RESEARCH ARTICLE

Physical Self-Concept and Social Physique Anxiety: Invariance across Culture, Gender and Age

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Abstract

This study examined the effects of culture, gender and age on the structure and mean levels of physical self-concept (PSC) and social physique anxiety (SPA) in adolescents from Portugal and Spain. An additional aim was to examine the effects of these variables on the PSC-SPA correlation. Adolescents ($N = 3528$, age range 12–18 years) completed the social physique anxiety scale and physical self-worth scale from the physical self-perception profile. Single- and multi-sample confirmatory factor analyses supported a two-factor model of PSC and SPA in the overall sample and within and across the culture, gender and age subsamples. Latent means analyses indicated that females tended to have significantly higher average SPA levels and lower PSC levels relative to males. There was a general downward trend in PSC in males and females in each cultural group. SPA was relatively consistent in females and higher than males in most groups. SPA was relatively similar in males and females in younger age groups (born 1994–1996), but declined in older males. SPA was similar in Portuguese males and females in the youngest age group (born 1996), but males tended to have lower scores in older age groups. Results generally support hypotheses and are discussed relative to self-presentation models and coping with appearance-related stress. Copyright © 2010 John Wiley & Sons, Ltd.

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Keywords

Anxiety; body image; health-related physical activity; confirmatory factor analysis impression management; cross-cultural issues; self-esteem

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Introduction

Social physique anxiety (SPA) is defined as an individual's perceived anxiety with the presentation of the physical self in contexts in which their physiques are perceived as being evaluated (Hart, Leary, & Rejeski, 1989; Leary & Kowalski, 1990). The construct is derived

from theories of self-presentation and impression management and has been correlated with numerous behavioural and psychological health-related outcomes, such as physical self-concept (Hagger, Hein, & Chatzisarantis, in press; N.P. Kowalski, Crocker, & Kowalski, 2001), body image (Chad & Spink, 1996), eating attitudes (Haase & Prapavessis, 1998), and

motivation to avoid health-related behaviours like physical activity (Hagger, Hein *et al.*, in press; Leary, Tchividjian, & Kraxberger, 1994; Niven, Fawcner, Knowles, Henretty, & Stephenson, 2009; Strong, Mack, Martin Ginis, & Wilson, 2006). There is, however, a relative dearth of research in the effect of demographic variables such as culture, gender and age on SPA. The purpose of the present study is to test the effects of culture, gender and age on SPA in samples drawn from school-age adolescent populations in two European nations: Portugal and Spain. Another aim of the study is to examine the effects of culture, gender and age on another salient self-related psychological variable associated with physical health, that is, physical self-concept (PSC). Variations in the relationship between these two self-related constructs by culture, gender and age will also be studied. The findings from the present study will make an original contribution to knowledge by testing developmental variations in SPA and PSC across gender, age and cultural groups. It will also provide preliminary evidence to indicate the developmental trends in these important self-related variables across age groups and provide useful normative data that reflects how young people view their physical self.

SPA and a theory of impression management

Self-related constructs are central to motivation and self-regulation of health behaviour (Hagger, Wood, Stiff, & Chatzisarantis, in press; Hall & Fong, 2007; Hofmann, Friese, & Wiers, 2008). As a construct, SPA is derived from a two component theory of impression management and self-presentation (Leary & Kowalski, 1990). The theory states that people are motivated to control how others see them and, wherever possible, present themselves in a positive light, known as *impression motivation*. People manage the impressions of themselves that they portray to others using selected behaviours and strategies in process known as *impression construction*. In physical contexts, people engaging in activities in which they expect their physique to be evaluated by others such as fitness centres or aerobics classes would be motivated to present their physique in a positive light (impression motivation) and likely engage in certain behaviours to manage that impression such as wearing appropriate clothing (impression construction). However, for people with elevated concern over a negative presentation of their physical self to

others—high SPA—such contexts likely evoke considerable stress. In order to cope with such stress, they may be motivated to avoid such situations (impression motivation) and may therefore choose to avoid those situations altogether (impression construction). This may be detrimental to health because a person may avoid situations there they might engage in health-promoting behaviours like physical activity (K.C. Kowalski, Mack, Crocker, Niefer, & Fleming, 2006; Lamarche, Gammage, & Strong, 2009). This model of impression formation suggests that variables, such as SPA, develop through repeated stress-inducing experiences in physical situations. A study of age-related variations in such impression-related variables may provide insight into the understanding of how such perceptions develop.

PSC and SPA

An individual's self-presentational perceptions in physical contexts, including SPA, are also inextricably linked with their overall evaluative perception of their self in physical contexts, known as PSC (Hagger, Hein *et al.*, in press; Hagger & Stevenson, in press; N.P. Kowalski *et al.*, 2001). PSC reflects a person's overall evaluation of their self in physical contexts (Fox, 1990). There are numerous models of PSC and the leading approaches in the field tend to consider PSC a sub-facet of general or global self-concept following work on physical self-concept in other domains (Marsh & Shavelson, 1985; Shavelson, Hubner, & Stanton, 1976). Furthermore, PSC is viewed as multidimensional in structure with numerous subdomains reflecting physical conditioning and endurance, physical strength, competence at sports and other physical activities, and body attractiveness and physical appearance (Fox, 1990; Marsh & Redmayne, 1994). These multidimensional models have received considerable support in the literature in adult (Hagger, Lindwall, & Asçi, 2004; Marsh & Redmayne, 1994; Marsh, Richards, Johnson, Roche, & Tremayne, 1994) and adolescent (Hagger, Ashford, & Stambulova, 1997; Hagger, Biddle, & Wang, 2005) samples and across cultures (Asçi, Asçi, & Zorba, 1999; Hagger, Biddle, Chow, Stambulova, & Kavussanu, 2003; Marsh, Asçi, & Marco, 2002). Support for the hierarchical nature of the constructs is less strong and recent research appears to question this aspect of the model (K.C. Kowalski, Crocker, Kowalski, Chad, & Humbert, 2003). An advantage of multidimensional

models of self-concept is that they permit the examination of single domains in isolation from others and that generalized constructs, such as PSC, serve as overall representations of all sub-facets of self-concept in a particular domain (Marsh & Shavelson, 1985). In the present study, we focus on self-concept in the physical domain as a representation of self-perceptions in the physical domain because it reflects perceptions at a comparable level to SPA and permits direct comparisons with this variable by age and gender.

PSC has been shown to be conceptually and empirically linked to SPA (Hagger, Hein *et al.*, in press; Hagger & Stevenson, in press; N. P. Kowalski *et al.*, 2001). People who rate their PSC highly view their physical competence and appearance as adequate and are unlikely to have concerns with the presentation of their physical self. As SPA is linked with concern over the negative presentation of the physical self in evaluative contexts according to Leary and Kowalski's (1990) model, it is likely that people with low PSC will have elevated SPA. Researchers have therefore hypothesized that PSC will be negatively related to SPA. Previous research has demonstrated that these constructs are indeed significantly and negatively correlated in adult samples (Hagger, Hein *et al.*, in press; N.P. Kowalski *et al.*, 2001), although there is a relative dearth of studies that have examined this relationship in younger age groups (Hagger & Stevenson. In press).

Gender and age effects on SPA and PSC

There is precedence in the empirical literature which has examined the effects of gender on SPA in adults and comparable research on PSC for both gender and age effects. Such research has provided preliminary data on the developmental aspects of these self-related constructs. Research on SPA has consistently demonstrated significantly higher average levels of the construct among females relative to males (Eklund, Kelley, & Wilson, 1997; Frederick & Morrison, 1996; Haase & Prapavessis, 1998; Kruisselbrink, Dodge, Swanburg, & MacLeod, 2004; Lantz, Hardy, & Ainsworth, 1997; Mack, Strong, Kowalski, & Crocker, 2007). SPA has also been shown to be associated with maladaptive behaviours related to lower physical health and psychological well-being such as abnormal eating and exercise patterns in female samples (Hausenblas & Fallon, 2002; Hausenblas & Mack, 1999). According to Leary and

Kowalski's (1990) model of impression management, the elevated levels of SPA typically observed in females suggest that they may have a greater propensity to avoid situations in which they may anticipate their physique being presented in a negative fashion. This has been corroborated in studies in which females reported significantly higher levels of SPA when they anticipated exercising in contexts where males were present rather than female-only contexts (Kruisselbrink *et al.*, 2004) or when they perceived their physique to be evaluated by others (Crawford & Eklund, 1994). However, much of this research has largely focused on adult populations. While there have been studies that have investigated SPA in younger populations, much of this research has been confined to measurement evaluation and specific adolescent groups (e.g. Chad & Spink, 1996; Haase & Prapavessis, 2001; Hagger *et al.*, 2007; N.P. Kowalski *et al.*, 2001; Mack *et al.*, 2007; Smith, 2004). There is therefore a need to compare levels of SPA across a full-range of adolescent age groups. Such a comparison will make an original contribution to the literature for two reasons. First, it will demonstrate developmental trends in SPA and second it will test whether gender differences in SPA found in previous research are consistent across adolescent age groups.

Focusing on developmental trends, previous studies have shown that other self-related constructs, such as self-esteem, exhibit a curvilinear developmental relationship across adolescence and into adulthood (Marsh, 1989a; Meece, Parsons, Kaczala, Goff, & Futterman, 1982). This relationship is characterized by a significant decline from early to middle adolescence followed by an increase into adulthood (Marsh, Parker, & Barnes, 1985; Marsh, Smith, Marsh, & Owens, 1988). The mid-adolescent decline has been attributed to the uncertainties surrounding physical and social changes during this period (Marsh, 1989a). Such uncertainties may lead to increased anxiety over self-presentation in numerous contexts including physical contexts (Aloiseyoung, 1993; K.C. Kowalski *et al.*, 2006). However, there are no studies that have investigated developmental trends in SPA across adolescent age groups. Given the increased levels of uncertainty in mid-adolescence, it can be hypothesized that SPA will be higher in mid-adolescent people with correspondingly lower levels of PSC in the same period.

Turning to gender differences in PSC, evidence for gender differences in self-concept in other domains across different age groups is consistent with the

single-sample research that has shown significantly higher SPA among adult females (e.g. Eklund *et al.*, 1997; Haase & Prapavessis, 1998; Mack *et al.*, 2007). Marsh (1989b) found gender variations in adolescents' self-concept levels that were consistent with gender stereotypes. Overall, males generally reported higher levels of self-esteem relative to females. In addition, research in the physical domain indicated that average levels of PSC tend to be significantly lower in older age groups in girls relative to boys, resulting in a gender $\times$ age interaction (Meece *et al.*, 1982). However, no research has demonstrated whether these gender and age differences occur for SPA. The present study aims to address this gap in the literature by examining the main and interactive effects of gender and age on the factor structure and mean levels of SPA and PSC, and the effect of these variables on the correlation between SPA and PSC in adolescent participants of different ages.

Cross-cultural variations in SPA and PSC

Models of constructs related to the physical self like PSC and SPA and their associated measures have been generally developed in Western European and North American contexts (e.g. Crawford & Eklund, 1994; Eklund & Crawford, 1994; Eklund, Mack, & Hart, 1996; McAuley & Burman, 1993; Petrie, Diehl, Rogers, & Johnson, 1996). Only relatively recently have researchers sought to compare the structure and average levels of PSC and SPA across cultures in non-English speaking nations and cultures outside of those in which these constructs were originally developed (Asçi *et al.*, 1999; Hagger *et al.*, 2004; Hagger *et al.*, 2007; Lindwall, 2004; Marsh *et al.*, 2002). One purpose of such cross-cultural research is to evaluate whether such constructs represent universally held perceptions independent of culture-specific variations in belief systems. Adopting such a perspective assumes that differences in structure and average levels of these self-related constructs would be relatively trivial. This is important as it will indicate that the self-presentational components, such as SPA, are universal constructs which are applicable to all cultural and national groups. This is consistent with information-processing theories of social psychology which assume that people process social information in the same way (Hofmann *et al.*, 2008). An alternative view is that individual differences in the cultural values endorsed by individuals from particular national or

ethnic groups would influence perceptions relating to the physical self and lead to cross-cultural variations. This culture-centric view proposes that individual differences such as the relative degree of collectivism or individualism endorsed by cultural groups will give rise to variations in the extent to which they interpret and rate their levels of PSC and SPA.

Previous cross-cultural research on PSC and SPA has demonstrated relatively few variations in structure across individualist and collectivist cultures (Hagger *et al.*, 2007; Marsh *et al.*, 2002). However, research has demonstrated that average levels of PSC and SPA tend to be similar within cultures that share the same orientations but significantly higher in individualist cultures relative to collectivist cultures (Hagger *et al.*, 2003; Hagger *et al.*, 2004; Hagger *et al.*, 2007). However, cross-cultural research on PSC and SPA has been largely confined to adult participant groups. Furthermore, with a few notable exceptions (Hagger *et al.*, 2005; Hagger & Stevenson, *in press*), there is comparatively little data on the developmental and gender variations in structure and average levels of SPA and PSC across cultures. In the present study, we will examine age and gender differences in PSC and SPA in two cultures from the Iberian Peninsula, Portugal and Spain. The Southern European and Iberian Peninsula nations typically have shared cultural norms, namely collectivism, and similar social customs such as work and social environment (e.g. Hofstede, 1983; Marzocchi *et al.*, 2004; Smulders, Kompier, & Paoli, 1996). This research will address a gap in the literature by testing hypothesized gender and age comparisons across cultural groups from two nations with traditionally collectivist orientations. It is expected that there will be no variations in both structure and mean levels of these constructs across these national groups due to their similar cultural norms. Such comparisons will provide further data to support the generalizability of the structure and mean levels of these self-related constructs in adolescent samples from similar backgrounds. This is important as each sample will serve as a means to cross-validate the hypothesized age and gender differences in PSC and SPA, and important endeavour in social science research (Guan, Xiang, & Keating, 2004; Thompson, 1994).

The present study

The main purpose of this study is to evaluate the effects of gender and age on the structure and average levels of

SPA and PSC in Portuguese and Spanish school-aged adolescent samples born in years 1990 to 1996 (age range 12–18). An additional aim is to test the invariance of the correlation between PSC and SPA across culture, gender, age, gender $\times$ age, and culture $\times$ gender $\times$ age groups. This research will contribute to the literature by providing normative data for two national groups on the developmental aspects of these self-related constructs. Given the importance of these variables to motivation to approach or avoid health-related behaviours in contexts where the physical self may be evaluated such as fitness centres or gymnasia, this research will provide vital information as to how these constructs develop and whether they may be important variables to consider when looking at health-related behaviour in younger people.

In terms of hypotheses, we expect the factor structure of PSC and SPA models to be replicable and invariant across cultural, gender and age groups in accordance with previous research (Hagger et al., 2004; Hagger et al., 2007; Marsh et al., 1994; Marsh et al., 2002). In addition, we expect a significant and negative correlation between PSC and SPA in all the individual cultural, gender and age groups and that the relationship will be consistent across groups. This is consistent with previous research that has shown a significant and negative relationship between these constructs in a number of samples. We also hypothesize that average levels of SPA will be typically higher in female samples and PSC significantly higher in male samples, congruent with previous research. This represents a 'main effect' of gender. We expect these differences to be independent of culture. However, we also hypothesize that average levels of SPA will be significantly higher and levels of PSC to be significantly lower among older age groups relative to younger age groups, particularly among females. This represents a 'main effect' of age. These hypotheses are made on the basis of previous research that has shown a decline in PSC with age (e.g. Marsh, 1989a). We therefore expect interactive effects of gender and age on the mean levels of these self-related constructs for the entire sample and also within each cultural group.

Methods

Participants

Participants ($N = 3528$, M age = 14.75, $SD = 1.99$) were secondary school pupils from four government-run

secondary schools in the Coimbra region of Portugal and the Castilla-La Mancha region of Spain. School pupils were recruited from all secondary school years (age range 12 to 18 years). Sample characteristics of the age and gender subsamples are provided in Table I. Self-reported ethnic background revealed that the majority of the participants in the Portuguese sample described themselves as white ($n = 1712$; 96.6%) with minority groups describing themselves as mixed race ($n = 29$; 1.6%), black ($n = 8$; 0.5%), Asian ($n = 4$; 0.2%), Chinese ($n = 3$; 0.2%), and other ($n = 16$; 0.9%). The majority of pupils in the Spanish sample classified themselves as white ($n = 1710$; 97.4%) with minority groups describing themselves as mixed race ($n = 21$; 1.2%), black ($n = 15$; 0.9%), Asian ($n = 5$; 0.3%) and Chinese ($n = 2$; 0.1%), with three participants opting not to report their ethnicity. Data from the national offices for standards in education in Portugal and Spain indicated that the pupils from each school were generally from a background that matched the socio-economic distribution of these nations based on income means test used to determine eligibility for free school meals. Finally, school pupils born in years 1992 to 1996 in both the Spanish and Portuguese samples received an average of 90 minutes of physical education per week, which is above the European average (Jürimäe & Jürimäe, 2000). Participants in the older age groups received no compulsory physical education. The PE lessons largely involve instruction in sports techniques and other motor skills and relatively little sustained physical activity (Wang, Pereira, & Mota, 2005).

Measures

SPA

The Social Physique Anxiety Scale (SPAS, Hart et al., 1989) was used to measure SPA. The scale comprises 12 items (e.g. 'Unattractive features of my physique/figure make me nervous in certain social settings') with responses made on five-point Likert-type scales. The labels for the scale points are *not at all* (1), *slightly* (2), *moderately* (3), *very* (4) and *extremely* (5). We used the eight-item version of the scale as advocated in previous research which found a substantive systematic method effect attributable to the positively-worded items (Hagger et al., 2007). Positively worded items 1, 5, 8 and 11 from the SPAS were therefore omitted from the analysis.

Table 1. Sample characteristics

Age group [†]	Full sample						Portugal						Spain					
	Males			Females			Males			Females			Males			Females		
	N	M	SD	N	M	SD	N	M	SD	N	M	SD	N	M	SD	N	M	SD
All	1829	14.86	1.98	1699	14.64	1.98	897	14.83	1.95	875	14.62	1.92	932	14.91	2.00	824	14.65	1.06
b. 1990	298	17.62	0.21	202	17.69	0.24	149	17.57	0.15	96	17.60	0.19	149	17.67	0.23	106	17.76	0.25
b. 1991	255	16.71	0.24	246	16.75	0.25	118	16.67	0.23	132	16.68	0.24	137	16.74	0.25	114	16.81	0.24
b. 1992	266	15.79	0.25	237	15.74	0.25	133	15.77	0.25	120	15.74	0.25	133	15.80	0.25	117	15.74	0.25
b. 1993	261	14.93	0.22	239	14.93	0.19	116	14.85	0.23	134	14.87	0.22	145	14.97	0.19	105	14.87	0.10
b. 1994	237	13.81	0.24	263	13.77	0.25	121	13.83	0.24	129	13.79	0.25	116	13.79	0.25	134	13.79	0.25
b. 1995	277	12.78	0.25	244	12.73	0.25	143	12.78	0.25	129	12.72	0.25	134	12.77	0.25	115	12.72	0.24
b. 1996	235	11.79	0.25	268	11.76	0.32	117	14.82	0.21	135	11.85	0.23	118	11.68	0.24	133	11.84	0.37

[†] Birth year of participants in subsample.

Physical self-concept

PSC was measured using the general physical self-worth scale from the physical self-perception profile (PSPP). The scale has adult (Fox, 1990) and child (Whitehead, 1995) versions with identical item content and the only variation being the focal subject of the items is either a child or an adult. The adult version was used for older participants (birth years 1990 to 1992) and the child version for the younger age groups as recommended (Dunton, Schneider, Graham, & Cooper, 2006). The scale comprises six items (e.g. 'Some kids (people) are proud of themselves physically BUT other kids (people) don't have much to be proud of physically') and responses made on four-point paired forced-alternative response scales. Respondents must first decide which side of the statement pertains to them and then decide whether the chosen statement is 'really true for me' or 'sort of true for me'.

Procedure

Standardized back-translation techniques (Brislin, 1986) were used to develop a Portuguese language version of the SPAS specifically for the present study. The translation process was repeated until the back-translated versions were equivalent to the original English version. The translated instrument was also independently reviewed by the translators to confirm that each item satisfactorily represented those from the original English version. We adopted previously validated Portuguese (Ferreira & Fox, 2008) and Spanish (Atzienga, Balaguer, Moreno, & Fox, 2004) versions of the physical self-worth scale from the PSPP inventory and a Spanish version of the SPAS (Hagger et al., 2007), which had been previously subjected to equally rigorous translation procedures. University ethical clearance was obtained prior to data collection. School principals granted written informed consent for data to be collected in schools. Consent from participants' parents was requested via a letter sent home with participants outlining the study prior to data collection. A pre-printed form was provided for parents to sign and return to the students' head teacher if they did not want their child to participate in the study. No forms were returned. Participants were informed that they were participating in a survey on self-evaluations, their responses would remain anonymous, and data would be used for research purposes only. They were informed that they had the right to withdraw from completing

the questionnaire at any time without giving a reason. After being provided with details of the study, participants gave informed written consent to participate in the study.

Data analysis

Data were initially treated for missing data using recommended multiple imputation procedures (Schafer & Graham, 2002). The incidence of missing data was extremely low and well within acceptable limits (0.05% in the Spanish sample and 0.11% in the Portuguese sample). We adopted a systematic approach to evaluate the adequacy of the hypothesized correlated two-factor model in accounting for covariances among responses to the SPA and PSC items. This approach required the estimation of confirmatory factor analytic (CFA) models with latent SPA and PSC factors. In the models, each factor was indicated by the scores from the inventory items hypothesized to pertain to that factor. One indicator for each factor was set at unity to define the scale of the factor and the factors were allowed to covary. The adequacy of the proposed model was evaluated in the entire sample in the first instance. Pending the adequacy of the proposed model in the global sample, the model was evaluated in each individual culture, gender, age and gender $\times$ age subsamples. We also examined the fit of the model in gender, age and gender $\times$ age subsamples within the Portuguese and Spanish samples. Subsequently, multi-sample confirmatory factor analyses were conducted to test the invariance of specific sets of structural parameters of interest, namely factor loadings (λ), factor variances (ξ) and factor correlations (ϕ) across the culture, gender, age, gender $\times$ age and culture $\times$ gender $\times$ age subsamples and also the gender, age and gender $\times$ age subsamples within the Portuguese and Spanish samples. This was followed up by further multi-sample models to compare the item intercepts (item means from the SPAS and PSC scales) and latent means (means of the SPA and PSC latent factors) across the same set of subsamples. This effectively tests for both the main effects of the culture, gender and age variables on the latent means of the SPA and PSC factors and also makes comparisons between individual subsamples to evaluate the interactive effects of these variables.

A maximum likelihood estimation method was used to estimate the CFA models using the EQS computer program (Bentler, 2004). We also used the Satorra and

Bentler (1988) correction for the chi-square estimate in each model because preliminary analyses indicated that the samples exhibited a degree of multivariate kurtosis based on Mardia's coefficient. Overall goodness-of-fit of the proposed models with the data was evaluated using multiple indices of good fit: the comparative fit index (CFI), the incremental fit index (NNFI), the standardized root mean square of the model residuals (SRMSR), and the root mean square error of approximation (RMSEA). Values above .90 for the CFI and NNFI are considered to be indicative of adequate model fit, although values approaching .95 are preferable, and values close to .08 and .05 or less for the SRMSR and RMSEA respectively support good model fit (Hu & Bentler, 1999).

The hypothesized model is illustrated in Figure 1. The model has two latent factors (PSC and SPA), one factor correlation ($\phi_{\text{PSC-SPA}}$), 14 indicator items (six for the PSC factor and eight for the SPA factor) and 29 free parameters.

Results

Hypothesized model and single-sample analyses

Goodness-of-fit statistics for the single sample CFA models are provided in Table II. The CFA models for the full sample, each individual cultural, gender and age subsample, and the interactive subsamples for gender $\times$ age exhibited adequate goodness-of-fit with the data according to the multiple criteria adopted. In addition, the models estimated in the gender, age and gender $\times$ age subsamples for the Portuguese and Spanish samples separately also exhibited adequate fit. Composite reliability coefficients based on factor loadings for the SPA and PSC variables in each subsample were satisfactory (>0.700) in all but four cases (Table III).

Multi-sample analyses

Considering the satisfactory fit of model in each of the single-sample analyses, we conducted the multi-sample confirmatory factor analyses to test the hypothesized invariance of the factor pattern and structural parameters of the proposed SPA and PSC model across culture, age, gender, age $\times$ gender and culture $\times$ gender $\times$ age subsamples. We adopted the invariance routine recommended by Byrne (1989). Initially, a baseline model was estimated to evaluate whether the factor

Figure 1 Hypothesized confirmatory factor analytic model for PSC and SPA

Note. PSC = Physical self-concept; SPA = Social physique anxiety; λ = factor loadings; ξ = factor variances; ϕ = factor correlation; ϵ = indicator error variance.

pattern (i.e. same number of factor and same number of indicators) was invariant across the samples. This was followed by subsequent tests of invariance of the factor loadings (λ), factor variances (ξ) and factor correlations (ϕ). Models were evaluated using the goodness-of-fit criteria adopted previously. We used Cheung and Rensvold's (2002) cut-off criterion of -0.01 or less in the CFI between baseline and subsequent nested models to evaluate measurement invariance of the nested models. Finally, in the event of substantial variation in parameters across models, the Lagrange Multiplier (LM) test was used to identify parameters in the model that would result in a statistically significant improvement in model goodness-of-fit if freely estimated.

Tests of the invariance for the CFA models across culture, gender and age and their interactions within the Portuguese and Spanish samples are shown in

Table IV. For the age, gender and age $\times$ gender models, the baseline models exhibited adequate goodness-of-fit indices supporting the invariance of the factor pattern across the groups. Introducing constraints on the sets of parameters hypothesized to be invariant revealed changes in the incremental fit indices across all of the restricted models of equal to or less than -0.01 (Cheung & Rensvold, 2002). This supports the hypothesized equivalence of the structural parameters in each model and is considered the minimum criterion for measurement invariance (Byrne et al., 1989). For analyses involving culture, there were differences in the fit indexes that exceeded the -0.01 criterion for the analyses restricting factor loadings to be invariant for culture ($\Delta CFI = 0.12$) and culture $\times$ gender $\times$ age ($\Delta CFI = 0.15$). Examining the LM tests for the culture $\times$ gender $\times$ age invariance analysis revealed that 12 parameters were responsible for this variation ($\Delta\chi^2 = 112.363$, $df = 12$,

Table II. Goodness-of-fit statistics for single-sample CFA models by culture, gender, age, age $\times$ gender and culture $\times$ age $\times$ gender

Sample	SB- χ^2 [†]	CFI	IFI	RMSEA	SRMSR
Full sample ($N = 3528$)	691.374**	0.954	0.954	0.048	0.041
Culture					
Portugal ($n = 1772$)	503.789**	0.931	0.931	0.056	0.051
Spanish ($n = 1756$)	396.420**	0.959	0.960	0.049	0.056
Gender					
Males ($n = 1829$)	373.476**	0.958	0.959	0.046	0.046
Females ($n = 1699$)	410.009**	0.946	0.946	0.051	0.041
Age					
b. 1990 ($n = 500$)	166.742**	0.959	0.959	0.049	0.045
b. 1991 ($n = 501$)	237.428**	0.937	0.937	0.065	0.068
b. 1992 ($n = 503$)	176.481**	0.957	0.958	0.051	0.044
b. 1993 ($n = 500$)	199.026**	0.943	0.943	0.057	0.046
b. 1994 ($n = 500$)	171.203**	0.947	0.948	0.050	0.059
b. 1995 ($n = 521$)	134.602**	0.967	0.967	0.039	0.047
b. 1996 ($n = 503$)	167.092**	0.950	0.951	0.049	0.045
Gender $\times$ age					
Male b. 1990 ($n = 298$)	158.281**	0.942	0.943	0.060	0.057
Female b. 1990 ($n = 202$)	119.946**	0.946	0.947	0.054	0.056
Male b. 1991 ($n = 255$)	133.059**	0.946	0.947	0.056	0.076
Female b. 1991 ($n = 246$)	169.851**	0.931	0.931	0.071	0.072
Male b. 1992 ($n = 266$)	110.586**	0.957	0.964	0.041	0.055
Female b. 1992 ($n = 237$)	174.333**	0.924	0.925	0.074	0.060
Male b. 1993 ($n = 261$)	134.026**	0.952	0.953	0.054	0.051
Female b. 1993 ($n = 239$)	138.828**	0.935	0.936	0.059	0.057
Male b. 1994 ($n = 237$)	141.534**	0.928	0.927	0.060	0.081
Female b. 1994 ($n = 263$)	112.696**	0.961	0.961	0.043	0.051
Male b. 1995 ($n = 277$)	109.926**	0.963	0.964	0.040	0.060
Female b. 1995 ($n = 244$)	88.120**	0.984	0.984	0.026	0.047
Male b. 1996 ($n = 235$)	111.259**	0.959	0.960	0.045	0.054
Female b. 1996 ($n = 268$)	139.776**	0.938	0.938	0.056	0.058
Portuguese sample					
Gender					
Males ($n = 897$)	271.712**	0.940	0.941	0.054	0.059
Females ($n = 875$)	295.936**	0.929	0.929	0.058	0.048
Age					
b. 1990 ($n = 245$)	132.784**	0.950	0.951	0.055	0.058
b. 1991 ($n = 250$)	186.924**	0.916	0.917	0.077	0.078
b. 1992 ($n = 253$)	126.261**	0.953	0.953	0.051	0.048
b. 1993 ($n = 250$)	125.078**	0.952	0.953	0.051	0.057
b. 1994 ($n = 250$)	131.661**	0.937	0.938	0.054	0.076
b. 1995 ($n = 272$)	127.296**	0.937	0.938	0.050	0.067
b. 1996 ($n = 252$)	148.249**	0.922	0.923	0.062	0.069
Gender $\times$ age					
Male b. 1990 ($n = 149$)	114.968**	0.940	0.942	0.059	0.071
Female b. 1990 ($n = 96$)	109.474**	0.934	0.936	0.068	0.076
Male b. 1991 ($n = 118$)	131.823**	0.901	0.903	0.079	0.100
Female b. 1991 ($n = 132$)	132.473**	0.935	0.936	0.075	0.078
Male b. 1992 ($n = 133$)	78.233	0.995	0.995	0.015	0.062
Female b. 1992 ($n = 120$)	127.042**	0.913	0.915	0.075	0.069
Male b. 1993 ($n = 116$)	107.335*	0.935	0.937	0.060	0.074
Female b. 1993 ($n = 134$)	120.923**	0.927	0.928	0.067	0.072
Male b. 1994 ($n = 121$)	100.180*	0.941	0.943	0.051	0.073
Female b. 1994 ($n = 129$)	102.393*	0.942	0.944	0.052	0.069

Table II. (Continued)

Sample	SB- χ^2 [†]	CFI	IFI	RMSEA	SRMSR
Male b. 1995 (<i>n</i> = 143)	79.883	0.990	0.990	0.019	0.076
Female b. 1995 (<i>n</i> = 127)	108.146**	0.924	0.927	0.057	0.071
Male b. 1996 (<i>n</i> = 117)	129.938**	0.898	0.901	0.078	0.088
Female b. 1996 (<i>n</i> = 135)	112.221**	0.925	0.927	0.060	0.073
Spanish sample					
Gender					
Males (<i>n</i> = 932)	252.759**	0.959	0.959	0.050	0.053
Females (<i>n</i> = 824)	229.416**	0.956	0.956	0.050	0.048
Age					
b. 1990 (<i>n</i> = 255)	142.837**	0.946	0.947	0.059	0.060
b. 1991 (<i>n</i> = 251)	132.303**	0.954	0.954	0.054	0.063
b. 1992 (<i>n</i> = 250)	148.874**	0.949	0.949	0.062	0.057
b. 1993 (<i>n</i> = 250)	159.770**	0.930	0.931	0.067	0.059
b. 1994 (<i>n</i> = 250)	128.622**	0.949	0.950	0.053	0.063
b. 1995 (<i>n</i> = 249)	99.934**	0.977	0.977	0.036	0.055
b. 1996 (<i>n</i> = 251)	112.990**	0.962	0.963	0.044	0.052
Gender $\times$ age					
Male b. 1990 (<i>n</i> = 149)	130.246**	0.934	0.936	0.069	0.074
Female b. 1990 (<i>n</i> = 106)	123.546**	0.892	0.895	0.077	0.081
Male b. 1991 (<i>n</i> = 137)	96.791	0.970	0.971	0.045	0.068
Female b. 1991 (<i>n</i> = 114)	127.586**	0.906	0.908	0.078	0.085
Male b. 1992 (<i>n</i> = 133)	115.951**	0.928	0.930	0.063	0.081
Female b. 1992 (<i>n</i> = 117)	151.292**	0.904	0.906	0.092	0.075
Male b. 1993 (<i>n</i> = 145)	121.458**	0.946	0.947	0.064	0.069
Female b. 1993 (<i>n</i> = 105)	102.138*	0.933	0.936	0.058	0.077
Male b. 1994 (<i>n</i> = 116)	127.319**	0.899	0.901	0.077	0.103
Female b. 1994 (<i>n</i> = 134)	110.281**	0.941	0.943	0.058	0.064
Male b. 1995 (<i>n</i> = 134)	111.220**	0.939	0.940	0.059	0.079
Female b. 1995 (<i>n</i> = 115)	67.167	1.000	1.000	0.008	0.059
Male b. 1996 (<i>n</i> = 118)	98.678*	0.951	0.953	0.051	0.072
Female b. 1996 (<i>n</i> = 133)	102.725*	0.951	0.953	0.052	0.070

* $p < 0.05$; ** $p < 0.01$.CFA = Confirmatory factor analysis; SB- χ^2 = Satorra–Bentler scaled chi-square statistic; [†]degrees of freedom for chi-square statistic for all models is 76; CFI = comparative fit index; IFI = incremental fit index; RMSEA = root mean square error of approximation; SRMSR = standardized root mean square of residuals.

$p < 0.01$). Of these parameters, five were associated with the factor loading of SPAS item 3 on the SPA factor and two were associated with the loading of SPAS item 4 on the SPA factor. Releasing the constraints on these parameters restored the CFI to within the -0.01 criterion of this analysis. Unsurprisingly, similar results for the LM test were found in the culture invariance model with SPAS item 3 responsible for the largest variation ($\Delta\chi^2 = 66.385$, $df = 1$, $p < 0.01$) and eliminating the parameter restricting the equivalence of this variable restored the model CFI value to within the recommended criterion for invariance. These analyses indicate that there was some cultural variation in factor loadings across the cultural groups, but such the only substantial variation was for SPAS item 3, providing

support for the partial invariance of the model across the cultural samples (Byrne et al., 1989).

Correlation between PSC and SPA

Factor correlations between PSC and SPA for each subsample are given in Table V. As hypothesized, the correlations were all significantly different from zero supporting concurrent validity (Bagozzi & Yi, 1994), significantly different from unity supporting discriminant validity (Bagozzi & Yi, 1994), and negative in valence in accordance with previous research (Hagger et al., 2007; N.P. Kowalski et al., 2001). It was also hypothesized that the correlation between PSC and SPA esteem would be invariant across culture, gender, age

Table IV. Goodness-of-fit statistics for multi-sample CFA models testing for invariance across age, gender, age $\times$ gender and culture $\times$ age $\times$ gender

Invariance tests	SB- χ^2	df	CFI	IFI	RMSEA	SRMSR	Δ df	$\Delta\chi^2$
Full sample								
Culture								
Baseline	892.363**	152	0.947	0.947	0.053	0.149	—	—
λ 's invariant	1073.986**	164	0.935	0.935	0.056	0.066	12	181.623**
λ 's and ξ 's invariant	1121.568**	166	0.932	0.932	0.057	0.086	2	47.582**
λ 's, ξ 's and ϕ 's invariant	1126.928**	167	0.932	0.932	0.057	0.082	3	52.942**
Gender								
Baseline	782.621**	152	0.953	0.953	0.049	0.044	—	—
λ 's invariant	811.070**	164	0.952	0.951	0.047	0.046	12	28.449**
λ 's and ξ 's invariant	816.822**	166	0.951	0.951	0.047	0.048	2	5.572
λ 's, ξ 's and ϕ 's invariant	837.212**	167	0.950	0.950	0.048	0.055	3	26.142**
Age								
Baseline	1255.544**	532	0.951	0.951	0.052	0.051	—	—
λ 's invariant	1365.716**	604	0.948	0.948	0.050	0.058	72	110.172**
λ 's and ξ 's invariant	1386.251**	616	0.948	0.948	0.050	0.064	12	20.535
λ 's, ξ 's and ϕ 's invariant	1430.060**	622	0.945	0.945	0.051	0.075	18	64.344**
Gender $\times$ age								
Baseline	1843.870**	1064	0.946	0.947	0.054	0.060	—	—
λ 's invariant	2061.271**	1220	0.942	0.942	0.052	0.072	156	217.401**
λ 's and ξ 's invariant	2110.291**	1246	0.941	0.941	0.053	0.062	26	49.020**
λ 's, ξ 's and ϕ 's invariant	2166.688**	1259	0.938	0.938	0.054	0.096	39	105.397**
Culture $\times$ gender $\times$ age								
Baseline	3021.043**	2128	0.927	0.929	0.065	0.083	—	—
λ 's invariant	3528.284**	2452	0.912	0.913	0.067	0.111	324	507.241**
λ 's and ξ 's invariant	3668.438**	2506	0.905	0.905	0.069	0.149	54	104.154**
λ 's, ξ 's and ϕ 's invariant	3744.826**	2533	0.901	0.901	0.070	0.157	81	216.542**
Portuguese sample								
Gender								
Baseline	567.117**	152	0.935	0.935	0.056	0.060	—	—
λ 's invariant	575.162**	164	0.936	0.936	0.053	0.055	12	8.045
λ 's and ξ 's invariant	592.444**	166	0.933	0.933	0.054	0.058	2	17.282**
λ 's, ξ 's and ϕ 's invariant	603.486**	167	0.932	0.932	0.054	0.059	3	28.324**
Age								
Baseline	977.109**	532	0.938	0.939	0.058	0.065	—	—
λ 's invariant	1065.689**	604	0.936	0.936	0.055	0.075	72	88.580
λ 's and ξ 's invariant	1086.256**	616	0.935	0.935	0.055	0.086	12	20.567
λ 's, ξ 's and ϕ 's invariant	1116.389**	622	0.931	0.932	0.056	0.100	18	50.700**
Gender $\times$ age								
Baseline	1749.337**	1064	0.923	0.925	0.072	0.077	—	—
λ 's invariant	1924.856**	1220	0.921	0.921	0.068	0.093	156	135.519
λ 's and ξ 's invariant	1977.846**	1246	0.918	0.918	0.068	0.118	26	52.990**
λ 's, ξ 's and ϕ 's invariant	2022.303**	1259	0.914	0.914	0.070	0.131	39	97.447**
Spanish sample								
Gender								
Baseline	482.745**	152	0.958	0.958	0.050	0.051	—	—
λ 's invariant	517.491**	164	0.955	0.955	0.050	0.056	12	34.746**
λ 's and ξ 's invariant	520.490**	166	0.955	0.955	0.049	0.057	2	2.999
λ 's, ξ 's and ϕ 's invariant	528.319**	167	0.954	0.954	0.050	0.059	3	10.828*
Age								
Baseline	927.062**	532	0.951	0.952	0.055	0.059	—	—
λ 's invariant	1044.080**	604	0.946	0.946	0.054	0.070	72	117.018**
λ 's and ξ 's invariant	1061.548**	616	0.945	0.945	0.054	0.079	12	17.168
λ 's, ξ 's and ϕ 's invariant	1091.516**	622	0.942	0.942	0.055	0.093	18	47.436**

Table IV. (Continued)

Invariance tests	SB- χ^2	df	CFI	IFI	RMSEA	SRMSR	Δdf	$\Delta\chi^2$
Gender $\times$ age								
Baseline	1587.619**	1064	0.935	0.937	0.063	0.076	—	—
λ 's invariant	1796.849**	1220	0.929	0.929	0.062	0.092	156	209.230**
λ 's and ξ 's invariant	1843.486**	1246	0.926	0.926	0.062	0.113	26	46.637**
λ 's, ξ 's and ϕ 's invariant	1877.955**	1259	0.924	0.924	0.063	0.123	39	81.106**

* $p < 0.05$; ** $p < 0.01$.

CFA = Confirmatory factor analysis; SB- χ^2 = Satorra-Bentler scaled chi-square statistic; df = degrees of freedom for chi-square statistic; CFI = comparative fit index; IFI = incremental fit index; RMSEA = root mean square error of approximation; SRMSR = standardized root mean square of residuals; Δdf = Incremental change in degrees of freedom; $\Delta\chi^2$ = Incremental change in goodness-of-fit χ^2 .

Table V. Factor Correlations between PSC and SPA by gender, age, and age $\times$ gender for each cultural group

Age group [†]	Full sample			Portuguese sample			Spanish sample		
	All	Males	Females	All	Males	Females	All	Males	Females
All	-0.375	-0.256	-0.449 ^c	-0.411	-0.253	-0.484	-0.356	-0.277	-0.419
b. 1990	-0.447	-0.383	-0.495	-0.541	-0.427	-0.657	-0.381	-0.383	-0.337
b. 1991	-0.361	-0.299	-0.410	-0.556	-0.465	-0.537	-0.162	-0.088	-0.223
b. 1992	-0.625	-0.510	-0.660	-0.571	-0.484	-0.598	-0.644	-0.496	-0.685
b. 1993	-0.349	-0.300	-0.409	-0.425	-0.222	-0.542	-0.299	-0.323	-0.248
b. 1994	-0.366	-0.191	-0.468	-0.262	-0.143	-0.335	-0.480	-0.325	-0.325
b. 1995	-0.219	-0.112	-0.277	-0.175	-0.037	-0.247	-0.284	-0.173	-0.173
b. 1996	-0.237	-0.138	-0.317	-0.206	-0.102	-0.318	-0.271	-0.165	-0.167

[†] Birth year of participants in subsample. PSC = Physical self-concept; SPA = Social physique anxiety. All correlations significant at $p < 0.01$ and significantly different from unity (1.000).

model of PSC and SPA, the hypothesis of mean differences in the reproduced item and latent variable means across age, gender, age $\times$ gender subsamples was tested. This involved evaluating the invariance of the reproduced item (intercept) and latent variable means across the subsamples (Byrne et al., 1989). The invariance routine employed to test the invariance of the latent means involved the specification of a baseline model, which tested the plausibility of the mean structure across the samples, followed by restricted models in which the equivalence of the reproduced means of the factor indicators or intercepts and the equivalence of the reproduced means of the latent factors were specified. As is convention in latent means models, the sets of parameters found to be invariant in the multi-sample analyses were retained in this analysis. In this case, only the factor loadings were constrained to be invariant (Byrne et al., 1989). The goodness-of-fit indexes adopted previously were used to evaluate the adequacy of each model. Model comparisons were made using two absolute fit indexes based on the goodness-of-fit chi-square value, Akaike's Information Criterion (AIC)

and the Expected Cross-validation Index (ECVI). Lower values for these indexes indicate better fit relative to other models (Whittaker & Stapleton, 2006).

Results of the invariance analyses for the latent mean structure of the proposed model across all subsamples are given in Table VI. The baseline models for all subsamples were indicative of adequate fit supporting the pattern of structured means across the groups. Tests of the equivalence of item intercepts and latent means resulted in models that exhibited adequate model fit according to the incremental fit indexes. However, there were large increases in the AIC, ECVI and SRMSR, indicating some model misspecifications and that the mean structures were not equivalent across samples. In order to make pairwise mean comparisons of the reproduced latent means across subsamples, one of the gender, age or gender $\times$ age groups was identified as a reference group. As in the tests of invariance for structural parameters, each gender, age, gender $\times$ age and culture $\times$ gender $\times$ age subsample served as the reference group in an iterative fashion so that the full complement of mean comparisons could be made.

Table VI. Goodness-of-fit statistics for multi-sample CFA models testing for invariance of latent mean structures across gender, age, gender $\times$ age and culture $\times$ age $\times$ gender

Invariance tests	SB- χ^2	df	CFI	IFI	RMSEA	SRMSR	AIC	ECVI
Full sample								
Culture								
Baseline	1022.600**	160	0.939	0.932	0.055	0.066	702.600	0.199
Factor intercepts invariant	1272.978**	172	0.936	0.936	0.056	0.066	928.978	0.263
Latent means and intercepts invariant	1265.835**	174	0.937	0.937	0.056	0.066	917.835	0.260
Gender								
Baseline	765.911**	160	0.955	0.955	0.046	0.046	445.911	0.126
Factor intercepts invariant	948.757**	172	0.954	0.955	0.047	0.046	604.757	0.172
Latent means and intercepts invariant	1043.771**	174	0.955	0.955	0.047	0.048	695.771	0.197
Age								
Baseline	1603.874**	595	0.932	0.932	0.057	0.119	413.874	0.118
Factor intercepts invariant	1799.739**	667	0.930	0.930	0.059	0.119	465.739	0.132
Latent means and intercepts invariant	1882.195**	679	0.930	0.930	0.059	0.120	524.195	0.149
Gender $\times$ age								
Baseline	2263.736**	1203	0.929	0.929	0.058	0.122	-142.263	.
Factor intercepts invariant	2709.440**	1359	0.929	0.930	0.061	0.122	-8.560	.
Latent means and intercepts invariant	2999.714**	1385	0.927	0.928	0.062	0.125	229.714	.
Culture $\times$ gender $\times$ age								
Baseline	3443.879**	2396	0.916	0.919	0.064	0.111	-1348.121	.
Factor intercepts invariant	4355.016**	2720	0.915	0.917	0.072	0.112	-1084.984	.
Latent means and intercepts invariant	4746.707**	2774	0.909	0.912	0.075	0.130	-801.293	.
Portuguese sample								
Gender								
Baseline	547.414**	160	0.940	0.940	0.051	0.055	227.414	.
Factor intercepts invariant	677.804**	172	0.941	0.941	0.053	0.055	333.804	.
Latent means and intercepts invariant	767.798**	174	0.940	0.940	0.054	0.058	419.798	.
Age								
Baseline	1192.278**	595	0.919	0.919	0.062	0.133	2.278	.
Factor intercepts invariant	1347.538**	667	0.916	0.917	0.065	0.133	13.538	.
Latent means and intercepts invariant	1406.685**	679	0.915	0.914	0.065	0.134	48.685	.
Gender $\times$ age								
Baseline	1814.093**	1203	0.921	0.920	0.061	0.075	-591.907	.
Factor intercepts invariant	2188.017**	1359	0.919	0.920	0.067	0.075	-529.983	.
Latent means and intercepts invariant	2411.985**	1385	0.914	0.916	0.069	0.143	-358.015	.
Spanish sample								
Gender								
Baseline	489.757**	160	0.958	0.958	0.048	0.056	169.7570	0.526
Factor intercepts invariant	571.925**	172	0.957	0.957	0.049	0.056	227.925	0.598
Latent means and intercepts invariant	608.304**	174	0.957	0.957	0.049	0.057	260.304	0.701
Age								
Baseline	1159.769**	595	0.932	0.932	0.060	0.130	-30.231	0.999
Factor intercepts invariant	1362.021**	667	0.929	0.930	0.064	0.130	28.021	1.137
Latent means and intercepts invariant	1451.361**	679	0.927	0.928	0.064	0.132	93.362	1.211
Gender $\times$ age								
Baseline	1885.610**	1203	0.919	0.920	0.065	0.136	-520.390	1.712
Factor intercepts invariant	2279.492**	1359	0.917	0.918	0.071	0.137	-438.508	2.023
Latent means and intercepts invariant	2479.895**	1385	0.913	0.914	0.073	0.143	-290.106	2.239

* $p < 0.05$; ** $p < 0.01$.

SB- χ^2 = Satorra-Bentler scaled chi-square statistic; df = degrees of freedom for chi-square statistic; CFI = comparative fit index; IFI = incremental fit index; RMSEA = root mean square error of approximation; SRMSR = standardized root mean square of residuals; AIC = robust Akaike's information criterion; ECVI = Robust expected cross-validation index.

Mean differences

Main effects of culture and gender

Focusing on the analysis across culture in the overall sample, SPA was significantly higher in Spanish participants relative to Portuguese participants (standardized mean difference (SMD) = 0.050; $z = 2.171$, $p < 0.05$), but there were no differences in PSC. For the analysis testing for differences across gender alone, PSC was significantly higher in males relative to females (SMD = 0.187; $z = 9.526$, $p < 0.01$) and SPA was significantly higher in females than in males (SMD = 0.168; $z = 7.329$, $p < 0.01$). This is consistent with study hypotheses.

Main effect of age

Examining the main effect of age in the overall sample, standardized mean differences and significance tests for the latent means analysis by age group alone are given in Table VII. Findings from the analysis revealed that PSC was significantly higher among participants born in 1995 and 1996 relative to older age groups (born in years 1990 to 1994) supporting the hypothesized decline in this variable across age groups. There were no other differences. SPA was significantly lower in the oldest age group (born in 1990) relative to the younger age groups (born in years 1994 to 1996). There were no other age differences.

Gender $\times$ age interactions

Standardized mean differences for PSC and SPA for the gender $\times$ age latent means analysis are given in Table VIII and reproduced means are illustrated in Figure 2. Examining gender differences in means within age groups, SPA was significantly higher in females born in the years 1990, 1991, 1992 and 1995 compared with males in accordance with the hypotheses. There were no differences within gender for participants born in 1993, 1994 and 1996. Consistent with hypotheses, PSC was significantly higher in males than females within each age group. The only exception was for participants born in 1993 for which there was no gender difference.

Focusing on age differences within gender, results revealed that SPA was consistent and did not differ across all female age groups. For males, SPA was significantly higher among younger age groups (born in 1993, 1994 and 1996) than participants in the older age groups (born in 1990 to 1992). The only exception to this trend was the levels of SPA for males born in 1995, which was significantly lower than participants born in 1996 and not significantly different from the other age groups (born 1990 to 1994). There were no other differences in SPA in males across the age groups. Mean levels of PSC were significantly lower in older female age groups (born in years 1991 to 1992) compared with younger female age groups (born in 1995 and 1996). PSC levels were also significantly higher in females born

Table VII. Latent mean differences in PSC and SPA by age

	1990	1991	1992	1993	1994	1995	1996
PSC	0.000	-0.052	-0.055	-0.052	-0.014	0.080*	0.185**
SPA	0.000	0.064	0.046	0.075	0.114**	0.097*	0.137**
PSC	0.052	0.000	-0.003	0.001	0.039	0.133**	0.237**
SPA	-0.064	0.000	-0.019	0.011	0.050	0.033	0.073
PSC	0.055	0.003	0.000	0.004	0.042	0.136**	0.240**
SPA	-0.046	0.019	0.000	0.029	0.068	0.051	0.091*
PSC	0.052	0.001	-0.003	0.000	0.038	0.132**	0.237**
SPA	-0.075	0.011	-0.029	0.000	0.039	0.022	0.062
PSC	0.014	-0.039	-0.042	-0.038	0.000	0.094**	0.199**
SPA	-0.114**	-0.050	-0.068	-0.039	0.000	-0.017	0.023
PSC	-0.080*	-0.133**	-0.136**	-0.132**	-0.094**	0.000	0.104
SPA	-0.097*	-0.033	-0.051	-0.022	0.017	0.000	0.040
PSC	-0.185**	-0.237**	-0.240**	-0.237**	-0.199**	-0.104	0.000
SPA	-0.137**	-0.073	-0.091*	-0.062	-0.023	-0.040	0.000

* $p < 0.05$; ** $p < 0.01$.

PSC = Physical self-concept; SPA = Social physique anxiety. Zero scores indicate the reference group.

Table VIII. Latent mean differences in SPA and PSC by gender × age

	Male						Female							
	1990	1991	1992	1993	1994	1995	1996	1990	1991	1992	1993	1994	1995	1996
PSC	0.000	0.003	0.035	-0.092	0.031	0.106*	0.186**	-0.184**	-0.266**	-0.316**	-0.163**	-0.199**	-0.113*	0.053
SPA	0.000	0.043	0.004	0.155**	0.165**	0.090	0.272**	0.252**	0.294**	0.315**	0.205**	0.268**	0.323**	0.211**
PSC	-0.003	0.000	0.032	-0.095	0.028	0.103*	0.184**	-0.187**	-0.269**	-0.318**	-0.166**	-0.202**	-0.115*	0.051
SPA	-0.043	0.000	-0.038	0.112	0.122*	0.048	0.229**	0.210**	0.251**	0.273**	0.163**	0.226**	0.280**	0.169**
PSC	-0.035	-0.032	0.000	-0.128**	-0.004	0.071	0.151**	-0.219**	-0.301**	-0.351**	-0.198**	-0.235**	0.148**	0.018
SPA	-0.004	0.038	0.000	0.151**	0.161**	0.086	0.268**	0.248**	0.290**	0.311**	0.201**	0.264**	0.318**	0.207**
PSC	0.092	0.095	0.128**	0.000	0.123*	0.198**	0.279**	-0.092	-0.174**	-0.223**	-0.071	-0.107*	-0.020	0.146**
SPA	-0.155**	-0.112	-0.151**	0.000	0.010	-0.064	0.117	0.097	0.139*	0.161**	0.050	0.114	0.168**	0.056
PSC	-0.031	-0.028	0.004	-0.123*	0.000	0.075	0.156**	-0.215**	-0.297**	-0.346**	-0.194**	-0.230**	-0.143**	0.023
SPA	-0.165**	-0.122*	-0.161**	-0.010	0.000	-0.074	0.107	0.087	0.129*	0.151*	0.040	0.104	0.158**	0.046
PSC	-0.106*	-0.103*	-0.071	-0.198**	-0.075	0.000	0.080	-0.290**	-0.372**	-0.422**	-0.269**	-0.306**	-0.219**	-0.053
SPA	-0.090	-0.048	-0.086	0.064	0.074	0.000	0.181**	0.162**	0.204**	0.225**	0.115*	0.178**	0.232**	0.121*
PSC	-0.186**	-0.184**	-0.151**	-0.279**	-0.156**	-0.080	0.000	-0.370**	-0.453**	-0.502**	-0.350**	-0.386**	-0.299**	-0.133**
SPA	-0.272**	-0.229**	-0.268**	-0.117	-0.107	-0.181**	0.000	-0.020	0.022	0.043	-0.067	-0.003	0.051	-0.061
PSC	0.184**	0.187**	0.219**	0.092	0.215**	0.290**	0.370**	0.000	-0.082	-0.132*	0.021	-0.016	0.071	0.237**
SPA	-0.252**	-0.210**	-0.248**	-0.097	-0.087	-0.162**	0.020	0.000	0.042	0.063	-0.047	0.016	0.070	-0.041
PSC	0.266**	0.269**	0.301**	0.174**	0.297**	0.372**	0.453**	0.082	0.000	-0.050	0.103	0.067	0.153*	0.319**
SPA	-0.294**	-0.251**	-0.290**	-0.139*	-0.129*	-0.204**	-0.022	-0.042	0.000	0.022	-0.089	-0.025	0.029	-0.083
PSC	0.316**	0.318**	0.351**	0.223**	0.346**	0.422**	0.502**	0.132*	0.050	0.000	0.152**	0.116*	0.203**	0.369**
SPA	-0.315**	-0.273**	-0.311**	-0.161**	-0.151*	-0.225**	-0.044	-0.063	-0.020	0.000	-0.110	-0.047	0.007	-0.104
PSC	0.163**	0.166**	0.198**	0.071	0.194**	0.269**	0.350**	-0.021	-0.103	-0.152**	0.000	-0.036	0.051	0.217**
SPA	-0.205**	-0.163**	-0.201**	-0.050	-0.040	-0.115*	0.067	0.047	0.089	0.110	0.000	0.063	0.117*	0.006
PSC	0.199**	0.202**	0.235**	0.107*	0.230**	0.306**	0.386**	0.016	-0.067	-0.116*	0.036	0.000	0.087	0.254**
SPA	-0.268**	-0.226**	-0.264**	-0.114	-0.104	-0.178**	0.003	-0.016	0.025	0.047	-0.063	0.000	0.054	-0.057
PSC	0.113*	0.115*	-0.148**	0.020	0.143**	0.219**	0.299**	-0.071	-0.153*	-0.203**	-0.051	-0.087	0.000	0.166**
SPA	-0.323**	-0.280**	-0.318**	-0.168**	-0.158**	-0.232**	-0.051	-0.070	-0.029	-0.007	-0.117*	-0.054	0.000	-0.111
PSC	-0.053	-0.051	-0.018	-0.146**	-0.023	0.053	0.133**	-0.237**	-0.319**	-0.369**	-0.216**	-0.253**	-0.166**	0.000
SPA	-0.211**	-0.169**	-0.207**	-0.056**	-0.046	-0.121*	0.061	0.041	0.083	0.104	-0.006	0.057	0.111	0.000

* $p < 0.05$; ** $p < 0.01$.

PSC = Physical self-concept; SPA = Social physique anxiety. Zero scores indicate the reference group.

Figure 2 Reproduced PSC and SPA latent factor means by gender and age for the full sample
Note. PSC = Physical self-concept; SPA = Social physique anxiety.

in 1996 relative to all other female age groups. In males, PSC levels were significantly lower in each progressive age group from birth years 1996 to 1993. Scores were marginally higher between participants born in 1993 and 1992 and then reached a plateau for birth years 1990 to 1992. Therefore, mean levels of PSC were also significantly higher in participants born in 1996 relative to older age groups (born years 1990 to 1994). PSC levels for males born in 1995 were also significantly higher than older males (born years 1990, 1991, and 1993).

Finally, looking at differences in the self-related variables across age and gender groups, mean levels of SPA for females were significantly higher than all male age groups born in the years 1990, 1991, 1992 and 1995. Mean SPA levels for females born in 1993, 1994 and 1996 were also higher than SPA levels for males born in 1990, 1991, 1992 and 1995. SPA levels for males born in 1996 did not differ from levels of SPA in any female age group. PSC means were significantly lower in females compared with all other male age groups. There were two exceptions. First, females born in 1996 exhibited PSC levels that were significantly higher than those in males born in 1993 and lower than males born in 1996 only. Second, males born in 1993 had mean levels of PSC that did not differ significantly from females born in 1993 and 1995.

Culture $\times$ gender $\times$ age interactions

Mean levels of PSC and SPA from the multi-sample analysis testing mean differences in individual culture $\times$ gender $\times$ age groups are shown in Figures 3 and 4 respectively.² Focusing first on PSC, findings from the Portuguese and Spanish samples closely mirrored those in the latent means analysis by gender and age in the overall sample (Figure 3). Focusing on within-gender comparisons for each national group, it is clear that PSC is significantly higher in males than females in all age groups for the Portuguese sample and most groups in the Spanish sample with the exception of participants born in years 1990, 1993 and 1996. This supports hypothesized gender differences. In terms of comparisons across age within national and gender groups, Spanish males and females and Portuguese females born in 1996 had significantly higher levels of PSC than their counterparts in the older age groups. Other than this difference, PSC means did not tend to differ with age in Portuguese males and females. Spanish females' PSC scores were also significantly lower in participants

²A table showing the reproduced latent mean differences in PSC and SPA by culture $\times$ gender $\times$ age is available from Wiley Online Library (wileyonlinelibrary.com). DOI: 10.1002/smi.1299

Figure 3 Reproduced PSC latent factor means by culture, gender and age

Note. PSC = Physical self-concept.

Figure 4 Reproduced SPA latent factor means by culture, gender and age

Note. SPA = Social physique anxiety.

born 1991 and 1992 age groups compared with older participants born 1993 and 1995 but not in the oldest participants born in 1990.

Focusing on gender $\times$ age comparisons across cultural groups, there were relatively few differences in PSC across Spanish and Portuguese females, and the scores appeared to mirror each other relatively consistently with a downward trend occurring in the younger age groups. There were no differences in PSC between Spanish and Portuguese males in the mid-range age groups (born in 1992 to 1994), but the levels of PSC in Spanish males born in 1990 and 1991 were significantly lower than PSC scores for Portuguese participants in all

age groups with the exception of those born in 1993. Spanish female participants exhibited a significant decrease in PSC levels in those born in 1992 before rallying in participants born in 1991 and 1992. Specifically, Spanish females born in 1992 had significantly lower PSC scores relative to all female age groups in the Portuguese sample. In contrast, Spanish females born in 1996 had significantly higher PSC scores than female Portuguese participants in all age groups.

Lastly, culture $\times$ gender $\times$ age comparisons for PSC were also consistent with the within-culture gender $\times$ age comparisons. Spanish male participants' PSC scores tended to be significantly higher than that

of Portuguese females within each age group. There were, however, no significant differences in PSC levels between Portuguese females born in 1996 and Spanish males born in years 1990 to 1994; this was also the case for Portuguese females born in 1995 with the exception of PSC levels for Spanish males born in 1992, which were significantly higher. Portuguese male participants also had significantly higher within-gender PSC scores relative to Spanish females with the exception of the 1990-, 1993- and 1996-born age groups. Spanish females born in 1996 had significantly higher means levels of PSC than Portuguese males for all age groups with the exception of males born in 1993 for which levels were significantly higher in the 1996-born Spanish females. In addition, due to significantly lower PSC scores in Portuguese males born in 1993 relative to other age groups, there were no differences with Spanish female scores in the 1990-, 1994- and 1995-born age groups.

Focusing next on SPA scores, findings from the Portuguese and Spanish samples closely resembled those in the overall sample (Figure 4). Within-gender comparisons for each national group, SPA levels were significantly higher in females than males in the Portuguese sample among participants in the older age groups (born in 1990 to 1993) but not in the younger age groups (born 1994 to 1996). Within-gender SPA levels were significantly higher for Spanish participants in all age groups with the exception of participants born in 1993 and 1996. These findings are generally in line with hypothesized gender differences.

Focusing on comparisons across age within national and gender groups, SPA means tended to remain relatively consistent in the Portuguese female group. Only mean SPA levels in Portuguese females born in 1990 were significantly lower than scores in all other Portuguese female groups. Spanish females' levels of SPA tended to be significantly higher among participants in the 1992-born age group than all other age groups. There were also significantly lower SPA scores in the 1993- and 1994-born Spanish female age groups relative to all other age groups. Scores then rallied such that there were no differences in SPA means for older Spanish females born in 1990 and 1991 to those for younger participants born in 1995 and 1996. For Portuguese males, mean SPA levels were consistent in the age groups born from 1993 to 1996. Mean levels of SPA were significantly lower among Portuguese male participants in the younger age groups (1990 and 1991)

than those in the older age groups (born in 1993 to 1996). SPA levels were also significantly lower among Portuguese male participants born in 1992 relative to those born in 1994 and 1996. Levels of SPA for Portuguese male participants born in the 1991-born age group were significantly lower than scores for participants in all other age groups.

Turning to gender $\times$ age comparisons on SPA across cultural groups, the patterns were less clear than those observed for PSC. While Portuguese females' SPA scores remained relatively consistent across age groups, the scores for Spanish females varied considerably, with substantially higher mean SPA levels for participants born in 1992, and significantly lower scores for participants born in 1993, relative to Portuguese female SPA scores in all other age groups. Among males, there was also substantial variation in SPA scores with age. Portuguese males' SPA levels for participants born 1991 were substantially lower than Spanish males' scores in all other age groups. However, Portuguese males' SPA scores were substantially elevated in the mid-range age groups (participants born 1993 to 1995) relative to SPA scores for Spanish males born in the years 1991, 1992, 1994 and 1995. SPA scores for Spanish males born in 1996 were significantly higher than SPA scores for Portuguese males in all other age groups except participants born in 1994 and 1996.

Finally, comparisons by culture $\times$ gender $\times$ age were consistent with the within-culture gender $\times$ age comparisons. SPA mean levels for Spanish male participants tended to be significantly lower than Portuguese females within each age group. There were two exceptions: (1) SPA scores for Spanish male participants born in 1993 and 1996 which were not significantly different from scores for Portuguese females born in years 1991 to 1996 and (2) SPA scores in Portuguese females that were not significantly different from Spanish male scores for all participants. Portuguese males' SPA levels were significantly lower than Spanish female scores in the older age groups (born in 1990 to 1992). In the younger age groups, there were few differences with mean scores generally following the same trend. The only exception to this were scores within the 1995-born age group, which were significantly higher in Spanish females than Portuguese male scores in all age groups but participants born in 1993 and 1996. These results suggest that SPA levels tended to be progressively lower in Portuguese males relative to Spanish females.

Discussion

The purpose of this investigation was to examine the main and interactive effects of culture, gender and age on the factor structure and mean levels of PSC and SPA in school-aged adolescents aged 12 to 18 years from Portugal and Spain ($N = 3528$). An additional aim was to examine the effects of these demographic variables on the correlation between PSC and SPA. We expected that the factor structure of a correlated two-factor model of PSC and SPA would exhibit good fit with the data in the overall sample and in each individual cultural, gender, age, gender $\times$ age and culture $\times$ gender $\times$ age subsample. It was also anticipated that the model would exhibit measurement invariance across culture, gender, age, gender $\times$ age, and culture $\times$ gender $\times$ age subsamples. The correlation between PSC and SPA was expected to be significant and negative in all samples. It was also hypothesized that males would generally report higher mean average levels of PSC and lower levels of SPA relative to females, regardless of culture or age. It was also expected that, on average, SPA would be progressively higher and PSC lower across age groups and that this effect would be particularly marked for females.

Summary of findings

Confirmatory factor analyses supported the construct validity proposed two-factor structure of SPA and PSC and their composite reliabilities in each cultural, gender, age, gender $\times$ age and culture $\times$ gender $\times$ age subsamples. The correlation between PSC and SPA was significant and negative in all subsamples supporting the consistency in the relationship between these constructs. The correlation was also significantly different from unity providing evidence for the discriminant validity of the construct. The correlation did vary across subsamples with a general trend towards stronger relationships in older samples.

In terms of differences in mean levels of SPA and PSC across the different subsamples, there was no significant main effect for culture on PSC as hypothesized, although scores on SPA were significantly higher in the Spanish sample. There was a significant main effect of gender for SPA with females reporting higher average levels relative to males, which supports the present hypotheses. Males also reported higher mean levels of PSC than females. In terms of the main effect of age, mean SPA levels were significantly lower in the oldest

age group (born 1990) compared with younger participants (born in years 1994 to 1996). Average levels of PSC were also significantly higher among participants born in 1995 and 1996 relative to older age groups (born in years 1990 to 1994). Gender $\times$ age interactions indicated that SPA levels were generally not significantly different across female age groups while mean levels of SPA were generally higher among younger age groups relative to older participants. SPA levels were generally higher in females than males, but did not differ in the youngest (born 1996) and mid-adolescent (born 1993) age groups. Similarly, male PSC levels were significantly higher than females in all age groups except for participants born in 1993.

Finally, culture $\times$ gender $\times$ age comparisons in means of PSC indicated that means in both national samples tended to mirror those in the gender $\times$ age comparisons. Overall, there were few differences in female and male PSC scores across gender. PSC scores for Spanish and Portuguese males tended to be significantly higher than scores for Portuguese and Spanish females respectively, indicating that the gender $\times$ age effects were consistent across cultures. This is consistent with hypotheses in terms of gender differences and cultural generalizability. There were, however, some idiosyncratic findings such that PSC scores tended not to differ between Portuguese males and Spanish females born in 1993 and 1996 and between Spanish males and Portuguese females born in 1990. For SPA, there were few differences in SPA for females across culture and this was consistent with the non-significant main effect for culture for the SPA variable. SPA remained relatively consistent for Spanish and Portuguese female participants within and across age groups, exceptions were a significantly higher mean SPA levels for Spanish females born in 1992 and a significantly lower mean for Portuguese females born in 1990. For SPA in Portuguese and Spanish males, there was more variability, although there was a general downward trend with age. There were significantly lower mean levels in the Spanish male participants born in 1994 and 1995 compared with Portuguese males and significantly lower mean levels in Portuguese male participants born in 1990 and 1991. Gender $\times$ age differences across culture were not as consistent as those for PSC. Spanish females SPA scores were significantly higher in the older age groups (born 1990 to 1992), but there were few differences in the younger age groups. SPA mean levels tended to be significantly lower in the

Portuguese females relative to Spanish males although there were no differences for participants born in the 1990, 1993 and 1996.

Factor structure of PSC and SPA across samples

An important finding in the present study was confirmatory support for the factor structure of the measures of PSC and SPA and the invariance of the factor structure across the gender and age subsamples and partial invariance across the culture subsamples. This is a prerequisite for subsequent tests of hypotheses with respect to the correlation between PSC and SPA and mean comparisons in these variables across the subsamples. These findings support previous research on these self-related constructs in single-sample confirmatory factor analyses in gender, and age groups (Crocker, Eklund, & Kowalski, 2000; Hagger *et al.*, 2003; Hagger *et al.*, 2004; Hagger *et al.*, 2005; Hagger *et al.*, 2007; Motl & Conroy, 2000; Smith, 2004). Current findings extend research by supporting the factor structure across adolescent participants in age groups ranging from 12 to 18 years in two non-English speaking cultures. We can therefore conclude that both self-related constructs relevant to health in physical situations are relevant to people from these cultures and in different age and gender groups. The only substantive differences in structure across the groups were for the factor loadings of two items from the SPAS. When the cross-cultural constraints were released, there was minimal difference in the goodness-of-fit supporting the partial invariance of the SPAS across the Portuguese and Spanish samples (Byrne *et al.*, 1989). This findings demonstrates that the measure SPA demonstrates partial invariance across these cultural groups, supporting previous cross-cultural research on SPA (Hagger *et al.*, 2007; Isogai, Brewer, Cornelius, Komiya, & Tokushima, 2001). This provides sufficient evidence for the evaluation of culture, age and gender group variations in the PSC-SPA correlation and mean levels of these variables in subsequent analyses.

Correlation between PSC and SPA

Correlation analyses indicate that the PSC and SPA relationship is significant and negative in all age groups. Although there were significant variations in the correlation across groups, particularly with gender and age, it is important to note that these variations were in

order of magnitude rather than presence or absence. This means the correlation is consistent in its significance from zero and negative valance across the cultural, gender, age, gender $\times$ age and culture $\times$ gender $\times$ age comparisons in the multi-sample analyses. This consistency is unsurprising given the conceptual link between these self-related variables and evidence from previous research (Hagger, Hein *et al.*, in press; N.P. Kowalski *et al.*, 2001). As SPA represents concern over the presentation of the physique in evaluative contexts, individuals reporting high levels of this construct are likely to have comparatively lower perceptions of this adequacy in physical contexts and, hence, lower PSC. This is because key components of PSC are concerned with physical appearance and body attractiveness (Fox, 1990; Marsh & Redmayne, 1994). However, PSC is multi-dimensional so it is only likely to share some of the variance with SPA such that SPA should not be considered the anti-thesis of PSC. This is an important conceptual point: SPA is not 'negative' PSC and the correlations support the discriminant validity of these constructs (Eklund, 1998). However, their link is important in demonstrating that competence in appearance and anxiety over its presentation are inextricably linked.

Mean levels of PSC and SPA

The comparisons of the mean levels of the self-related variables presented in the current data provide support for previous research and hypotheses based on conceptually related, self-related constructs (e.g. Marsh, 1989b; Marsh, Parker *et al.*, 1985; Marsh, Smith, & Barnes, 1985; Meece *et al.*, 1982). The hypothesis that males tend to have higher levels of PSC relative to females and females tend to have higher levels of SPA relative to males was supported not only in overall main effects for gender but also within and across cultural and age groups. Such findings support and extend those from previous research with these self-related constructs. Research has consistently demonstrated that females tend to have elevated levels of SPA (e.g. Frederick & Morrison, 1996; Kruisselbrink *et al.*, 2004; Lantz *et al.*, 1997) and depressed levels of PSC (e.g. Hagger *et al.*, 2005) relative to males, although few studies have corroborated this with SPA in younger age groups (Smith, 2004) and there are no studies that have supported this across adolescent age groups or in different cultural groups (see Hagger *et al.*, 2007). Interestingly, there

were relatively few cultural variations in the present data in terms of measurement invariance, supporting the hypothesis of cross-cultural generalizability in terms of the structure of PSC and SPA. However, mean levels of SPA were significantly higher in the Spanish sample, a difference that was not anticipated. As these cultures tend to share a collectivist cultural background and similar social norms and customs, an explanation based on cultural differences is implausible. To speculate, one possible explanation may be differences in exposure to the portrayal of a thin body 'ideal' in the media across these groups. Exposure to images of such unrealistic physiques has been suggested as precursors of SPA and motivation to avoid situations in which the physique is evaluated by others (Hagger, Hein *et al.*, in press). However, this cannot be established from the current data and future research would have to confirm this by conducting a content analysis for body image portrayal in the media typically accessed by young people in both national groups.

It would be remiss to omit mention of the few variations in the overall trend in the present research. For example, the interaction of culture $\times$ gender $\times$ age indicated that for the Portuguese sample, male and female levels of SPA did not differ in younger age groups and that while SPA levels were at a consistent level for females in each age group, SPA levels for males declined with age. This was not the case in Spanish females whose SPA levels were consistently lower relative to males with the exception of participants born in 1996 and 1993. These findings indicate that the trends in SPA levels are not as clear as those observed in the gender $\times$ age analysis collapsed across culture. Importantly, these results do not indicate that SPA increases with age in female adolescents and suggests that levels of this construct remains relatively constant throughout this period of adolescence. The results therefore do not identify a critical period in which SPA increases dramatically among females in each sample. It is possible that concern over the physique may be socialized much earlier among females and that concern over the presentation of the physique is learned in early childhood. The decline in male SPA scores may reflect increased acceptability of the presentation of the physique throughout adolescence relative to females. The pattern of the decrease occurs at different ages—early for the Portuguese and later for the Spanish sample.

Other deviations from the expected pattern of effects include variations in mean differences in PSC across

males and females in the culture $\times$ gender $\times$ age interactions. While there were consistently significant gender differences for most age groups, levels of PSC were no different in the Spanish males and females, and Portuguese females in the oldest age group (participants born in 1990). Results suggest that PSC scores tend to rally in older adolescence particularly among females from both samples, while PSC scores for Spanish males tended to decrease. This is consistent with previous research on age effects and self-esteem in other domains (Marsh, 1989a, 1989b). In such research, a curvilinear pattern in which after an initial fall on early adolescence self-concept follows an upward trajectory in later adolescence. This pattern is consistent with the speculative suggestion that concerns regarding the presentation of the physical self that occur in mid-adolescence reflect a peak in the adolescent 'crisis' period where psychological and physical pubertal changes precipitate uncertainties, concerns and worries with respect to appearance and identity (Heaven, 2001).

Importance of findings to theory and practice

Present findings make an original contribution to knowledge of the physical self and, in particular, theory of self-presentation in three important ways. First, to our knowledge, no previous study has examined the effects of culture, gender and age on levels of SPA. It is important to examine developmental trends in SPA in adolescent age groups as this may shed light on the development of observed levels of SPA in adults and, in particular, whether elevated levels of SPA in females relative to males are present in younger as well as older samples of adolescents. The finding that differences are less marked in the youngest age groups indicates that the gender gap may appear at the onset of puberty and develop thereafter. It is also interesting to note that such pubertal variations also seem to coincide with decreases in PSC. However, the explanation advanced by some researchers that such changes may be due to increased concern regarding appearance and body image coinciding with the psychological and physical changes that occur in puberty should be considered speculative (Marsh, 1993; Meece *et al.*, 1982). Present results do not provide data to support such explanations. Second, present results provide an indication that the negative relationship between SPA and PSC observed in previous studies is present in all the

cultural, gender and age subsamples. Theoretically, this indicates that concerns with the presentation of the physique are likely to be associated with compromised PSC and probably the aspects of that construct concerned with physical appearance. Third, these findings indicate that SPA and PSC are applicable in these cultural groups and conform to the structures developed in English-speaking nations with largely individualist cultural perspectives. There were cross-cultural differences in the patterns of the mean levels of SPA across the Portuguese and Spanish groups, but these differences were relatively trivial and did not amount to structural differences.

Finally, the findings are important from a practical perspective as they indicate that motivation to avoid health-related behaviours, such as physical activity, in order to cope with the stress of presenting oneself negatively may be less of an issue in younger participants. This may therefore be important for people interested in developing interventions to change behaviour and promote health-related physical activity (e.g. Abraham & Graham-Rowe, 2009; Chatzisarantis & Hagger, 2009). Such interventions may help manage potential anxieties that develop in the course of adolescence regarding the presentation of the physical self. Such interventions may involve raising awareness of the negative consequences of becoming preoccupied with the physique, providing opportunities to exercise in environments that do not emphasize the physique in order to allay concerns, and providing recognition of the physical changes that may occur during puberty. Such techniques may alleviate the negative repercussions of SPA on maladaptive psychological and behavioural outcomes such as avoidance of physical activity.

Limitations and avenues for future research

The advantages of the present study is that it adopted hypotheses based on an appropriate theory in Leary's model of self-presentation and used single- and multi-sample covariance structure analyses permitting a rigorous, hypothesis-testing approach to evaluate the hypotheses. The study also adopts a large, representative sample of the school-aged adolescents in Portugal and Spain. There are of course limitations with the between-participant and correlational design adopted in the present study. Accordingly, we have avoided

referring to differences in PSC and SPA across age groups as age-related *changes* because the between-participant differences do not represent true change. We have also exercised caution when making reference to directional nature of relationship between these variables because of the limitations involved in using correlational data to infer causality. A further limitation is that we focused only on physical self-concept at the domain-level and did not measure subdomains from multidimensional models which may have masked more specific age and gender differences.

Future studies may seek to adopt a cross-lagged time-series design taking measures of PSC and SPA in cohorts of young people tracked over a number of years. This would be more effective in identifying true age-related changes in these variables, controlling for the autoregressive effects of the variables on themselves, and helping to disentangle the directionality in the relationship between the two constructs through the estimation of cross-lagged effects. Future research should also attempt to intervene and change one of these self-related constructs and examine their effect on the other and on typical coping behaviours, such as approach or avoidance of physical activity. For example, anxiety management techniques to reduce stress in environments where the physique may be perceived to be negatively evaluated by others may alleviate levels of SPA. This would not only shed further light on the causal nature of the PSC-SPA relationship, but also identify whether these constructs evoke changes in perceptions that lead to changes in behaviour.

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