$).

Table S4.

Standardized Parameters Estimates from the Confirmatory Factor Analytic and Exploratory Structural Equation Models of the PSI-S (Original) in the Turkish-Speaking Sample

	Confirmatory factor analysis							Exploratory structural equation modeling						
Standardized factor loadings (λ) and uniquenesses (δ)														
Items	GSW (λ)	PSW (λ)	PA (λ)	PS (λ)	PC (λ)	SC (λ)	δ	GSW (λ)	PSW (λ)	PA (λ)	PS (λ)	PC (λ)	SC (λ)	δ
GSW1	.754						.432	*.168*	.630	*.077*	*-.072*	*.079*	*-.023*	.475
GSW2	.160						.974	.452	*-.071*	.330	-.152	-.100	*.057*	.592
GSW3	.598						.642	.450	.141	.200	*-.040*	*.067*	*.080*	.569
PSW1		.682					.535	*-.037*	.772	*.024*	*-.004*	*.026*	.134	.287
PSW2		.695					.516	.318	.422	*.066*	.145	*.047*	*.073*	.413
PSW3		.848					.280	.205	.208	*.013*	.411	.274	*.028*	.315
PA1			.101				.990	*.064*	*-.053*	.648	*-.043*	.124	*-.079*	.541
PA2			.792				.373	*.094*	.15	.288	.284	*.015*	.263	.502
PA3			*-.013*				1.000	.289	*.013*	.394	*-.089*	-.141	*-.063*	.654
PS1				.632			.600	-.093	.184	-.062	.529	*-.001*	*.084*	.544
PS2				.814			.337	-.129	*.028*	.104	.798	.154	*.020*	.199
PS3				.617			.619	.223	*.066*	-.218	.248	.098	.197	.604
PC1					.845		.286	.111	.134	.023	.403	*.024*	.336	.353
PC2					.737		.457	*.021*	*.004*	.025	*.073*	.802	*-.005*	.280
PC3					.652		.574	-.097	*-.009*	.010	*-.083*	.740	.149	.397
SC1						.747	.442	-.222	*-.011*	.086	*.001*	*-.030*	.941	.230
SC2						.704	.504	.270	*.045*	-.183	*.030*	*.075*	.507	.468
SC3						.785	.384	.134	.040	.020	*-.064*	.249	.568	.386
ω	.527	.788	.247	.732	.791	.790		.412	.659	.510	.648	.704	.789	

Factor correlations (95% confidence intervals)										
Factor	PSW	PA	PS	PC	SC	PSW	PA	PS	PC	SC
GSW	.88 (.81-.95)	.74 (.49-1.00)	.38 (.28-.47)	.46 (.37-.56)	.54 (.45-.62)	.38 (.29-.47)	.32 (.23-.41)	.17 (.08-.27)	.21 (.11-.31)	.29 (.20-.38)
PSW		.80 (.53-1.07)	.84 (.80-.89)	.85 (.81-.89)	.82 (.78-.86)		.15 (.03-.27)	.40 (.30-.49)	.36 (.27-.44)	.49 (.40-.58)
PA			.73 (.47-.98)	.68 (.45-.91)	.75 (.49-1.00)			*-.10* (-.21-.01)	*.02* (-.09-.13)	*.02* (-.11-.14)
PS				.89 (.85-.93)	.83 (.79-.87)				.55 (.48-.63)	.67 (.61-.73)
PC				(.37-.56)	.89 (.85-.92)					.64 (.57-.72)

Note. GSW = global self-worth; PSW = physical self-worth; PC = physical condition; SC = sport competence; PA = physical attractiveness; PS = physical strength; Greyscale = main loadings; non-significant parameters are in italics. All correlations are statistically significant ($p \leq .01$).

Table S5.

Standardized Parameters Estimates from the Confirmatory Factor Analytic and Exploratory Structural Equation Models of the PSI-S (Revised) in the Turkish-Speaking Sample

	Confirmatory factor analysis							Exploratory structural equation modeling						
Standardized factor loadings (λ) and uniquenesses (δ)														
Items	GSW (λ)	PSW (λ)	PA (λ)	PS (λ)	PC (λ)	SC (λ)	δ	GSW (λ)	PSW (λ)	PA (λ)	PS (λ)	PC (λ)	SC (λ)	δ
GSW1	.659						.566	*-.014*	.633	.271	-.132	.111	*-.097*	.393
GSW2	.839						.296	.600	.174	.186	*-.067*	*.065*	.094	.270
GSW3	.672						.549	.544	*.049*	.311	-.131	*.068*	*-.034*	.421
PSW1		.679					.539	-.071	.669	.100	*.036*	*.027*	.132	.368
PSW2		.706					.501	.309	.569	-.075	.093	*.008*	.112	.371
PSW3		.837					.300	.182	.255	*.063*	.363	.249	*.049*	.319
PA1			.863				.256	.378	-.060	.678	.064	*-.014*	*.020*	.169
PA2			.803				.356	.094	*.010*	.562	.235	*.012*	*.082*	.402
PA3			.686				.530	-.091	*-.053*	.774	*-.008*	*.007*	.137	.396
PS1				.638			.594	-.140	.111	.223	.556	*.027*	*-.002*	.537
PS2				.810			.344	*-.040*	*.056*	.079	.732	.181	*-.005*	.237
PS3				.622			.613	*.000*	.134	*.046*	.223	*.061*	.274	.660
PC1					.847		.282	.137	.242	*-.058*	.388	*-.032*	.386	.313
PC2					.735		.460	*.056*	*-.009*	*-.059*	*.084*	.848	*-.018*	.236
PC3					.648		.580	*-.051*	*-.058*	*-.012*	*-.026*	.690	.163	.438
SC1						.734	.461	-.176	*-.023*	.172	*.076*	*.053*	.689	.348
SC2						.715	.489	.154	.087	*.032*	*.018*	*.020*	.561	.494
SC3						.788	.378	.086	*.066*	*.053*	-.103	.224	.600	.367
ω	.769	.787	.829	.734	.790	.790		.541	.678	.807	.614	.697	.739	

Factor correlations (95% confidence intervals)	Confirmatory factor analysis										Exploratory structural equation modeling									
Factor	PSW		PA		PS		PC		SC		PSW		PA		PS		PC		SC	
GSW	.87	(.82-.91)	.89	(.85-.93)	.43	(.35-.51)	.53	(.46-.60)	.61	(.55-.68)	.36	(.29-.43)	.48	(.40-.56)	.17	(.09-.26)	.29	(.20-.38)	.30	(.23-.37)
PSW			.75	(.70-.80)	.85	(.81-.89)	.85	(.81-.89)	.82	(.78-.87)			.52	(.45-.58)	.28	(.18-.38)	.38	(.30-.46)	.42	(.32-.52)
PA					.63	(.57-.70)	.60	(.54-.66)	.71	(.66-.76)					.25	(.15-.34)	.40	(.31-.49)	.44	(.34-.54)
PS							.89	(.85-.93)	.83	(.79-.87)							.50	(.42-.58)	.63	(.57-.70)
PC									.89	(.85-.92)									.64	(.56-.72)

Note. GSW = global self-worth; PSW = physical self-worth; PC = physical condition; SC = sport competence; PA = physical attractiveness; PS = physical strength; Greyscale = main loadings; non-significant parameters are in italics. All correlations are statistically significant ($p \leq .01$).

Table S6.

Standardized Parameters Estimates from the Confirmatory Factor Analytic and Exploratory Structural Equation Models of the PSI-S (Original) in the Italian-Speaking Sample

	Confirmatory factor analysis							Exploratory structural equation modeling						
Standardized factor loadings (λ) and uniquenesses (δ)														
Items	GSW (λ)	PSW (λ)	PA (λ)	PS (λ)	PC (λ)	SC (λ)	δ	GSW (λ)	PSW (λ)	PA (λ)	PS (λ)	PC (λ)	SC (λ)	δ
GSW1	.806						.350	.397	.348	.169	*.025*	*.005*	-*.010*	.431
GSW2	.662						.562	.570	-*.040*	.275	-*.011*	*.037*	*.034*	.438
GSW3	.793						.371	.658	.152	.077	*.025*	*.031*	.046	.338
PSW1		.877					.231	.291	.645	.084	.040	.045	.087	.114
PSW2		.871					.241	.114	.530	.118	.178	.075	.146	.245
PSW3		.893					.202	.088	.359	.293	.281	.162	.076	.213
PA1			.517				.733	.187	*.008*	.469	-.097	.074	*.031*	.635
PA2			.890				.208	.158	.263	.413	.113	.100	*.006*	.406
PA3			.402				.838	*.049*	-*.048*	.651	-*.014*	-.135	*.009*	.571
PS1				.746			.443	.102	.157	-*.003*	.647	*.005*	*.025*	.393
PS2				.956			.086	-*.026*	.085	.090	.697	.146	.166	.118
PS3				.654			.572	*.039*	-*.001*	-*.009*	.533	.119	.123	.548
PC1					.970		.059	-.121	.275	*.054*	.285	.338	.276	.222
PC2					.838		.298	*.015*	.081	*.018*	-.012	.918	.039	.058
PC3					.812		.341	.077	-.061	-*.027*	.136	.723	.122	.280
SC1						.942	.113	-.099	.254	.094	.094	.111	.682	.103
SC2						.921	.152	.116	.054	.038	.117	.112	.722	.156
SC3						.955	.087	.120	*.019*	.047	.094	.138	.790	.054
ω	.799	.912	.648	.834	.908	.958		.686	.804	.593	.769	.875	.939	

Factor correlations (95% confidence intervals)	Confirmatory factor analysis										Exploratory structural equation modeling									
Factor	PSW		PA		PS		PC		SC		PSW		PA		PS		PC		SC	
GSW	.84	(.81-.86)	.84	(.80-.87)	.45	(.40-.50)	.39	(.34-.45)	.49	(.44-.53)	.46	(.41-.50)	.55	(.50-.59)	.14	(.08-.19)	.16	(.11-.21)	.17	(.13-.22)
PSW			.82	(.79-.85)	.79	(.77-.82)	.71	(.68-.74)	.76	(.74-.79)			.44	(.38-.50)	.48	(.45-.52)	.34	(.30-.38)	.42	(.38-.45)
PA					.50	(.45-.55)	.43	(.37-.48)	.52	(.47-.57)					.20	(.14-.26)	.14	(.09-.20)	.24	(.18-.29)
PS							.79	(.77-.82)	.78	(.75-.81)							.43	(.40-.47)	.48	(.45-.51)
PC									.80	(.78-.83)									.49	(.46-.52)

Note. GSW = global self-worth; PSW = physical self-worth; PC = physical condition; SC = sport competence; PA = physical attractiveness; PS = physical strength; Greyscale = main loadings; non-significant parameters are in italics. All correlations are statistically significant ($p \leq .01$).

Table S7.

Standardized Parameters Estimates from the Confirmatory Factor Analytic and Exploratory Structural Equation Models of the PSI-S (Revised) in the Italian-Speaking Sample

	Confirmatory factor analysis							Exploratory structural equation modeling						
Standardized factor loadings (λ) and uniquenesses (δ)														
Items	GSW (λ)	PSW (λ)	PA (λ)	PS (λ)	PC (λ)	SC (λ)	δ	GSW (λ)	PSW (λ)	PA (λ)	PS (λ)	PC (λ)	SC (λ)	δ
GSW1	.776						.398	.495	.331	.087	*.028*	*.016*	*-.016*	.391
GSW2	.912						.168	.618	.195	.175	*.011*	.073	.080	.191
GSW3	.788						.379	.620	.097	.169	*.014*	*.032*	.063	.342
PSW1		.885					.218	.251	.615	.124	.068	.041	.064	.148
PSW2		.863					.255	.126	.554	.092	.182	.069	.119	.232
PSW3		.894					.200	.158	.310	.268	.281	.142	.088	.219
PA1			.959				.080	.431	.116	.498	*.024*	.061	.063	.129
PA2			.853				.273	*.010*	.091	.832	.044	.061	.027	.136
PA3			.671				.550	.152	*.007*	.585	.053	*-.030*	.052	.496
PS1				.752			.434	.059	.116	.080	.649	*.010*	*.020*	.396
PS2				.952			.093	-.070	.128	.095	.672	.144	.159	.123
PS3				.650			.577	*.056*	*.012*	-.058	.552	.123	.116	.535
PC1					.971		.057	-.165	.338	.060	.259	.339	.250	.212
PC2					.840		.295	*.016*	.073	.039	*-.018*	.926	.030	.050
PC3					.809		.346	.053	-.066	*-.002*	.144	.722	.120	.285
SC1						.941	.114	-.120	.296	.085	.075	.104	.672	.097
SC2						.922	.151	.126	.053	*.016*	.124	.119	.718	.153
SC3						.955	.087	.097	*.008*	.066	.101	.140	.788	.055
ω	.866	.912	.872	.834	.908	.958		.765	.785	.828	.769	.878	.940	

Factor correlations (95% confidence intervals)

Factor	PSW		PA		PS		PC		SC		PSW		PA		PS		PC		SC	
GSW	.86	(.84-.88)	.90	(.88-.92)	.48	(.43-.53)	.43	(.38-.48)	.53	(.49-.57)	.49	(.45-.52)	.54	(.51-.57)	.13	(.10-.17)	.14	(.10-.18)	.17	(.14-.21)
PSW			.84	(.82-.87)	.80	(.77-.82)	.71	(.68-.74)	.76	(.74-.79)			.49	(.46-.52)	.49	(.45-.52)	.35	(.31-.38)	.44	(.41-.48)
PA					.53	(.49-.58)	.47	(.42-.51)	.55	(.51-.59)					.29	(.25-.33)	.22	(.18-.26)	.28	(.24-.31)
PS							.79	(.77-.82)	.78	(.75-.81)							.43	(.40-.46)	.48	(.45-.51)
PC									.80	(.78-.83)									.49	(.46-.52)

Note. GSW = global self-worth; PSW = physical self-worth; PC = physical condition; SC = sport competence; PA = physical attractiveness; PS = physical strength; Greyscale = main loadings; non-significant parameters are in italics. All correlations are statistically significant ($p \leq .01$).

Table S8.

Standardized Parameters Estimates from the Confirmatory Factor Analytic and Exploratory Structural Equation Models of the PSI-S (Original) in the Arab-Speaking Sample

	Confirmatory factor analysis							Exploratory structural equation modeling						
Standardized factor loadings (λ) and uniquenesses (δ)														
Items	GSW (λ)	PSW (λ)	PA (λ)	PS (λ)	PC (λ)	SC (λ)	δ	GSW (λ)	PSW (λ)	PA (λ)	PS (λ)	PC (λ)	SC (λ)	δ
GSW1	.772						.403	.418	.270	.158	-.249	.340	*-.071*	.356
GSW2	.751						.437	.482	.058	.358	*.088*	-.135	.084	.409
GSW3	.838						.298	.858	.050	*.018*	.072	-.001	.051	.145
PSW1		.962					.075	.089	.713	.098	.095	.066	.126	.060
PSW2		.914					.164	.144	.686	.050	.110	*.031*	.109	.139
PSW3		.889					.210	.140	.455	.127	.167	.216	*.034*	.245
PA1			.820				.328	.175	*.035*	.694	.075	*.006*	*.040*	.271
PA2			.853				.272	.372	.145	.333	-.098	.334	-.078	.310
PA3			.763				.418	*-.009*	.044	.844	*-.001*	*.037*	.043	.218
PS1				.868			.247	.111	.184	.070	.448	.238	.079	.255
PS2				.958			.082	.050	.164	.076	.589	.156	.175	.075
PS3				.913			.167	.097	.174	.063	.562	.163	.114	.160
PC1					.952		.094	-.063	.171	.084	.351	.344	.265	.114
PC2					.944		.109	*-.024*	.057	.039	.232	.572	.263	.076
PC3					.937		.122	.092	*.046*	.005	.264	.516	.241	.116
SC1						.958	.083	.085	.124	.068	.141	.161	.618	.097
SC2						.954	.091	*.023*	.134	.092	.095	.125	.705	.068
SC3						.937	.122	.078	.111	.054	.144	.154	.623	.128
ω	.830	.945	.854	.938	.961	.965		.773	.886	.814	.839	.870	.928	

Factor correlations (95% confidence intervals)

Factor	PSW		PA		PS		PC		SC		PSW		PA		PS		PC		SC	
GSW	.77	(.74-.80)	.90	(.87-.92)	.57	(.53-.62)	.52	(.47-.57)	.53	(.49-.58)	.50	(.46-.53)	.52	(.49-.56)	.17	(.12-.22)	.33	(.25-.40)	.19	(.13-.24)
PSW			.73	(.70-.75)	.86	(.84-.88)	.82	(.80-.84)	.80	(.78-.83)			.40	(.38-.43)	.49	(.43-.54)	.54	(.51-.58)	.46	(.42-.49)
PA					.60	(.57-.64)	.54	(.50-.59)	.57	(.53-.61)					.21	(.15-.28)	.31	(.26-.36)	.25	(.21-.30)
PS							.95	(.94-.96)	.91	(.90-.92)							.57	(.51-.62)	.64	(.61-.67)
PC									.93	(.92-.94)									.57	(.52-.62)

Note. GSW = global self-worth; PSW = physical self-worth; PC = physical condition; SC = sport competence; PA = physical attractiveness; PS = physical strength; Greyscale = main loadings; non-significant parameters are in italics. All correlations are statistically significant ($p \leq .01$).

Table S9.

Standardized Parameters Estimates from the Confirmatory Factor Analytic and Exploratory Structural Equation Models of the PSI-S (Revised) in the Arab-Speaking Sample

	Confirmatory factor analysis							Exploratory structural equation modeling						
Standardized factor loadings (λ) and uniquenesses (δ)														
Items	GSW (λ)	PSW (λ)	PA (λ)	PS (λ)	PC (λ)	SC (λ)	δ	GSW (λ)	PSW (λ)	PA (λ)	PS (λ)	PC (λ)	SC (λ)	δ
GSW1	.777						.397	.309	.224	.430	-*.081*	*.073*	-*.003*	.372
GSW2	.877						.231	.740	.192	-*.016*	*.014*	*.041*	.079	.181
GSW3	.828						.314	.630	.049	.227	*.063*	*.063*	-*.019*	.274
PSW1		.961					.077	.109	.673	.080	.139	.044	.137	.065
PSW2		.915					.162	.182	.661	*.014*	.083	.101	.077	.130
PSW3		.889					.211	.114	.432	.168	.192	.187	*.041*	.246
PA1			.935				.126	.383	*.019*	.594	.081	-*.038*	.112	.114
PA2			.888				.212	.230	.063	.627	.139	-*.008*	*.049*	.216
PA3			.865				.251	.049	.144	.743	.020	.109	*.018*	.203
PS1				.870			.243	*.028*	.130	.166	.490	.195	.099	.238
PS2				.957			.084	.050	.114	*.003*	.634	.146	.186	.064
PS3				.911			.169	*.057*	.168	*.015*	.532	.211	.110	.169
PC1					.951		.095	*.058*	.154	-.064	.315	.405	.225	.114
PC2					.944		.109	.057	.069	-*.006*	.116	.709	.161	.058
PC3					.938		.121	*.032*	.084	.084	.177	.590	.168	.122
SC1						.958	.083	*.013*	.111	.101	.159	.168	.615	.090
SC2						.953	.092	.058	.119	*.002*	.098	.169	.680	.071
SC3						.938	.121	.106	.071	*.015*	.153	.185	.600	.126
ω	.867	.944	.925	.938	.961	.965		.773	.876	.879	.853	.908	.926	

Factor correlations (95% confidence intervals)										
Factor	PSW	PA	PS	PC	SC	PSW	PA	PS	PC	SC
GSW	.82 (.79-.84)	.92 (.90-.94)	.61 (.57-.65)	.56 (.51-.60)	.58 (.54-.63)	.54 (.51-.58)	.59 (.55-.63)	.29 (.24-.33)	.28 (.22-.33)	.29 (.25-.34)
PSW		.73 (.70-.76)	.86 (.84-.88)	.82 (.80-.84)	.80 (.78-.83)		.38 (.35-.41)	.55 (.52-.59)	.52 (.48-.55)	.47 (.44-.50)
PA			.60 (.55-.64)	.51 (.47-.56)	.55 (.50-.59)			.25 (.21-.30)	.20 (.15-.24)	.19 (.15-.23)
PS				.95 (.94-.96)	.91 (.90-.92)				.70 (.67-.74)	.62 (.59-.65)
PC					.93 (.92-.94)					.67 (.64-.70)

Note. GSW = global self-worth; PSW = physical self-worth; PC = physical condition; SC = sport competence; PA = physical attractiveness; PS = physical strength; Greyscale = main loadings; non-significant parameters are in italics. All correlations are statistically significant ($p \leq .01$).

Table S10.

Goodness-of-Fit and Measurement Invariance across Arab Countries

Model	Description	χ^2 (df)	CFI	TLI	RMSEA	90% CI
Kuwait						
Original Version	CFA	503.432 (120)*	.998	.998	.070	.064-.077
	CFA with Method Factor	539.261 (117)*	.998	.998	.075	.068-.081
	ESEM	98.120 (60)*	1.000	1.000	.031	.020-.042
	ESEM with Method Factor	93.913 (57)*	1.000	1.000	.032	.020-.043
Revised version	CFA	325.957 (120)*	.999	.999	.052	.045-.058
	ESEM	85.571 (60)*	1.000	1.000	.026	.011-.037
Tunisia						
Original version	CFA	1193.398 (120)*	.910	.885	.124	.117-.130
	CFA with Method Factor	833.214 (117)*	.940	.922	.102	.096-.109
	ESEM	204.012 (60)*	.988	.969	.064	.055-.074
	ESEM with Method Factor	176.413 (57)*	.990	.973	.060	.050-.070
Revised version	CFA	619.652 (120)*	.961	.950	.084	.078-.091
	ESEM	173.276 (60)*	.991	.977	.057	.047-.067
Measurement invariance	Configural invariance	848.332 (150)*	.997	.994	.087	.082-.093
	Weak (λ) invariance	1103.481 (222)*	.996	.995	.079	.074-.084
	Strong (λ, ν) invariance	1244.661 (251)*	.996	.995	.080	.076-.085
	Strict (λ, ν, δ) invariance	1457.493 (269)*	.995	.994	.085	.081-.089

Note. CFA = confirmatory factor analytic model; ESEM = exploratory structural equation modeling; MIMIC = multiple indicators multiple cause models; χ^2 = robust weighed least square (WLSMV) chi-square; df = degrees of freedom; CFI = comparative fit index; TLI = Tucker-Lewis index; RMSEA = root mean square error of approximation; 90% CI = 90% confidence interval of the RMSEA; λ = factor loadings; ν = thresholds; δ = uniquenesses; *p<.01.

Table S11.
Goodness-of-Fit of Models Including Method Factors

Sample	Description	χ^2 (df)	CFI	TLI	RMSEA	90% CI
Dutch-Speaking	CFA with method factor	1316.455 (117)*	.965	.954	.093	.089-.098
	ESEM with method factor	180.032 (57)*	.996	.990	.043	.036-.050
French-Speaking	CFA with method factor	674.829 (117)*	.974	.966	.089	.083-.096
	ESEM with method factor	138.908 (57)*	.996	.990	.049	.039-.059
Arab-Speaking	CFA with method factor	487.279 (117)*	.997	.996	.051	.046-.055
	ESEM with method factor	160.037 (57)*	.999	.998	.038	.031-.045
Turkish-Speaking	CFA with method factor	1095.780 (117)*	.904	.875	.114	.108-.120
	ESEM with method factor	144.242 (57)*	.991	.977	.049	.039-.059
Italian-Speaking	CFA with method factor	1629.653 (117)*	.972	.963	.103	.098-.107
	ESEM with method factor	281.914 (57)*	.996	.989	.057	.050-.064

Note. CFA = confirmatory factor analytic model; ESEM = exploratory structural equation modeling; MIMIC = multiple indicators multiple cause models; χ^2 = robust weighed least square (WLSMV) chi-square; df = degrees of freedom; CFI = comparative fit index; TLI = Tucker-Lewis index; RMSEA = root mean square error of approximation; 90% CI = 90% confidence interval of the RMSEA; *p<.01.

Table S12.

Standardized Parameters Estimates from the Confirmatory Factor Analytic and Exploratory Structural Equation Models of the PSI-S (Original) Including a Method Factor for Negatively-Worded items in the Dutch-Speaking Sample

	Confirmatory factor analysis							Exploratory structural equation modeling						
Standardized factor loadings (λ) and uniquenesses (δ)														
Items	GSW (λ)	PSW (λ)	PA (λ)	PS (λ)	PC (λ)	SC (λ)	δ	GSW (λ)	PSW (λ)	PA (λ)	PS (λ)	PC (λ)	SC (λ)	δ
GSW1	.774						.401	.801	*.027*	.082	*-.004*	*.007*	-.032	.287
GSW2	.452						.508	.168	*-.052*	.508	*.015*	*.025*	*.004*	.500
GSW3	.793						.371	.263	.135	.546	*.004*	*-.018*	.099	.365
PSW1		.899					.191	.275	.645	*-.024*	.030	.089	.120	.135
PSW2		.886					.214	.108	.649	.165	.094	.069	.118	.171
PSW3		.888					.211	.236	.334	.118	.277	.189	.121	.228
PA1			.218				.545	*.049*	*-.006*	.293	*.024*	*.030*	*-.044*	.521
PA2			.921				.153	.310	*.041*	.348	.057	.109	.158	.486
PA3			.213				.743	*-.044*	.087	.307	*.000*	*.036*	*-.050*	.742
PS1				.871			.241	.172	.251	-.192	.375	.124	.189	.382
PS2				.828			.314	*.018*	.065	.063	.895	*.023*	*.018*	.096
PS3				.644			.585	*.049*	-.064	*-.053*	.658	*.026*	.130	.479
PC1					.958		.082	*.008*	.405	*.009*	.112	.376	.228	.218
PC2					.846		.284	.067	*.020*	*.027*	*.013*	.925	.046	.023
PC3					.797		.365	*.024*	.078	*.005*	.064	.683	.101	.338
SC1						.837	.300	.063	.070	*.030*	.096	.088	.712	.224
SC2						.721	.480	.221	*-.010*	*.022*	.120	.080	.516	.454
SC3						.924	.146	*-.013*	.301	.073	.074	.158	.561	.177
ω	.761	.921	.559	.828	.902	869		.569	.832	.339	.795	.872	.789	

Factor correlations (95% confidence intervals)										
Factor	PSW	PA	PS	PC	SC	PSW	PA	PS	PC	SC
GSW	.72 (.68-.76)	.77 (.69-.86)	.39 (.33-.45)	.45 (.40-.51)	.56 (.51-.61)	.44 (.39-.49)	.47 (.41-.54)	.30 (.25-.35)	.28 (.24-.33)	.37 (.33-.42)
PSW		.64 (.56-.72)	.76 (.73-.79)	.83 (.81-.85)	.87 (.85-.89)		.21 (.15-.26)	.36 (.33-.40)	.46 (.43-.50)	.54 (.50-.57)
PA			.41 (.33-.48)	.49 (.42-.57)	.57 (.49-.64)			.06 (.00-.12)	.14 (.09-.19)	.14 (.08-.20)
PS				.65 (.62-.69)	.76 (.72-.79)				.30 (.27-.34)	.44 (.41-.48)
PC					.82 (.80-.85)					.47 (.44-.51)

Note. GSW = global self-worth; PSW = physical self-worth; PC = physical condition; SC = sport competence; PA = physical attractiveness; PS = physical strength; Greyscale = main loadings; non-significant parameters are in italics. All correlations are statistically significant ($p \leq .01$).

Table S13.

Standardized Parameters Estimates from the Confirmatory Factor Analytic and Exploratory Structural Equation Models of the PSI-S (Original) Including a Method Factor for Negatively-Worded items in the French-Speaking Sample

	Confirmatory factor analysis							Exploratory structural equation modeling						
Standardized factor loadings (λ) and uniquenesses (δ)														
Items	GSW (λ)	PSW (λ)	PA (λ)	PS (λ)	PC (λ)	SC (λ)	δ	GSW (λ)	PSW (λ)	PA (λ)	PS (λ)	PC (λ)	SC (λ)	δ
GSW1	.894						.201	.325	.208	.354	.094	*.059*	.103	.374
GSW2	.449						.592	.604	*.050*	*.049*	*-.023*	*-.052*	*-.017*	.138
GSW3	.760						.422	.686	.161	*.104*	*-.053*	*.034*	*.072*	.294
PSW1		.861					.258	.132	.531	.111	.069	.121	.196	.245
PSW2		.863					.256	.096	.752	*.031*	.081	.039	.116	.124
PSW3		.883					.220	.295	.241	.190	.265	.199	.142	.214
PA1			.289				.617	*-.120*	.143	.481	*-.085*	*-.009*	*.032*	.627
PA2			.950				.097	.376	*.046*	.368	.232	.126	*.084*	.323
PA3			.200				.673	*.040*	-.110	.662	*-.040*	*-.044*	*-.051*	.538
PS1				.859			.261	*.097*	.148	*-.060*	.597	.103	.125	.322
PS2				.881			.224	-.069	.096	.067	.813	.070	.073	.130
PS3				.777			.397	*.001*	*.043*	*-.001*	.607	*.063*	.185	.401
PC1					.889		.210	*.043*	.288	*-.059*	.061	.617	.076	.257
PC2					.915		.163	*-.040*	.156	*.043*	.072	.829	*.034*	.077
PC3					.825		.319	*.024*	-.102	.072	.090	.706	.211	.282
SC1						.906	.180	*-.016*	.108	*.041*	.186	.183	.612	.175
SC2						.887	.212	*-.004*	.213	.061	.070	*-.001*	.730	.148
SC3						.919	.156	.135	.126	*.040*	.094	.169	.614	.176
ω	.784	.903	.599	.878	.909	.931		.764	.799	.605	.827	.883	.885	

Factor correlations (95% confidence intervals)										
Factor	PSW	PA	PS	PC	SC	PSW	PA	PS	PC	SC
GSW	.82 (.78-.86)	.80 (.70-.89)	.47 (.39-.54)	.47 (.39-.54)	.61 (.55-.67)	.43 (.31-.55)	.40 (.26-.54)	.18 (.07-.29)	.15 (.03-.28)	.24 (.13-.36)
PSW		.77 (.68-.86)	.76 (.72-.81)	.77 (.73-.80)	.88 (.86-.91)		.28 (.21-.35)	.40 (.34-.46)	.42 (.36-.48)	.56 (.51-.61)
PA			.54 (.45-.64)	.51 (.42-.60)	.61 (.52-.70)			.15 (.09-.22)	.16 (.09-.23)	.23 (.16-.30)
PS				.70 (.64-.75)	.80 (.76-.83)				.41 (.37-.46)	.51 (.47-.55)
PC					.78 (.74-.81)					.48 (.43-.52)

Note. GSW = global self-worth; PSW = physical self-worth; PC = physical condition; SC = sport competence; PA = physical attractiveness; PS = physical strength; Greyscale = main loadings; non-significant parameters are in italics. All correlations are statistically significant ($p \leq .01$).

Table S14.

Standardized Parameters Estimates from the Confirmatory Factor Analytic and Exploratory Structural Equation Models of the PSI-S (Original) Including a Method Factor for Negatively-Worded items in the Turkish-Speaking Sample

	Confirmatory factor analysis							Exploratory structural equation modeling						
Standardized factor loadings (λ) and uniquenesses (δ)														
Items	GSW (λ)	PSW (λ)	PA (λ)	PS (λ)	PC (λ)	SC (λ)	δ	GSW (λ)	PSW (λ)	PA (λ)	PS (λ)	PC (λ)	SC (λ)	δ
GSW1	.741						.451	*.176*	.597	*.100*	*-.047*	*.066*	*-.030*	.500
GSW2	.148						.650	.473	*-.068*	.260	-.150	*-.117*	*.061*	.609
GSW3	.591						.651	.445	.117	.249	*-.028*	*.060*	*.087*	.547
PSW1		.683					.533	*-.068*	.848	*.019*	*-.032*	*.009*	.118	.225
PSW2		.696					.515	.321	.416	*.077*	.149	*.051*	*.060*	.414
PSW3		.850					.278	.204	.206	*.022*	.413	.278	*.026*	.315
PA1			.079				.625	*.036*	*-.017*	.538	*-.047*	*.082*	*-.056*	.074
PA2			.730				.468	*.090*	.121	.328	.306	*-.015*	.280	.481
PA3			*-.039*				.662	.299	*.010*	.350	*-.097*	*-.169*	*-.041*	.670
PS1				.635			.597	*-.090*	.185	*-.071*	.532	*.002*	*.077*	.538
PS2				.823			.323	-.121	*.023*	*.096*	.782	.149	*.040*	.210
PS3				.618			.618	.229	*.089*	-.248	.233	*.130*	*.176*	.592
PC1					.845		.286	.112	.141	*.015*	.394	*.032*	.332	.354
PC2					.738		.455	*.014*	*.010*	*.042*	*.076*	.794	*.007*	.275
PC3					.654		.573	-.101	*.001*	*.020*	*-.078*	.716	.166	.403
SC1						.748	.440	-.208	*-.014*	*.083*	*.012*	*-.037*	.927	.245
SC2						.702	.507	.261	*.071*	-.193	*.009*	*.102*	.497	.465
SC3						.784	.385	.127	*.044*	*.034*	*-.068*	.244	.579	.383
ω	.556	.789	.253	.737	.792	.789		.420	.694	.547	.641	.697	.786	

Factor correlations (95% confidence intervals)	Confirmatory factor analysis					Exploratory structural equation modeling				
Factor	PSW	PA	PS	PC	SC	PSW	PA	PS	PC	SC
GSW	.89 (.82-.96)	.80 (.49-1.11)	.38 (.28-.48)	.47 (.38-.56)	.55 (.46-.64)	.38 (.27-.49)	.33 (.23-.43)	*.17* (-.01-.34)	.18 (.08-.28)	.28 (.12-.45)
PSW		.86 (.54-1.18)	.84 (.80-.88)	.85 (.81-.88)	.82 (.78-.86)		*.17* (-.04-.38)	.42 (.33-.50)	.36 (.26-.47)	.51 (.42-.59)
PA			.80 (.49-1.10)	.74 (.47-1.01)	.81 (.51-1.12)			*-.09* (-.39-.20)	*.06* (-.07-.19)	*.02* (-.26-.30)
PS				.88 (.84-.92)	.83 (.78-.87)				.54 (.46-.62)	.67 (.60-.73)
PC					.89 (.85-.92)					.63 (.53-.73)

Note. GSW = global self-worth; PSW = physical self-worth; PC = physical condition; SC = sport competence; PA= physical attractiveness; PS = physical strength; Greyscale = main loadings; non-significant parameters are in italics. All correlations are statistically significant ($p \leq .01$).

Table S15.

Standardized Parameters Estimates from the Confirmatory Factor Analytic and Exploratory Structural Equation Models of the PSI-S (Original) Including a Method Factor for Negatively-Worded items in the Italian-Speaking Sample

	Confirmatory factor analysis							Exploratory structural equation modeling						
Standardized factor loadings (λ) and uniquenesses (δ)														
Items	GSW (λ)	PSW (λ)	PA (λ)	PS (λ)	PC (λ)	SC (λ)	δ	GSW (λ)	PSW (λ)	PA (λ)	PS (λ)	PC (λ)	SC (λ)	δ
GSW1	.814						.337	.422	.332	.163	*.027*	*.000*	*-.014*	.421
GSW2	.643						.418	.644	*.033*	.092	*.005*	*.032*	*.037*	.414
GSW3	.802						.357	.633	.116	.141	*.027*	.042	.049	.343
PSW1		.877					.231	.257	.599	.165	.055	.050	.059	.136
PSW2		.871					.241	.103	.567	.122	.168	.068	.116	.229
PSW3		.893					.202	.114	.321	.322	.260	.129	.086	.225
PA1			.480				.561	.231	.152	.233	-.131	*.041*	*.036*	.549
PA2			.889				.210	*.022*	*-.006*	.915	*.031*	.048	*.017*	.096
PA3			.357				.668	.191	*.090*	.297	*-.045*	-.185	*.031*	.639
PS1				.746			.443	.051	.142	.105	.628	*.008*	*.017*	.399
PS2				.956			.087	*-.028*	.101	.129	.671	.133	.164	.121
PS3				.654			.572	*.050*	*.031*	*-.016*	.532	.119	.117	.542
PC1					.970		.059	-.117	.322	.047	.274	.328	.258	.217
PC2					.838		.298	*.012*	.085	.072	*-.012*	.901	.039	.060
PC3					.812		.341	.062	-.050	*.029*	.134	.716	.123	.281
SC1						.942	.113	-.096	.286	.077	.086	.100	.667	.103
SC2						.921	.152	.101	.062	.062	.117	.112	.713	.158
SC3						.955	.087	.097	*.009*	.096	.093	.135	.788	.051
ω	.821	.912	.674	.834	.908	.958		.710	.789	.619	.759	.871	.938	

Factor correlations (95% confidence intervals)	Confirmatory factor analysis										Exploratory structural equation modeling									
Factor	PSW		PA		PS		PC		SC		PSW		PA		PS		PC		SC	
GSW	.83	(.81-.86)	.81	(.77-.85)	.45	(.40-.50)	.39	(.34-.45)	.49	(.44-.53)	.46	(.42-.51)	.51	(.44-.59)	.08	(.03-.12)	.09	(.04-.14)	.15	(.11-.20)
PSW			.83	(.80-.87)	.79	(.77-.82)	.71	(.68-.74)	.76	(.74-.79)			.54	(.48-.60)	.46	(.41-.50)	.31	(.27-.36)	.43	(.40-.47)
PA					.51	(.46-.56)	.44	(.39-.50)	.54	(.49-.59)					.29	(.25-.34)	.23	(.18-.28)	.31	(.27-.35)
PS							.79	(.77-.82)	.78	(.75-.81)							.41	(.38-.45)	.46	(.43-.50)
PC									.80	(.78-.83)									.47	(.44-.50)

Note. GSW = global self-worth; PSW = physical self-worth; PC = physical condition; SC = sport competence; PA = physical attractiveness; PS = physical strength; Greyscale = main loadings; non-significant parameters are in italics. All correlations are statistically significant ($p \leq .01$).

Table S16.

Standardized Parameters Estimates from the Confirmatory Factor Analytic and Exploratory Structural Equation Models of the PSI-S (Original) Including a Method Factor for Negatively-Worded items in the Arab-Speaking Sample

	Confirmatory factor analysis							Exploratory structural equation modeling						
Standardized factor loadings (λ) and uniquenesses (δ)														
Items	GSW (λ)	PSW (λ)	PA (λ)	PS (λ)	PC (λ)	SC (λ)	δ	GSW (λ)	PSW (λ)	PA (λ)	PS (λ)	PC (λ)	SC (λ)	δ
GSW1	.781						.390	.318	.237	.389	-*.060*	*.069*	-*.040*	.413
GSW2	.729						.404	.746	*.049*	-*.004*	*.023*	*.019*	*.045*	.272
GSW3	.851						.276	.630	.102	.219	*.045*	*.015*	*.010*	.268
PSW1		.962					.075	.072	.685	.107	.134	.053	.130	.062
PSW2		.914					.164	.160	.684	*.011*	.081	.105	.077	.128
PSW3		.889					.210	.133	.422	.165	.188	.196	*.027*	.246
PA1			.753				.142	.300	.101	.327	*.034*	*.080*	.068	.282
PA2			.846				.284	.115	*.016*	.850	.077	*.042*	-*.001*	.067
PA3			.699				.358	*.070*	.132	.467	*.029*	-*.011*	.140	.183
PS1				.868			.247	*.007*	.142	.176	.488	.193	.086	.243
PS2				.958			.082	*.009*	.117	.071	.606	.160	.185	.072
PS3				.913			.167	.136	.132	-*.014*	.584	.162	.115	.154
PC1					.952		.094	*.008*	.156	*.007*	.315	.399	.228	.119
PC2					.944		.109	*.021*	.077	*.026*	.091	.754	.138	.040
PC3					.937		.122	.100	.070	*.029*	.215	.550	.167	.131
SC1						.958	.083	.037	.097	.098	.162	.180	.596	.093
SC2						.954	.091	.063	.111	*.017*	.102	.176	.674	.069
SC3						.937	.122	.063	.091	.044	.156	.184	.594	.128
ω	.839	.945	.871	.938	.961	.965		.751	.880	.836	.857	.909	.923	

Factor correlations (95% confidence intervals)																				
Factor	PSW		PA		PS		PC		SC		PSW		PA		PS		PC		SC	
GSW	.77	(.74-.80)	.90	(.88-.93)	.57	(.53-.62)	.52	(.47-.57)	.53	(.49-.58)	.50	(.47-.53)	.55	(.50-.59)	.25	(.21-.30)	.28	(.23-.33)	.25	(.20-.29)
PSW			.77	(.74-.80)	.86	(.84-.88)	.82	(.80-.84)	.80	(.78-.83)			.46	(.43-.49)	.55	(.51-.58)	.51	(.47-.54)	.47	(.43-.50)
PA					.64	(.60-.68)	.58	(.53-.62)	.61	(.56-.65)					.28	(.23-.33)	.25	(.20-.30)	.26	(.21-.31)
PS							.95	(.94-.96)	.91	(.90-.92)							.71	(.68-.74)	.61	(.58-.64)
PC									.93	(.92-.94)									.67	(.63-.70)

Note. GSW = global self-worth; PSW = physical self-worth; PC = physical condition; SC = sport competence; PA = physical attractiveness; PS = physical strength; Greyscale = main loadings; non-significant parameters are in italics. All correlations are statistically significant ($p \leq .01$).

Latent Means Differences on the PSI-S Factors Across Cultural Groups.

Introduction

Interestingly, research suggests that physical standards may differ as a function of sociocultural norms about desirable physical attributes (Smith, Noll, & Bryant, 1999; McCabe & Ricciardelli, 2003), exposure to gender stereotypes through media and social sources of influences (Klomsten, Shaalvik, & Espnes, 2004; Tiggeman, 2003), and degree of skin exposure (Maïano, Ninot, Stephan, Morin, Florent, & Vallée, 2006). These factors purportedly influence how youth from diverse cultures and countries perceive themselves in the physical area and the importance that they attribute to a variety of physical self-domains (Scalas, Morin, Marsh, & Nagengast, 2014; Smith et al., 1999).

Unfortunately, there is so far only very limited research regarding expected cross-cultural differences on multidimensional physical self-concept dimensions, and this limited evidence remains globally inconclusive. It is first interesting to note that although some studies do report evidence of measurement invariance across cultural or linguistic groups (e.g., Lindwall, Aşçı, Palmeira, Fox, & Hagger, 2011; Marsh, Marco, & Aşçı, 2002; Marsh, Martin et al., 2010; Scalas et al., 2014), these tests are seldom extended to the verification of the significance of latent means differences. Among the few studies that have looked at cultural differences in relation to mean levels on multidimensional self-concept instruments, Morin and Maïano (2011) failed to find evidence of mean-level differences on any of the dimensions assessed in the PSI-S as a function of parents' ethnic background. However, this result was based on a rough classification of participants depending on whether their parents were of a European or foreign origin, with no consideration of the fact that children of foreign parents (i.e., the second generation) might still have spent their entire life immersed in the dominant French culture. Morin, Maïano, et al.'s (2016) results similarly supported the measurement invariance and lack of latent mean differences of the revised PSI-S ratings across samples of English- and French- speaking participants from Australia and France.

Other studies have compared the physical self-perceptions among adolescents from more diversified cultural background, contrasting those from a more individualistic and collectivistic cultural orientation (Aşçı, Alfermann, Çağlar, & Stiller, 2008; Hagger, Aşçı, & Lindwall, 2004; Hagger, Biddle, Chow, Stambulova, & Kavussanu, 2003; Lindwall, Hagger, & Aşçı, 2011; Tomás, Marsh, González-Romá, Valls, & Nagengast, 2014). Aşçı et al. (2008) demonstrated that adolescents from Germany (considered as an individualistic culture) tend to have higher levels on many physical self-dimensions (with the exception of appearance, body fat and physical self-worth that were lower) than adolescents from Turkey (considered as a collectivist culture). Additionally, Hagger et al. (2003) revealed that adolescents from Hong Kong (considered as a collectivist culture) tended to report significantly lower latent means on most physical self-dimensions relative to adolescents from the United Kingdom or Russia (considered as individualistic cultures), with the exception of the GSW scale which was equally low in the Russian and Hong Kong samples. In another study, Hagger et al. (2004) revealed that adolescents from Turkey (considered as a collectivist culture) and Sweden (considered as a individualistic culture) tended to report significantly lower latent means on most physical self-dimensions (with the exception of physical condition that was higher) compared to adolescents from the United Kingdom (considered as an individualistic culture). Nevertheless, two more recent studies by Lindwall et al. (2011) and Tomás et al. (2014) failed to identify significant latent mean differences among adolescents from several more individualistic (Australia, Sweden, United Kingdom) or collectivistic (Turkey, Spain) countries, suggesting thus that such differences may not be as common as initially believed.

Research focusing on the dimensions of GSW and PA, rather than on multidimensional physical self-conceptions, has been more extensive. As noted above, results also suggest that GSW levels tended to be higher in more individualistic cultures (Oyserman et al., 2002;

Oyserman & Lee, 2008; Schmitt & Allik, 2005). Furthermore, research suggests that GSW and PA levels tend to be higher among Black/African/Hispanic/Arab populations than among Caucasian/Western populations, although differences involving Hispanic, Arab and Asian populations are not as well established as those involving Black versus Caucasian populations (e.g., Gray-Little, & Hafdahl, 2000; Morin, Maïano, Marsh, Janosz, & Nagengast, 2011; Ricciardelli, McCabe, Williams, & Thompson, 2007; Roberts, Cash, Feingold, & Johnson, 2006; Twenge & Crocker, 2002). Finally, this research suggests that these differences tend to emerge over the course of adolescence, and to be more pronounced for females, relative to males. This result has generally been attributed to the fact that pubertal development often results in body fat accumulation in girls, an undesired change according to the thin-ideal Caucasian beauty standards but a desired one among cultures valuing "fuller" forms, whereas for boys it usually results in muscle increase and the emergence of other culturally valued attributes (e.g., Morin, Maïano et al., 2011; Siegel, Yancey, Aneshensel, & Schuler, 1999; Stice & Bearman, 2001). These observations suggest that investigations of cultural differences in levels of physical self-concepts cannot be conducted in disconnection from the investigation of gender and age differences.

Results

As noted in the main manuscript, our results revealed the presence of latent mean differences across cultural samples. Latent means on the various PSI-S factors estimated as part of the most invariant measurement model (Model 6-5: invariance of the latent variances and covariances) are reported in Table S17 of these online supplements. In multiple group models, latent means are constrained to be zero in a referent group for identification purposes, so that latent means can be freely estimated in the other groups (Morin, Marsh, & Nagengast, 2013). These freely estimated latent means provide a direct estimation of the size of the difference between the target group and the referent group, expressed in SD units, and are accompanied by tests of the statistical significance.

The observed pattern of latent mean differences differed as a function of PSI-S subscales. Results showed that all samples significantly differed from one another on their levels of GSW, with the highest levels observed in the Dutch, followed closely by the French (-.242 SD) and then by the Turkish, Italian, and Arab samples (-.505 to -1.457 SD). In contrast, levels of PSW were highest in the Turkish sample, followed closely by the Arab sample (-.135 SD), then by the Dutch and French samples (-.452 and -.380 SD, and non-statistically different from each other), with the lowest latent means observed in the Italian sample (-.559 SD). PA levels followed a similar pattern, with the exception that the highest latent means were observed in the Arab rather than the Turkish (-.757 SD) sample, followed again by the Dutch and French samples (-1.007 and -1.001 SD, and non-statistically different from each other), with the lowest latent means again observed in the Italian sample (-1.247 SD). In terms of PS and PC, the French and Italian samples presented the lowest latent means, although French levels were higher than Italian levels on PC (-.238 SD), whereas Italian levels were higher on PS (-.285 SD). On both of these factors, the highest levels were observed in the Dutch, Arab, and Turkish samples, which did not differ from one another on PS, whereas Turkish levels were slightly lower on PC (-.163 to -.180 SD). Finally, SC levels were highest in the Arab sample than among the remaining samples, which did not differ statistically from one another (-.375 to -.475 SD).

Discussion

Furthermore, our results also revealed the presence of meaningful latent mean differences across samples, showing that whereas the highest levels of GSW were observed in countries characterized by a more individualistic culture (Belgium and France), the highest levels on most of the other more "physical" dimensions of the PSI-S (PSW, PA, PS, PC, SC) were highest in countries characterized by more collectivistic cultures (Arabic countries and

Turkey), together with the Belgian sample. In contrast, lower levels on physical dimensions were observed in the last two countries characterized by more individualistic cultures (France and Italy).

The differences in GSW are mostly consistent with those reported in previous studies showing that more individualistic cultures tend to present higher levels of GSW than more collectivistic cultures (e.g., Oyserman et al., 2002; Oyserman & Lee, 2008; Schmitt & Allik, 2005). However, the latent mean differences observed in the current study on other dimensions of the physical self-concept are harder to interpret in light of the limited and inconsistent findings reported by prior research. Indeed, the present findings revealed that the more collective cultures (Arabic countries, Turkey) tended to present higher physical self-perceptions than most of the more individualistic cultures, at least those from the Southern European samples (France and Italy). These results are in contrast with those found by Hagger et al. (2003, 2004) and Aşçı et al. (2008), and could be explained by the fact that these previous studies were conducted in individualistic cultures from Middle (Germany) and Northern Europe (Sweden, United Kingdom), whereas the present study recruited participants from Southern (France and Italy) and Middle (Belgium) Europe. Thus, adolescents living in Southern European countries might be exposed to slightly different, and possibly harder to achieve, physical norms and standards than those living in Middle and Northern European countries (see also Maïano et al., 2006 for a similar North-South interpretation). Similarly, these results suggest that possibly easier to achieve physical norms and standards might be present in Middle-Eastern and North African countries, or at least that collectivistic cultures favor a greater level of self-acceptance in the physical area. Interestingly, these results and interpretations are aligned with prior results showing higher levels of PA among non-Caucasians (e.g., Morin, Maïano et al., 2011; Ricciardelli et al., 2007; Roberts et al., 2006). In sum, the current results are highly informative regarding possible cross-cultural variations in physical self-conceptions, and may serve as a benchmark for future investigations. Indeed, the cross-cultural comparison of ideal physical self-conceptions, norms and standards could help to better understand the mechanisms involved in the emergence of these cross-cultural differences.

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Table S17

Latent Mean Differences Observed across the Five Different Samples.

Subscale	Dutch-Speaking	French-Speaking	Arab-Speaking	Turkish-Speaking	Italian-Speaking
Global self-worth	0	-.242**	-1.457**	-.747**	-1.062**
Physical self-worth	0	.073	.318**	.452**	-.105*
Physical attractiveness	0	.006	1.008**	.250**	-.240**
Physical strength	0	-.414**	-.066	-.034	-.130*
Physical condition	0	-.373**	.016	-.163**	-.611**
Sport competence	0	.100	.475**	.072	.063
Global self-worth	.240**	0	-1.218**	-.505**	-.819**
Physical self-worth	-.072	0	.246**	.380**	-.178**
Physical attractiveness	-.006	0	1.001**	.244**	-.246**
Physical strength	.413**	0	.347**	.380**	.285**
Physical condition	.375**	0	.389**	.210**	-.238**
Sport competence	-.100	0	.374**	-.029	-.038
Global self-worth	1.457**	1.215**	0	.710**	.397**
Physical self-worth	-.318**	-.245**	0	.135*	-.424**
Physical attractiveness	-1.007**	-1.001**	0	-.757**	-1.247**
Physical strength	.066	-.348**	0	.032	-.063
Physical condition	-.016	-.389**	0	-.180**	-.627**
Sport competence	-.475**	-.375**	0	-.403**	-.412**
Global self-worth	.749**	.508**	-.710**	0	-.310**
Physical self-worth	-.452**	-.380**	-.135*	0	-.559**
Physical attractiveness	-.249**	-.244**	.757**	0	-.489**
Physical strength	.034	-.380**	-.033	0	-.094
Physical condition	.164**	-.209**	.180**	0	-.448**
Sport competence	-.073	.027	.402**	0	-.010
Global self-worth	1.061**	.819**	-.396**	.314**	0
Physical self-worth	.106*	.179**	.423**	.558**	0
Physical attractiveness	.240**	.246**	1.246**	.489**	0
Physical strength	.129*	-.285**	.064	.096	0
Physical condition	.611**	.238**	.627**	.448**	0
Sport competence	-.064	.036	.412**	.009	0

* $p \leq .05$; ** $p \leq .01$.