Psychology and Health
Vol. 25, No. 1, January 2010, 89–110

Social physique anxiety and physical self-esteem: Gender and age effects

Martin S. Hagger* and Andy Stevenson

Social Psychology, Personality, and Health Research Group, School of Psychology, University Park, Nottingham, NG7 2RD, UK

(*Received 14 December 2008; final version received 3 July 2009*)

The aim of this study was to test the generalisability of the factor pattern, structural parameters, factor correlations and latent mean structure of social physique anxiety and physical self-esteem across gender, age and gender × age. The social physique anxiety scale and general physical self-esteem scale from the physical self-perception profile was administered to high school and university students aged 11–24 years ($N = 2334$). Confirmatory factor analysis (CFA) was used to test the adequacy of a two-factor correlated model in the full sample, and separately by gender, age and gender × age sub-samples. The CFA model satisfied criteria for goodness-of-fit with the data in all sub-samples, the only exception was for females aged 21 and over. Tests of invariance of the factor pattern, structural parameters and correlations across age, gender and age × gender revealed few decrements in goodness-of-fit. Latent means analysis revealed that females had consistently higher levels of social physique anxiety and lower levels of physical self-esteem than males, with the exception of the 11–12 age group. Results extend previous findings that females tend to report higher levels of social physique anxiety and lower levels of physical self-esteem than males by demonstrating that these differences are consistent across age group.

Keywords: self-presentation; self-concept; physical activity; confirmatory factor analysis

Introduction

Social physique anxiety is social psychological variable derived from theories of self-presentation and impression management that reflects an individual's perceived worry or concern with the presentation of the physique in situations in which others are perceived to be evaluating them (Hart, Leary, & Rejeski, 1989; Leary & Kowalski, 1990). Social physique anxiety is important because it has been shown to be related to salient psychological and behavioural factors associated with health. For example, social physique anxiety is associated with physical self-esteem (Kowalski, Crocker, & Kowalski, 2001), body image (Chad & Spink, 1996), dissatisfaction with appearance and weight (Crawford & Eklund, 1994), eating attitudes (Haase & Prapavessis, 1998) and motivation to avoid of health-related behaviours, such as physical activity (Leary, Tchividjian, & Kraxberger, 1994; Niven, Fawkner, Knowles, Henretty, & Stephenson, 2009; Strong, Mack, Martin Ginis, & Wilson, 2006). Furthermore, there is a substantial body of research that has examined the structure of social physical anxiety (Motl &

*Corresponding author. Email: martin.hagger@nottingham.ac.uk

ISSN 0887–0446 print/ISSN 1476–8321 online

DOI: 10.1080/08870440903160990
http://www.informaworld.com

Conroy, 2000), the contextual factors that give rise to this variable, and its effects on motivation in physical activity contexts (Crawford & Eklund, 1994) and relations with health-related outcomes (Haase & Prapavessis, 1998; Hausenblas & Mack, 1999). However, there has been comparatively little research that has examined the developmental trends in the construct across age groups. The aim of this study is to examine the effects of age and gender on social physique anxiety in young people aged 11–22 years. It is expected that findings from this study will make a unique contribution to the literature by demonstrating the developmental trends in social physique anxiety across gender groups and how it varies in relation to a conceptually related variable, physical self-esteem.

Impression management and social physique anxiety

Leary and Kowalski (1990) present a two-component model of self-presentation. The model proposes that social contexts motivate people to control how others see them and, wherever possible, people seek to present a positive image of themselves to others, a component termed *impression motivation* (Leary & Kowalski, 1990). In addition, people also have a number of means available to manage the impressions of themselves that they portray to others and can range from overt self-description to non-verbal behaviours, referred to as *impression construction*. In the context of this model, people considering exercising in contexts where the physical self is salient such as in gymnasia or group exercise classes are likely to expect that their body will be evaluated by others. They are therefore likely to be motivated to portray an impression of their physique that they perceive others will evaluate as positive (impression motivation) and may engage in certain behaviours to do so such as planning the kinds of attire to wear (impression construction). However, individuals with higher levels of social physique anxiety will likely be concerned that the presentation of their physique in such contexts will be perceived as unfavourable or negative in the eyes of others. They are therefore motivated to avoid such a negative self-presentation (impression motivation) and take action to do so such as avoiding such contexts, exercising in private to change their body, or adopting certain impression management strategies such as wearing loose fitting clothing or attending gymnasia during off-peak hours when fewer people are present (impression construction) (Kowalski, Mack, Crocker, Niefer, & Fleming, 2006; Lamarche, Gammage, & Strong, 2009).

Age, gender, and social physique anxiety

Much of the research on social physique anxiety has been focused on female groups (Chad & Spink, 1996; Eklund & Crawford, 1994; Eklund, Mack, & Hart, 1996; Haase & Prapavessis, 2001; Hausenblas & Mack, 1999; Kowalski et al., 2001; McAuley & Burman, 1993). A reason for this focus has been the consistent finding that social physique anxiety tends to be significantly higher 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) even in younger populations (Hagger et al., 2007; Smith, 2004). Furthermore, social physique anxiety is a correlate of abnormal eating and exercise patterns in female populations (Hausenblas & Fallon, 2002; Hausenblas & Mack, 1999). Interestingly, higher levels of social physique anxiety tend to be reported by females anticipating exercising in contexts where males are present and this is attenuated in anticipation of all-female exercise environments (Kruisselbrink et al., 2004) or in

environments where they do not perceive their physique to be under evaluation (Crawford & Eklund, 1994). In accordance with Leary and Kowalski's (1990) model, these effects indicate greater impression motivation among females to avoid contexts in which display of the physique is salient and such effects are attributable to heightened social physique anxiety. Likely explanations for these gender-specific effects may lie in antecedents of social physique anxiety such as the fulfilment of valued outcomes, such as the desire to conform to a perceived ideal or to look good to members of the opposite sex who may be potential partners (Leary & Kowalski, 1990).

While these findings have been consistently found in adult populations, little is known about the developmental differences in levels of social physique anxiety among males and females from different age groups. Although there have been single-sample studies conducted on young populations, typically university-age students and adolescents (Chad & Spink, 1996; Haase & Prapavessis, 2001; Kowalski et al., 2001; Mack et al., 2007; Smith, 2004), no study to date has examined the effects of age and gender on social physique anxiety or made direct comparisons by age and gender sub-groups. The aim of this study is to examine the main and interactive effects of age and gender on social physique anxiety.

A number of important questions may be addressed through this research. First, it will provide evidence for developmental trends in social physique anxiety. Research examining age variations in other self-related variables, such as self-concept in various domains, including the physical domain, has revealed significant decreases in self-esteem beginning in early adolescence (aged 11–12 years) and continuing into mid-adolescence (15–16 years) (Marsh, 1989a; Meece, Parsons, Kaczala, Goff, & Futterman, 1982). Thereafter, levels of self-concept tend to increase and continue to do so into early adulthood (21 years and older) indicating a curvilinear relationship for self-concept across adolescence and into adulthood (Marsh, Parker, & Barnes, 1985; Marsh, Smith, Marsh, & Owens, 1988). Marsh (1989a) suggested that early adolescence reflects a pivotal period of transition in terms of actual physique as well as in self-perceptions and decreased self-concept may reflect the uncertainties associated with such changes. This period also coincides with considerable social and emotional changes and a search for identity (Heaven, 2001). This increased uncertainty is likely to lead to heightened concern over the presentation of the self in numerous contexts (Aloiseyoung, 1993), including the physical domain (Kowalski et al., 2006). There is, however, no research that has made developmental comparisons across age groups for social physique anxiety. We expect that levels of social physique anxiety may increase from early- to mid-adolescence during this period of uncertainty and transition and decrease thereafter.

Second, another aim of this research is to examine whether the significantly higher levels of social physique anxiety in females relative to males found in adult populations is consistent across young people in different age groups. Marsh (1989b) found that gender differences in adolescents for different facets of self-concept were consistent with gender stereotypes, although boys tended to report higher overall self-concept scores than girls. Gender differences are also reflected in the available single-sample research on social physique anxiety (Eklund et al., 1997; Haase & Prapavessis, 1998; Mack et al., 2007). However, no research has demonstrated whether these gender differences effects are consistent across age. Research in self-concept has also demonstrated that levels of physical self-concept tend to decrease across age in girls at a greater rate than boys, resulting in a gender $\times$ age interaction (Meece et al., 1982). Given that the problems associated with lower levels of social physique anxiety and maladaptive outcomes are often observed in later adolescence, it is important to investigate how elevated levels of social physique anxiety develop in girls and whether this mirrors changes in other self-related

variables. In this study we seek to advance understanding of the development of social physique anxiety by examining the interactive effects of age and gender on levels of social physique anxiety in age groups ranging from early adolescence to early adulthood. Furthermore, we also aim to establish whether the structure of a previously validated instrument measuring social physique anxiety is applicable to male and female samples from early adolescence to early adulthood.

Social physique anxiety and physical self-esteem

Social physique anxiety is closely allied with another self-related construct, physical self-esteem (Hagger et al., 2007; Kowalski et al., 2001). Physical self-esteem represents an individual's perception of the self in physical contexts and has descriptive and evaluative content. Research has indicated that key sub-facets of physical self-esteem are physical appearance (Marsh & Redmayne, 1994) and body attractiveness (Fox, 1990). Given that these presentation-related aspects are considered essential components of physical self-esteem, it is expected that higher levels reflect perceptions of adequacy with appearance-related aspects of the physical self and lower levels represent concerns with these aspects. One manifestation of such concerns may be the tendency to report concerns with the presentation of the physical self in evaluative situations and physical self-esteem, therefore, is hypothesised to be negatively related to social physique anxiety, a hypothesis that has received empirical support (Kowalski et al., 2001). Given that Leary and Kowalski (1990) suggest in their model of self-presentation that people are motivated to impression manage in situations where they expect others to be evaluating them, those with higher levels of physical self-esteem will feel competent with their appearance in evaluative physical situations, are unlikely to be concerned with the presentation of their physique, and will therefore report lower levels of social physique anxiety. In contrast, those with higher levels of social physique anxiety are likely to be motivated to prevent the presentation of their physique in a manner that they deem others will evaluate as negative and this may be related to lower levels of physical self-esteem. In this study, we seek to establish whether the negative relationship between social physique anxiety and physical self-esteem is consistent, and therefore invariant, across age and gender. Consistency in this relationship will confirm that the interdependence of these constructs is consistent across demographic groups of young people throughout adolescence. To date, there are no data that have tested the invariance of this relationship across age and gender in samples from early adolescence to early adulthood.

Measuring social physique anxiety

An important consideration in research with social physical anxiety is the issue of measurement. Social physique anxiety has been measured using the 12-item social physique anxiety scale (SPAS, Hart et al., 1989). While the original 12-item version of the SPAS exhibited reasonable psychometric integrity (Hart et al., 1989), an increasing body of research examining the factor structure and validity of the SPAS using state-of-the-art confirmatory factor analysis (CFA) techniques have suggested that some items perform sub-optimally (Eklund et al., 1996; Eklund, Whitehead, & Welk, 1997; Hagger et al., 2007; Motl & Conroy, 2000; Motl, Conroy, & Horan, 2000; Smith, 2004). This research has advocated the need for well-fitting structural models to fit data from the SPAS in order to ensure a valid and reliable measure of social physique anxiety that is psychometrically

sound prior to addressing subsequent research questions on social physique anxiety (Hagger et al., 2007; Motl & Conroy, 2000). Therefore confirmation of the structural integrity of measures of social physique anxiety within each age and gender sample are considered prerequisite prior to addressing the principle research questions in this study, namely, comparing average levels of social physique anxiety across age and gender and its relation to physical self-esteem.

The present study

The aim of this study was to evaluate whether the gender differences in social physique anxiety and physical self-esteem observed in previous research were consistent in young people in age groups from 11 to 24 years. An additional aim was to examine the strength of the relationship between social physique anxiety and physical self-esteem across age, gender and age × gender. Few previous studies have examined this relationship, and none have examined whether this correlation is consistent across age and gender. This analysis therefore adds to current knowledge by providing evidence as to whether individuals with higher levels of social physique anxiety consistently report lower levels of physical self-esteem in accordance with the two-component model of self-presentation (Leary & Kowalski, 1990).

We adopted a systematic approach to evaluate the adequacy of the measures of social physique anxiety and physical self-esteem followed by the testing mean differences and inter-correlations for these constructs across age, gender and gender × age in this study. Using CFA methods we hypothesised a correlated two-factor model of social physique anxiety and physical self-esteem and tested its goodness-of-fit with the data in young people from six age groups: 11–12-year olds, 13–14-year olds, 15–16-year olds, 17–18-year olds, 19–20-year olds and 21-year olds and over. Methods advocated by Motl et al. (Motl & Conroy, 2000; Motl et al., 2000) and Hagger et al. (2007) were used to manage any potential misspecifications in the models in each sub-sample.

Pending adequate fit of the models in each sub-sample, we conducted tests of invariance to test the hypothesis of equivalent factor structure of social physique anxiety (Hagger et al., 2007) and physical self-esteem (Marsh, Asçi, & Marco, 2002) across the sub-samples. We also conducted invariance analyses of structured latent means across age, gender, age × gender sub-samples to test for age differences in social physique anxiety and physical self-esteem, whether the hypothesised gender differences were consistent across age group or whether there was an age × gender interaction as suggested by previous research findings for self-concept (Hagger et al., 2007; Hagger, Biddle, & Wang, 2005; Marsh, Barnes, Cairns, & Tidman, 1984). Finally, tests of invariance of factor correlations were used to test whether the relationship between social physique anxiety and physical self-esteem was consistent across age and gender sub-groups.

Methods

Participants

Participants ($N = 2334$) were secondary school and university students (male = 1073, female = 1261; M age = 16.77, SD = 3.17) from four government-run secondary schools and one University in the UK. School pupils were recruited from all secondary school years (age range 11–18 years) and University students from three undergraduate years (age range 18–24). Data from the UK National Office for Standards in Education indicated

that the pupils from each school were generally from a background that matched the socio-economic distribution of the UK schools based on an income means test used to determine whether the child was eligible for free school meals. University statistics revealed that student socio-economic status were significantly higher than the national average based on parental income. For the purposes of the analyses, the sample was segregated into age groups spanning two school/university years: school years 6 and 7 ($n = 301$; males = 146, females = 155; M age = 11.62, SD = 0.48), years 7 and 8 ($n = 311$; males = 150, females = 161; M age = 13.49, SD = 0.50), years 9 and 10 ($n = 473$; males = 190, females = 283; M age = 15.59, SD = 0.49), years 11 and 12 ($n = 456$; males = 178, females = 278; M age = 17.38, SD = 0.48), first-year university students ($n = 439$; males = 204, females = 235; M age = 19.59, SD = 0.49) and second- and third-year university students ($n = 354$, males = 205, females = 149; M age = 21.30, SD = 0.58). Self-reported ethnic background revealed that the majority of the participants described themselves as White ($n = 1783$; 76.4%) with substantial minority groups describing themselves as Indian/Pakistani ($n = 220$; 9.4%), mixed race ($n = 149$; 6.4%), Black ($n = 105$; 4.5%), Chinese ($n = 52$; 2.2%) and other ($n = 24$; 1.0%). One participant did not report their ethnicity.

Measures

Social physique anxiety

The SPAS(Hart et al., 1989) was administered to school pupils and undergraduate university students in quiet classroom or lecture room conditions. The scale comprises 12 items (e.g., 'Unattractive features of my physique/figure make me nervous in certain social settings') with responses made on 5-point Likert-type scales. The labels for the scale points were *not at all* (1), *slightly* (2), *moderately* (3), *very* (4) and *extremely* (5). Items 1, 5, 8 and 11 denote positively worded perceptions towards presentation of the physique and are consequently reverse scored.

Physical self-esteem

Physical self-esteem was measured using the general physical self-esteem 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 participants aged 16 years and older. Previous research have used adult-version physical self-esteem scales for adolescents of this age because the use of the word 'kids' was considered patronising for adolescents from these older age groups (Dunton, Schneider, Graham, & Cooper, 2006). The scale comprises 6 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

University ethical clearance for the study was obtained prior to data collection. School principals granted written informed consent for data to be collected in schools. Consent

from participants' parents was sought via a letter sent home with students outlining the study prior to data collection. A preprinted form was provided for parents to sign and return to the students' home-room teacher if they did not want their child to participate in the study. No forms were returned. Data from University students were collected from undergraduate students within timetabled lecture slots. Participants in both school and university samples were told 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.

Results

Hypothesised model and single-sample analyses

A systematic approach was adopted to evaluate the adequacy of the hypothesised correlated two-factor model in accounting for covariances among responses to the 12-item SPAS and physical self-esteem items (Marsh, 1993). This approach required the estimation of CFA models with unobserved or 'latent' social physique anxiety and physical self-esteem factors. In the models each of the factors was indicated by the observed scores from the scale items that ostensibly measure these constructs. As is typical in CFA models, 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 age, gender, age × gender sub-sample. Subsequently, specific sets of structural parameters of interest, namely factor loadings (λ), factor variances (ξ) and factor correlations (ϕ) were tested for invariance across the sub-samples by age and gender. This was followed up by comparisons of item intercepts (item means from the SPAS and physical self-esteem scales) and latent means (means of the social physique anxiety and physical self-esteem latent factors) across age and gender. This effectively tests for the main effects of these independent variables on the latent means of the social physique anxiety and physical self-esteem factors. Finally, tests of invariance structural parameters and latent means were then tested in each age × gender sub-sample to evaluate the interactive effects of these independent 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–Bentler (Satorra & Bentler, 1988) correction for the chi-square estimate in each model because preliminary analyses indicated that the samples exhibited a degree of multi-variate kurtosis based on Mardia's coefficient (median normalised estimate = 9.47, $p < 0.001$). 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 non-normed fit index (NNFI), the standardised root mean square of the model residuals (SRMSR) and the root mean square error of approximation (RMSEA). Values above 0.90 for the CFA and NNFI are considered to be indicative of adequate model fit, although values approaching 0.95 are preferable, and values close to 0.08 and 0.05 or less for the SRMSR and RMSEA, respectively, support good model fit (Hu & Bentler, 1999).

The model was adjudged to have sub-optimal fit with the data from the full sample according to the goodness-of-fit indices ($\chi^2 = 3526.566$, df = 134; CFI = 0.857; NNFI = 0.837; SRMSR = 0.096; RMSEA = 0.104). We adopted the criteria proposed by

Motl and Conroy (2000) and Hagger et al. (2007) to identify parameters responsible for misspecifications in the model, namely, examination of the parameters responsible for the largest standardised residuals as well as the factor loadings and variance accounted for by each item in the latent factor. Examination of the largest standardised residuals revealed that item 1 (7 residuals), item 5 (6 residuals), item 8 (5 residuals) and item 11 (3 residuals) from the SPAS were the most common items implicated in the top 20 largest residuals. In total, 19 of the top 20 residuals involved items 1, 5, 8 and 11. In addition, items 1 ($\lambda = 0.639$, $R^2 = 0.409$), 5 ($\lambda = 0.638$, $R^2 = 0.407$), 8 ($\lambda = 0.652$, $R^2 = 0.426$) and 11 ($\lambda = 0.567$, $R^2 = 0.321$) exhibited lower factor loadings compared with other items in the model (median $\lambda = 0.759$, range = 0.668–0.867; median $R^2 = 0.575$, range = 0.447–0.752). None of the largest standardised residuals were associated with items from the physical self-esteem scale and this scale exhibited acceptable factor loadings. Findings for the SPAS is consistent with previous research which has found the same set of items to be consistently associated with large standardised residuals and low factor loadings (Hagger et al., 2007; Motl & Conroy, 2000). Common to these items was their positive wording, a feature that previous researchers have suggested introduces a systematic bias to scores in this instrument (Eklund, 1998; Motl & Conroy, 2000). Previous research has suggested that these items be eliminated due to their method effect and have advocated the use of an 8-item version using the negatively worded items only (Hagger et al., 2007). Re-estimating the CFA model using the 8-item version of the SPAS in the full sample revealed a model that exhibited adequate fit with the data ($\chi^2 = 836.062$, df = 76; CFI = 0.959; NNFI = 0.950; SRMSR = 0.041; RMSEA = 0.065).

The next step in the analysis required the estimation of the model in each age group and gender sub-sample. Goodness-of-fit statistics for these models are provided in Table 1. All of the models indicated good fit with the data according to the multiple criteria adopted. The exception was the model for the 21+ female age group which exhibited sub-optimal fit for some of the indices. Examining the largest standardised residuals for this model and the factor loadings indicated that item 12 from the SPAS was implicated in 6 of the top 20 largest residuals. Motl and Conroy (2000) also advocate examining the content of items that do not exhibit good fit. The content of item 12 ('When I am in a bathing suit, I feel nervous about the shape of my body') is consistent with the defining features of social physique anxiety and is a satisfactory indicator of the latent social physique anxiety factor in other samples. To speculate, it may be that this item results in inconsistent responses in older females as it specifies wearing 'bathing suits' which may not be relevant to them or does not equate with the other SPAS items which do not make reference to a specific form of clothing. Although there is precedence for item 12 being responsible for model misspecification in other studies (Isogai et al., 2001; Lindwall, 2004), this item performed well in all other sub-samples in this study. In summary, with the exception of the 21+ sub-sample, the proposed model exhibited good fit in all samples. Finally, composite reliabilities (Bagozzi & Yi, 1994) for the social physique anxiety and physical self-esteem variables in each sub-sample were satisfactory (>0.800) in all cases (Table 2).

Multi-sample analyses

Considering the satisfactory fit of model in each of the single-sample analyses, we conducted a series of multi-sample CFA to test the hypothesised invariance of the factor pattern and structural parameters of the proposed social physique anxiety and physical self-esteem model across age, gender, age × gender. We adopted the invariance routine

Table 1. Goodness-of-fit statistics for single-sample CFA models by age, gender and age × gender.

Sample	SB-χ^{2a}	CFI	NNFI	RMSEA	SRMSR
Full sample ($N = 2334$)	836.062**	0.959	0.950	0.065	0.045
Gender					
Males ($n = 1073$)	375.315**	0.955	0.947	0.061	0.045
Females ($n = 1261$)	547.011**	0.952	0.952	0.070	0.045
Age					
11–12-year olds ($n = 301$)	141.551**	0.953	0.944	0.054	0.063
13–14-year olds ($n = 311$)	154.708**	0.966	0.959	0.058	0.043
15–16-year olds ($n = 473$)	196.363**	0.963	0.955	0.058	0.058
17–18-year olds ($n = 456$)	290.836**	0.950	0.941	0.079	0.044
19–20-year olds ($n = 439$)	247.976**	0.958	0.949	0.072	0.045
20+ year olds ($n = 354$)	99.752**	0.957	0.948	0.074	0.041
Gender × age					
Males aged 11–12 years ($n = 146$)	114.770**	0.945	0.934	0.059	0.075
Females aged 11–12 years ($n = 155$)	114.770**	0.977	0.972	0.039	0.071
Males aged 13–14 years ($n = 150$)	119.947**	0.956	0.947	0.062	0.064
Females aged 13–14 years ($n = 161$)	136.858**	0.941	0.929	0.071	0.062
Males aged 15–16 years ($n = 190$)	122.981**	0.949	0.939	0.057	0.052
Females aged 15–16 years ($n = 283$)	196.518**	0.944	0.932	0.075	0.060
Males aged 17–18 years ($n = 178$)	143.062**	0.947	0.936	0.071	0.063
Females aged 17–18 years ($n = 278$)	221.616**	0.943	0.932	0.083	0.049
Males aged 19–20 years ($n = 204$)	173.510**	0.932	0.918	0.050	0.061
Females aged 19–20 years ($n = 235$)	144.547**	0.966	0.960	0.062	0.045
Males aged 21+ years ($n = 205$)	133.103**	0.964	0.956	0.061	0.049
Females aged 21+ years ($n = 149$)	178.829**	0.912	0.895	0.065	0.096

Note: CFA = Confirmatory factor analysis; SB-χ^2 = Satorra-Bentler scaled chi-square statistic; [a]degrees of freedom for chi-square statistic for all models is 76; CFI = comparative fit index; NNFI = non-normed fit index; RMSEA = root mean square error of approximation; SRMSR = standardised root mean square of residuals.
*$p < 0.05$ **$p < 0.01$.

Table 2. Composite reliability coefficients (ρ) for SPA and PSE by age, gender and age × gender.

Age group	Males and Females		Males		Females	
	SPA	PSE	SPA	PSE	SPA	PSE
All ages	0.902	0.918	0.882	0.914	0.897	0.911
11–12 years	0.838	0.904	0.816	0.898	0.854	0.910
13–14 years	0.893	0.923	0.866	0.934	0.885	0.891
15–16 years	0.887	0.910	0.865	0.891	0.890	0.912
17–18 years	0.922	0.919	0.905	0.901	0.914	0.912
19–20 years	0.917	0.915	0.891	0.911	0.913	0.907
21+ years	0.924	0.917	0.909	0.926	0.908	0.875

Note: SPA = Social physique anxiety; PSE = physical self-esteem.

recommended by Byrne, Shavelson, & Muthén (1989). Initially, a baseline model was estimated to evaluate whether the factor 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

Table 3. Goodness-of-fit statistics for multi-sample CFA models testing for invariance across age, gender and age × gender.

Invariance tests	SB-χ^2	df	CFI	NNFI	RMSEA	SRMSR	Δdf	$\Delta\chi^2$
Age								
Baseline	1255.378**	456	0.956	0.948	0.067	0.047	–	–
λ's invariant	1369.823**	516	0.953	0.951	0.065	0.059	60	114.445**
λ's and ξ's invariant	1404.041**	526	0.952	0.950	0.066	0.086	10	34.218**
λ's, ξ's and ϕ's invariant	1426.344**	531	0.951	0.950	0.066	0.103	5	22.303**
Gender								
Baseline	920.142**	152	0.953	0.943	0.066	0.045	–	–
λ's invariant	967.733**	164	0.951	0.945	0.065	0.050	12	47.591**
λ and ξ's invariant	987.280**	166	0.950	0.945	0.065	0.068	2	19.547**
λ, ξ and ϕ's invariant	989.530**	167	0.949	0.945	0.065	0.075	1	2.250
Age × gender								
Baseline	1775.090**	912	0.947	0.936	0.070	0.060	–	–
λ's invariant	2004.610**	1044	0.941	0.938	0.069	0.080	132	229.520*
λ and ξ's invariant	2059.546**	1066	0.939	0.937	0.069	0.108	22	54.936**
λ, ξ and ϕ's invariant	2083.044**	1077	0.938	0.937	0.069	0.120	11	23.498*

Note: 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; NNFI = non-normed fit index; RMSEA = root mean square error of approximation; SRMSR = standardised root mean square of residuals; Δdf = Incremental change in degrees of freedom; $\Delta\chi^2$ = Incremental change in goodness-of-fit χ^2.
*$p < 0.05$ **$p < 0.01$.

correlations (ϕ). Models were evaluated using the same incremental fit indices used for the single-sample analyses. Cheung and Rensvold (2002) noted that the evaluation of measurement invariance using the traditional likelihood ratio test is likely to yield significant differences given the sensitivity of the goodness-of-fit chi-square to sample size. The authors recommend the use of incremental fit indices (e.g. CFI) with a cutoff criterion of −0.01 or less between baseline and subsequent restricted invariance models considered satisfactory to support the invariance of the fixed parameters across the samples.

Tests of the invariance for the CFA models across age, gender, age × gender are shown in Table 3. For all the three multi-sample 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 hypothesised to be invariant revealed changes in the incremental fit indices across all of the restricted models less than −0.01 (Cheung & Rensvold, 2002). This supports the equivalence of the structural parameters in each model (Byrne et al., 1989). These findings support hypotheses that the structure of social physique anxiety and physical self-esteem would be equivalent for age, gender, age × gender sub-samples.

We hypothesised that the relationship between social physique anxiety and physical self-esteem would be consistent across age, gender and age × gender. The standardised factor correlations between the two latent factors for each sub-sample are given in Table 4. As hypothesised, the correlations were all significantly different from zero supporting concurrent validity, significantly different from unity supporting their discriminant validity (Bagozzi & Yi, 1994) and negative in valence supporting previous tests of the relationship (Hagger et al., 2007; Kowalski et al., 2001).

Table 4. Factor correlations between SPA and PSE by age, gender and age × gender.

Age group	Males and Females	Males	Females
All ages	−0.561	−0.451[a]	−0.562[a]
11–12 years	−0.386[b]	−0.244[c,d]	−0.467
13–14 years	−0.487	−0.366	−0.443
15–16 years	−0.572	−0.495	−0.561
17–18 years	−0.667[b]	−0.519	−0.658[d]
19–20 years	−0.644	−0.578	−0.629
21+ years	−0.667	−0.643[c]	−0.577

Note: SPA = Social physique anxiety; PSE = physical self-esteem. All correlations significant at $p < 0.01$ and significantly different from unity (1.00).
[a,b,c]Significantly different at $p < 0.05$, [d]significantly different at $p < 0.01$.

A formal test of whether these correlations were significantly different across age, gender and age × gender was provided in the third phase of the invariance routine in the multi-sample analyses. In making those comparisons, we adopted Cheung and Rensvold's (2002) criteria using incremental fit indices rather than goodness-of-fit chi-square because of the sensitivity of the chi-square to sample size such that even trivial differences in parameters across groups lead to the rejection of the hypothesis of invariance in large samples. The issue is therefore one of 'statistical significance *versus* practical significance' (Cheung & Rensvold, 2002, p. 239). The authors therefore advocate adopting a common sense approach to evaluating invariance of parameters expected to differ on a theoretical basis across groups. One way to do this would be to examine both the statistical significance and the effect sizes (Cohen's *d*) of the univariate differences in parameters across groups in the invariance tests. We therefore used the Lagrange-multiplier (LM) tests that provide univariate chi-square difference tests of the correlations that significantly different across the groups in the invariance analyses.

The LM tests (the LM-test statistics are expressed as non-scaled chi-squared values while overall model goodness-of-fit is expressed as Satorra-Bentler (Satorra & Bentler, 1988) scaled chi-square values. Fit indexes are also based on the scaled chi-square value) revealed that only four of the correlations were significantly different in the three multi-sample models (Table 4) and in all cases the effect sizes were small (Cohen, 1992). For the model examining invariance across age, the social physique anxiety-physical self-esteem correlation for the 11–12-year-old sample ($\phi = -0.386$) was significantly weaker than the correlation for the 17–18 year old ($\phi = -0.667$; $\Delta\chi^2 = 3.999$, $p < 0.05$, $d = 0.079$) and borderline significant for the 21+ year-old ($\phi = -0.667$; $\Delta\chi^2 = 3.104$, $p = 0.078$, $d = 0.070$) samples. For the gender invariance model, the correlation was significantly stronger in females ($\phi = -0.562$) than in males ($\phi = -0.451$; $\Delta\chi^2 = 4.258$, $p < 0.05$, $d = 0.082$). For the age × gender invariance model, the correlation was significantly weaker in the 11–12-year-old male sample ($\phi = -0.244$) compared with the 17–18-year-old female ($\phi = -0.658$; $\Delta\chi^2 = 6.677$, $p = 0.01$, $d = 0.103$) and the 21+ year-old male ($\phi = -0.643$; $\Delta\chi^2 = 5.298$, $p < 0.05$, $d = 0.091$) samples. The present analyses suggest there are few differences in the correlation between social physique anxiety and physical self-esteem across the age, gender and age × gender sub-groups and that the observed variations in the correlations were small.

Testing for invariant latent mean structures

Given the invariance of the factor pattern structural parameters for the hypothesised correlated two-factor model of social physique anxiety and physical self-esteem model, we then tested the hypothesis of mean differences in the reproduced item and latent variable means across age, gender, age × gender sub-samples. This involved evaluating the invariance of the matrix of reproduced indicator (intercept) means and latent variable means across the sub-samples (Byrne et al., 1989). The invariance routine employed to test the invariance of the structured 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 as this is the minimum required set of constraints for measurement invariance in multi-sample analyses (Byrne et al., 1989). The incremental fit indexes based on model residuals (CFI and NNFI) were used to evaluate the adequacy of each model but not to make model comparisons as these fit indexes include comparisons with a 'null model' which are difficult to interpret when making comparisons in latent means analyses. Model comparisons were therefore evaluated 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). Model fit was also evaluated on two fit indexes based on non-centrality, the RMSEA and the SRMSR.

Results of the invariance analyses for the latent mean structure of the proposed model across all sub-samples are given in Table 5. The baseline models for all sub-samples 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. Within the latent means analyses, one of the age, gender or age × gender groups was identified as a reference group to make pairwise comparisons of the reproduced latent means. Each age, gender or age × gender group served as the reference group in an iterative fashion so that the full compliment of mean comparisons could be made.

Focusing on the analysis across gender alone, social physique anxiety was significantly higher in females than in males (standardised mean difference (SMD) = 0.557; $z = 14.768$, $p < 0.01$) and physical self-esteem was significantly higher in males relative to females (SMD = 0.339; $z = 12.501$, $p < 0.01$).

Next, we focus on the analysis examining the main effect of age. The SMDs and significance tests for the latent means analysis by age group alone are given in Table 6. Findings from the analysis revealed that social physique anxiety was significantly lower in the 21+ age group relative to the 11–12 and 13–14-year-old age groups. Physical self-esteem in the 11–12-year-old, 13–14-year-old and 15–16-year-old age groups was significantly higher than all older age groups. The only exception was the values for the 13–14-year-old and 15–16-year-old age groups which did not differ. Finally, physical self-esteem levels did not differ across the 17–18-year-old, 19–20-year-old and 21+ year-old age groups.

Table 5. Goodness-of-fit statistics for multi-sample CFA models testing for invariance of latent mean structures across age, gender and age × gender.

Invariance tests	SB-χ^2	df	CFI	NNFI	RMSEA	SRMSR	AIC	ECVI
Gender								
Baseline	908.404**	160	0.954	0.949	0.062	0.050	588.404	0.526
Factor intercepts invariant	1050.744**	172	0.959	0.952	0.065	0.049	706.744	0.598
Latent means and intercepts invariant	1287.567**	174	0.958	0.951	0.065	0.075	939.567	0.701
Age								
Baseline	1322.111**	504	0.956	0.953	0.063	0.059	314.11	0.999
Factor intercepts invariant	1534.620**	559	0.955	0.948	0.066	0.059	416.620	1.137
Latent means and intercepts invariant	1687.681**	569	0.954	0.946	0.067	0.070	549.681	1.211
Gender × age								
Baseline	1954.097**	1020	0.944	0.941	0.067	0.080	−85.903	1.712
Factor intercepts invariant	2416.553**	1152	0.951	0.942	0.072	0.081	112.553	2.023
Latent means and intercepts invariant	2875.861**	1174	0.946	0.937	0.075	0.127	527.861	2.239

Note: SB-c^2 = Satorra–Bentler scaled chi-square statistic; df = degrees of freedom for chi-square statistic; CFI = comparative fit index; NNFI = non-normed fit index; RMSEA = root mean square error of approximation; SRMSR = standardised root mean square of residuals; AIC = robust Akaike's information criterion; ECVI = robust expected cross-validation index.
*$p < 0.05$ **$p < 0.01$.

Table 6. Latent mean differences in SPA and PSE by age.

	11–12 years	13–14 years	15–16 years	17–18 years	19–20 years	21+ years
SPA	0.000	0.003	−0.079	−0.024	−0.048	−0.148*
PSE	0.000	−0.232**	−0.266**	−0.426**	−0.432**	−0.397**
SPA	−0.003	0.000	−0.082	−0.027	−0.051	−0.151*
PSE	0.232**	0.000	−0.034	−0.194**	−0.200**	−0.165**
SPA	0.079	0.082	0.000	0.055	0.031	−0.069
PSE	0.266**	0.034	0.000	−0.160**	−0.166**	−0.131**
SPA	0.024	0.027	−0.055	0.000	−0.024	−0.124
PSE	0.426**	0.194**	0.160**	0.000	−0.006	0.029
SPA	0.048	0.051	−0.031	0.024	0.000	−0.100
PSE	0.432**	0.200**	0.166**	0.006	0.000	0.035
SPA	0.148*	0.151*	−0.069	0.125	0.100	0.000
PSE	0.397**	0.165**	0.131**	−0.029	−0.035	0.000

Note: SPA = Social physique anxiety; PSE = physical self-esteem. Zero scores indicate the reference group.
*$p < 0.05$ **$p < 0.01$.

Evaluating mean differences by age and gender in isolation may have concealed the interactive effects of these variables on social physique anxiety and physical self-esteem, so we tested for interactions in the age × gender latent means analysis. The SMDSs and significance tests for age × gender latent means analysis are given in Table 7 and

Table 7. Latent mean differences in SPA and PSE by age × gender.

	Males 11–12 years	Females 11–12 years	Males 13–14 years	Females 13–14 years	Males 15–16 years	Females 15–16 years	Males 17–18 years	Females 17–18 years	Males 19–20 years	Females 19–20 years	Males 21+ years	Females 21+ years
SPA	0.000	0.126	−0.265**	0.390**	−0.246**	0.142	−0.349**	0.316**	−0.355**	0.351**	−0.401**	0.362**
PSE	0.000	−0.103	−0.050	−0.490**	−0.129*	−0.430**	−0.201**	−0.632**	−0.304**	−0.612**	−0.273**	−0.659**
SPA	−0.126	0.000	−0.392**	0.264**	−0.373**	0.016	−0.475**	0.189*	−0.481**	0.225*	−0.527**	0.236*
PSE	0.103	0.000	0.053	−0.387**	−0.026	−0.327**	−0.098	−0.529**	−0.201**	−0.509**	−0.170**	−0.556**
SPA	−0.265**	0.392**	0.000	0.656**	0.019	0.408**	−0.083	0.581**	−0.090	0.616**	−0.135	0.628**
PSE	0.050	−0.053	0.000	−0.440**	−0.079	−0.380**	−0.151*	−0.583**	−0.254**	−0.562**	−0.223**	−0.610**
SPA	−0.390**	−0.264**	−0.656**	0.000	−0.637**	−0.248**	−0.739**	−0.075	−0.745**	−0.040	−0.791**	−0.028
PSE	0.490**	0.387**	0.440**	0.000	0.361**	0.060	0.289**	−0.142*	0.186**	−0.122*	0.217**	−0.169**
SPA	0.246**	0.373**	−0.019	0.637**	0.000	0.389**	−0.103	0.562**	−0.109	0.597**	−0.154	0.609**
PSE	0.129*	0.026	0.079	−0.361**	0.000	−0.301**	−0.072	−0.503**	−0.175**	−0.483**	−0.144*	−0.530**
SPA	−0.142	−0.016	−0.480**	0.248**	−0.389**	0.000	−0.491**	0.173*	−0.497**	0.208**	−0.543**	0.220*
PSE	0.430**	0.327**	0.380**	−0.060	0.301**	0.000	0.229**	−0.202**	0.126*	−0.182**	0.157**	−0.229**
SPA	0.349**	0.475**	0.084	0.740**	0.103	0.492**	0.000	0.665**	−0.006	0.700**	−0.052	0.712**
PSE	0.201**	0.098	0.151*	−0.289**	0.072	−0.229**	0.000	−0.431**	−0.103	−0.411**	−0.072	−0.459**
SPA	−0.315**	−0.189*	−0.581**	0.075	−0.562**	−0.173*	−0.664**	0.000	−0.670**	0.035	−0.716**	0.047
PSE	0.632**	0.529**	0.582**	0.142*	0.503**	0.202**	0.432**	0.000	0.328**	0.020	0.359**	−0.027
SPA	0.355**	0.481**	0.090	0.745**	0.108	0.497**	0.006	0.671**	0.000	0.706**	−0.046	0.717**
PSE	0.304**	0.201**	0.254**	−0.186**	0.175**	−0.126*	0.103	−0.328**	0.000	−0.308**	0.031	−0.355**
SPA	−0.351**	−0.224*	−0.616**	0.040	−0.597**	−0.208*	−0.699**	−0.035	−0.705**	0.000	−0.751**	0.012
PSE	0.612**	0.509**	0.562**	0.122**	0.483**	0.182**	0.411**	−0.020	0.308**	0.000	0.339**	−0.047
SPA	0.401**	0.527**	0.135	0.791**	0.154	0.543**	0.052	0.717**	0.046	0.752**	0.000	0.763**
PSE	0.273**	0.170**	0.223**	−0.217**	0.144*	−0.157**	0.072	−0.359**	−0.031	−0.339**	0.000	−0.387**
SPA	−0.362**	−0.235*	−0.627**	0.029	−0.608**	−0.219*	−0.710**	0.046	−0.716**	−0.011	−0.762**	0.000
PSE	0.659**	0.556**	0.610**	0.169**	0.530**	0.229**	0.459**	0.027	0.355**	0.047	0.386**	0.000

Note: SPA = Social physique anxiety; PSE = physical self-esteem. Zero scores indicate the reference group.
*$p < 0.05$ **$p < 0.01$

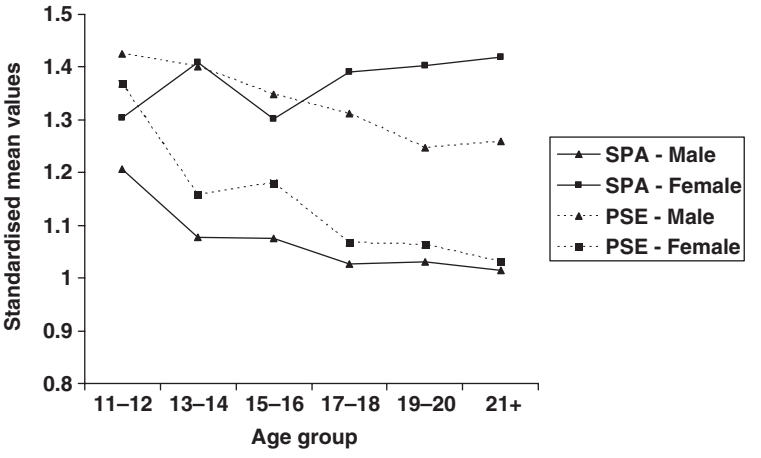

Figure 1. Reproduced social physique anxiety latent factor means by age × gender. SPA = Social physique anxiety; PSE = physical self-esteem.

reproduced means for the self-related variables for the age × gender latent means analysis are illustrated in Figure 1. *Turning first to age differences in self-related variables within gender*. Results revealed that social physique anxiety in 11–12-year-old females was significantly lower than each of the older female age groups. The only exception was social physique anxiety for the 15–16-year-old age group which did not differ from the 11–12-year-old age group and was also significantly lower than all other female age groups. Social physique anxiety in 11–12-year-old males was significantly higher compared with all other male age groups. There were no other differences in social physique anxiety in males across the age groups. Physical self-esteem in 11–12-year-old females was significantly higher than all other age groups. Levels of physical self-esteem in 13–14-year-old and 15–16-year-old females were also significantly higher compared with older age groups. There were no differences in physical self-esteem between the 13–14 and 15–16-year-old female age groups. Physical self-esteem in males exhibited a steady decline with age starting with the 11–12-year-old age group with levels of physical self-esteem significantly lower in each successively older age group bar the closest. The exception to this pattern was the 17–18, 19–20 and 21+ year-old males who exhibited no significant differences in physical self-esteem.

Examining gender differences in self-related variables within age groups, social physique anxiety was significantly higher in females within each age group. The only exception was the 11–12-year-old age group in which there was no significant gender difference. Physical self-esteem was significantly higher in males within each age group. Again, the only exception was the 11–12-year-old age group in which there was no gender difference.

Finally, looking at differences in the self-related variables across age and gender groups, social physique anxiety means for females was significantly higher than males across each level of age. The only exception was scores for 11–12-year-old males and 15–16-year-old females which were not significantly different. Finally, physical self-esteem scores were significantly lower in females compared with all other male age groups, the 11–12-year-old female age group was the only exception. Physical self-esteem in 11–12-year-old females was significantly higher than males in the 19–20-year-old and 21+ year-old age groups and did not differ to physical self-esteem in males in the 13–14, 15–16 and 17–18-year-old age groups.

Discussion

This study examined the effects of age, gender, age × gender on the mean levels of social physique anxiety and physical self-esteem. The CFA models were used to evaluate the adequacy of a correlated two-factor model of social physique anxiety and physical self-esteem in age, gender and age × gender sub-samples of a sample of young people aged 11–24 ($N = 2334$). Multi-sample CFA models were used to determine whether the proposed factor structure, structural parameters and factor correlation was tenable across age, gender, age × gender sub-samples. Latent means analysis was used to test whether there were mean differences in social physique anxiety and physical self-esteem across age, gender, age × gender.

Results supported the adequacy of the hypothesised correlated two-factor model of social physique anxiety (8-item version) and physical self-esteem in each individual age group, gender and age group x gender sub-sample. Testing the suitability of subsequent CFA models that restricted sets of structural parameters to be invariant across age, gender, age × gender groups indicated few misspecifications that could be considered substantive and supported the adequacy of the structure across these samples. Despite observed differences, there were a few variations in the factor correlation between social physique anxiety and physical self-esteem across the samples, although the overall correlation was stronger for females than for males. Tests of invariance of latent means supported the hypothesis that social physique anxiety levels were significantly higher in females compared with males between and within age groups for all but the very youngest age group. Analogously, physical self-esteem was also significantly higher in males within each age group with the exception of the 11–12-year-old age group. Social physique anxiety was significantly higher in the older age groups in females compared with the 11–12-year-old and 15–16-year-old groups but did not differ across the older age groups from the 17–18-year-old age group onwards. Social physique anxiety tended to be significantly lower in older age groups in males compared with the youngest age group (11–12 years) with no differences observed from the 13–14-year-old age group onwards. There was an observed decline in physical self-esteem with age in both males and females. The age-related decline in physical self-esteem levelled off at the 19–20-year-old age group for males and the 17–18-year-old age group for females.

A key preliminary finding in this study is that the structure of the correlated two-factor model adequately accounted for covariances among the social physique anxiety (8-item version) and physical self-esteem scale items in the present sample. Importantly, the proposed model exhibited very little variation across the age group, gender and age group x gender sub-samples in terms of structural parameters (factor loadings, factor variances and factor correlations) and any variations in these parameters were considered unsubstantial (Cheung & Rensvold, 2002). This supports previous research that has supported the adequacy of the factor structure of the 8-item social physique anxiety measure (Hagger et al., 2007) and the general physical self-esteem scale from the PSPP (Hagger, Biddle, Chow, Stambulova, & Kavussanu, 2003) using CFA. Considering that previous research with the social physique anxiety and physical self-esteem constructs have tended to confine analyses to older age groups and to single samples with no direct comparisons, present findings make an original contribution to the extant literature by demonstrating the universality of the proposed structure and correlations between these factors in samples of males and females aged from 11 to 24 years. In addition, support for the structural integrity of these factors is an important prerequisite step prior to testing for substantive differences in latent means across the age and gender sub-samples.

In accordance with hypotheses and previous research, present findings support the gender differences in social physique anxiety consistently reported in previous studies on adult populations. Mean levels of social physique anxiety in the females tended to be significantly higher than males irrespective of age, a finding that has been reported elsewhere (Eklund et al., 1997; Frederick & Morrison, 1996; Haase & Prapavessis, 1998; Kruisselbrink et al., 2004; Lantz et al., 1997; Mack et al., 2007). The only exception was the 11–12-year-old age group, in which there were no gender differences in social physique anxiety. This is an important finding as it suggests that the gender differences in social physique anxiety observed in adult samples may have their origins in preadolescence and are clearly present among young people in early, middle and late adolescence.

To date no research has identified variables that explain the observed variation in social physique anxiety across gender. Speculative accounts have suggested that media portrayal of slight, waif-like physiques in domains such as the fashion industry imply to females, with extreme clarity and little ambiguity, that such physiques are a societal ideal and that should be strived for (Hausenblas & Fallon, 2002). Such unrealistic images not only place pressure on women to strive to match such physiques but also highlight the fact that physique plays an important role in society and will be scrutinised in social situations (Luff & Gray, 2009). There is also evidence that young women are exposed to these images from a very young age and report a greater mismatch between the 'ideal' media-portrayed physique and actual physique relative to males (Knauss, Paxton, & Alsaker, 2008). Such discrepancies may be antecedents of social physique anxiety and give rise to impression motivation to adopt coping strategies aimed at minimising the portrayal of the physique that is perceived to be evaluated as negative by others (Leary & Kowalski, 1990).

Trends in this study indicate that physical self-esteem declines with age in both males and females, with a levelling off of this downward trend in older age groups. These results are consistent with cross-sectional and longitudinal comparisons of self-concept in other domains by age. In a review of the developmental literature on self-concept, Marsh (1989a) concluded that there was relatively strong evidence for declines in self-concept in early adolescence corresponding with the 12–13-year-old age group. He also found support for increases in self-concept in older age groups. Present findings corroborate the early adolescent decrease trend but do not support the previously observed increases in mid-to-late adolescence. It seems that the proposed curvilinear effect observed by Marsh et al. in various self-concept domains do not hold in this study. Social physique anxiety, by comparison, demonstrated a significant increase in younger age groups followed by a levelling off after the 17–18-year-old age group. This is in contrast to males where social physique anxiety exhibited a decline in early adolescence followed by a levelling off after the 13–14-year-old age group. Concern over presentation of the physique appears to be a limited issue for males while females appear to have significantly higher and more stable and elevated levels of social physique anxiety. This in keeping with the previously mentioned increases in perceived social expectations and exposure to media, as well as pubertal bodily changes that are associated with health concerns in females (Leventhal, Cameron, Leventhal, & Ozakinci, 2005; Shelly, Ward, & Hyde, 2008; Stice & Shaw, 1994).

There were two interesting variations from the above trends in the analyses of means. Levels of social physique anxiety and physical self-esteem did not differ within the 11–12-year-old age group for both males and females. Social physique anxiety was also significantly higher in 11–12-year-old boys and physical self-esteem significantly higher in 11–12-year-old girls compared with their same sex counterparts in other age groups (Figure 1). One possible reason for this may be that participants in the younger age groups may not have a sufficiently realistic or differentiated view of the physical self. Previous

research has provided evidence to support this hypothesis. For example, research in physical self-esteem (Hagger et al., 2005) and self-esteem in other domains (Marsh, 1989a) indicated that multi-dimensional models of self-esteem were not appropriate for preadolescent children and found significantly inflated levels of self-esteem among children of this age relative to older age groups. The increased differentiation and sophistication in self-related perceptions may be attributed to changes in cognitive development that occur in puberty and to increased experience (Obradovic, van Dulmen, Yates, Carlson, & Egeland, 2006). For example, children are likely to improve in their ability to introspect and report their internal states and will also be exposed to greater opportunities to interact with others and demonstrate competence during early adolescence (Carpendale & Lewis, 2004). To speculate, the developmental changes in children that are manifested in changes in self-perceptions in the self-concept literature may also apply to social physique anxiety. Children of this age may not have had sufficient experience in social and physical situations to provide realistic estimates. Future research, however, should seek to investigate young children's perceptions about their physique in evaluative social situations, perhaps by interviewing younger children and conducting thematic content analysis of their responses for themes relating to perception of the physical self.

Present results revealed few differences in the correlation between social physique anxiety and physical self-esteem across the age, gender and age × gender sub-samples. The correlation was observed to be lower in younger and higher in older adolescents, but there were no significant differences across age and gender with the exception of the correlation for 11–12-year-old males and the correlation in two older age groups (17–18-year-old females and 21+ year-old males). The effect sizes of these differences were small. The results therefore point to a relatively consistent relationship between these variables across groups and one that was significantly different from zero and negative in all cases. People with lower levels of physical self-esteem are likely to have higher levels of social physique anxiety and one possible response when faced with the prospect of presenting the physique in evaluative contexts may be to avoid such situations. In contrast, those who are confident in their physical self in situations where the physique is likely to be evaluated are likely to have higher levels of physical self-esteem and lower levels of social physique anxiety. People with such a profile may be less motivated to avoid such situations. Present results suggest that these profiles of self-perceptions are consistent in young people across age groups and therefore may be relevant in situations, such as school physical education (PE) classes as well as leisure-time exercise and sport settings. Low social physique anxiety among adolescents may present difficulties for PE teachers as they may be faced with pupils motivated to avoid PE classes. This may be because they perceive their physique will be evaluated as negative by their peers in such contexts. In the light of lower levels of physical activity among young people, such avoidance may stymie efforts to increase physical activity using existing networks such as PE (Hagger et al., 2003; Hagger, Chatzisarantis, & Biddle, 2002).

Limitations, conclusions, and avenues for future research

While this study adopts a rigorous, hypothesis-testing approach to testing the structural integrity and latent mean differences across age, gender, age × gender of the proposed two-factor model of social physique anxiety and physical self-esteem, caution should be exercised in extrapolating findings to the general population. While considerable effort

was invested in recruiting participants from a number of schools, the sample was not randomly selected from school children in the UK. Future research may attempt to provide further support in a representative national sample of young people selected at random. In addition, this research did not account for within-participant variables such as class and school membership. These data were not recorded. This precludes the use of multi-level analyses to examine variations in the structure and mean levels of social physique anxiety and physical self-esteem with class and school membership as within-participant factors. Another analysis that may have further informed present findings is a control for variables related to maturation and developmental age. Inclusion of a measure of body mass index or, ideally, pubertal status may have provided further information on the effects of developmental stage rather than merely chronological age on social physique anxiety. Finally, as with all such data sets, current data are cross-sectional. They therefore do not reflect developmental changes in social physique anxiety and physical self-esteem. Future research adopting a multi-cohort, multi-occasion design measuring these constructs in the same participants at multiple time points and using autoregressive covariance structure analyses would provide robust support for these developmental changes (Marsh, 1998).

Conclusion

This study provides new and original information on variations in social physique anxiety with respect to age, gender and age × gender among adolescents and young adults ranging in age from 11 to 22 years. The study also provided original data on the relationship between social physique anxiety and physical self-esteem, across these age and gender groups. Results confirmed findings of previous cross-sectional studies that have found that adolescent girls and young adult females tend to have significantly elevated social physique anxiety scores relative to males. Present findings confirm this trend across age groups and that it is consistent from a relatively young age with the exception of the youngest age group (11–12 years). In addition, the study provided evidence that physical self-esteem is significantly higher in adolescent boys and young adult males relative to females and the relations between social physique anxiety and physical self-esteem remain consistent across age groups. These findings are important in that they provide information that concern over the presentation of the body in physical situations is elevated in females after early adolescence. This is relevant given that previous research has linked this variable with maladaptive outcomes such as dissatisfaction with appearance and weight (Crawford & Eklund, 1994), eating attitudes (Haase & Prapavessis, 1998) and motivation to avoid health-related behaviours such as physical activity (Niven et al., 2009).

Acknowledgement

We thank Dr Shiri Einav for her assistance with a previous draft of this manuscript.

References

Aloiseyoung, P.A. (1993). The development of self-presentation – Self-promotion in 6-year-old to 10-year-old children. *Social Cognition, 11*, 201–222.

Bagozzi, R.P., & Yi, Y. (1994). Advanced topics in structural equation models. In R.P. Bagozzi (Ed.), *Advanced methods for marketing research* (pp. 1–51). Oxford: Blackwell.

Bentler, P.M. (2004). *EQS structural equations modeling software (Version 6.1) [Computer Software]*. Encino, CA: Multivariate Software.

Byrne, B.M., Shavelson, R.J., & Muthén, B. (1989). Testing for the equivalence of factor covariance and means structures: The issue of partial measurement invariance. *Psychological Bulletin, 105*, 456–466.

Carpendale, J.I.M., & Lewis, C. (2004). Constructing an understanding of mind: The development of children's social understanding within social interaction. *Behavioral and Brain Sciences, 27*, 79–151.

Chad, K., & Spink, K.S. (1996). Body image, social physique anxiety, and tendency to develop eating disorders in female gymnasts. *Journal of Applied Sport Psychology, 8*(Suppl.), S148.

Cheung, G.W., & Rensvold, R.B. (2002). Evaluating goodness-of-fit indexes for testing measurement invariance. *Structural Equation Modeling, 9*, 233–255.

Cohen, J. (1992). A power primer. *Psychological Bulletin, 112*, 155–159.

Crawford, S., & Eklund, R.C. (1994). Social physique anxiety, reasons for exercise, and attitudes toward exercise settings. *Journal of Sport and Exercise Psychology, 16*, 70–82.

Dunton, G.F., Schneider, M., Graham, D.J., & Cooper, D.M. (2006). Physical activity, fitness, and physical self-concept in adolescent females. *Pediatric Exercise Science, 18*, 240–251.

Eklund, R.C. (1998). With regard to the social physique anxiety scale: Conceptually speaking. *Journal of Sport and Exercise Psychology, 20*, 225–227.

Eklund, R.C., & Crawford, S. (1994). Active women, social physique anxiety, and exercise. *Journal of Sport and Exercise Psychology, 16*, 431–448.

Eklund, R.C., Kelley, B., & Wilson, P. (1997). The social physique anxiety scale: Men, women, and the effects of modifying item 2. *Journal of Sport and Exercise Psychology, 19*, 188–196.

Eklund, R.C., Mack, D.E., & Hart, E.A. (1996). Factorial validity of the social physique anxiety scale for females. *Journal of Sport and Exercise Psychology, 18*, 281–295.

Eklund, R.C., Whitehead, J.R., & Welk, G.J. (1997). Validity of the children and youth physical self-perception profile: A confirmatory factor analysis. *Research Quarterly for Exercise and Sport, 68*, 240–256.

Fox, K.R. (1990). *The physical self-perception profile manual (PRN monograph)*. Dekalb, IL: Northern Illinois University Office for Health Promotion.

Frederick, C.M., & Morrison, C.F. (1996). Social physique anxiety: Personality constructs, motivations, exercise attitudes, and behaviors. *Perceptual and Motor Skills, 82*, 963–972.

Haase, A.M., & Prapavessis, H. (1998). Social physique anxiety and eating attitudes: Moderating effects of body mass and gender. Psychology. *Health and Medicine, 3*, 201–210.

Haase, A.M., & Prapavessis, H. (2001). Social physique anxiety and eating attitudes in female athletic and non-athletic groups. *Journal of Science and Medicine in Sport, 4*, 396–405.

Hagger, M.S., Asçi, F.H., Lindwall, M., Hein, V., Mülazimoglu-Balli, Ö., Tarrant, M., et al. (2007). Cross-cultural validity and measurement invariance of the social physique anxiety scale in five European nations. *Scandinavian Journal of Medicine and Science in Sports, 17*, 703–719.

Hagger, M.S., Biddle, S.J.H., Chow, E.W., Stambulova, N., & Kavussanu, M. (2003). Physical self-perceptions in adolescence: Generalizability of a hierarchical multidimensional model across three cultures. *Journal of Cross-Cultural Psychology, 34*, 611–628.

Hagger, M.S., Biddle, S.J.H., & Wang, C.K.J. (2005). Physical self-perceptions in adolescence: Generalizability of a multidimensional, hierarchical model across gender and grade. *Educational and Psychological Measurement, 65*, 297–322.

Hagger, M.S., Chatzisarantis, N.L.D., & Biddle, S.J.H. (2002). A meta-analytic review of the theories of reasoned action and planned behavior in physical activity: Predictive validity and the contribution of additional variables. *Journal of Sport and Exercise Psychology, 24*, 3–32.

Hart, E.A., Leary, M.R., & Rejeski, W.J. (1989). The measurement of social physique anxiety. *Journal of Sport and Exercise Psychology, 11*, 94–104.

Hausenblas, H.A., & Fallon, E.A. (2002). Relationship among body image, exercise behavior, and exercise dependence symptoms. *International Journal of Eating Disorders, 32*, 179–185.

Hausenblas, H.A., & Mack, D.E. (1999). Social physique anxiety and eating disorder correlates among female athletic and non-athletic populations. *Journal of Sport Behavior, 22*, 502–513.

Heaven, P.C.L. (2001). *The Social Psychology of Adolescence*. New York: Palgrave Macmillan.

Hu, L., & Bentler, P.M. (1999). Cutoff criteria for fit indexes in covariance structure analysis: Conventional criteria versus new alternatives. *Structural Equation Modeling, 6*, 1–55.

Isogai, H., Brewer, B.W., Cornelius, A.E., Komiya, S., Tokunaga, M., & Tokushima, S. (2001). Cross-cultural validation of the social physique anxiety scale. *International Journal of Sport Psychology, 32*, 76–87.

Knauss, C., Paxton, S.J., & Alsaker, F.D. (2008). Body dissatisfaction in adolescent boys and girls: Objectified body consciousness, internalization of the media body ideal and perceived pressure from media. *Sex Roles, 59*, 633–643.

Kowalski, K.C., Mack, D.E., Crocker, P.R.E., Niefer, C.B., & Fleming, T.L. (2006). Coping with social physique anxiety in adolescence. *Journal of Adolescent Health, 39*, 275.e9–275.e16.

Kowalski, N.P., Crocker, P.R.E., & Kowalski, K.C. (2001). Physical self and physical anxiety relationships in college women: Does social physique anxiety moderate effects? *Research Quarterly for Exercise and Sport, 72*, 55–62.

Kruisselbrink, D.L., Dodge, A.M., Swanburg, S.L., & MacLeod, A.L. (2004). Influence of same-sex and mixed-sex exercise settings on the social physique anxiety of males and females. *Journal of Sport and Exercise Psychology, 26*, 616–622.

Lamarche, L., Gammage, K.L., & Strong, H.A. (2009). The effect of mirrored environments on self-presentational efficacy and social anxiety in women in a step aerobics class. *Psychology of Sport and Exercise, 10*, 67–71.

Lantz, C.D., Hardy, C.J., & Ainsworth, B.E. (1997). Social physique anxiety and perceived exercise behavior. *Journal of Sport Behavior, 20*, 83–93.

Leary, M.R., & Kowalski, R.M. (1990). Impression management: A literature review and two component model. *Psychological Bulletin, 107*, 34–47.

Leary, M.R., Tchividjian, L.R., & Kraxberger, B.E. (1994). Self-presentation can be hazardous to your health - Impression management and health risk. *Health Psychology, 13*, 461–470.

Leventhal, H., Cameron, L., Leventhal, E., & Ozakinci, G. (2005). Do messages from your body, your friends, your doctor, or the media shape your health behavior? In T. Brock, & M. Green (Eds.), *Persuasion, psychological insights and perspectives* (pp. 195–224). Thousand Oaks, CA: Sage.

Lindwall, M. (2004). Factorial validity and invariance testing of the Swedish social physique anxiety scale: Arguments for gender-specific scales. *Journal of Sport and Exercise Psychology, 26*, 492–499.

Luff, G.M., & Gray, J.J. (2009). Complex messages regarding a thin ideal appearing in teenage girls' magazines from 1956 to 2005. *Body Image, 6*, 133–136.

Mack, D.E., Strong, H.A., Kowalski, K.C., & Crocker, P.R.E. (2007). Does friendship matter? An examination of social physique anxiety in adolescence. *Journal of Applied Social Psychology, 37*, 1248–1264.

Marsh, H.W. (1989a). Age and sex effects in multiple dimensions of self-concept: Preadolescence to early adulthood. *Journal of Educational Psychology, 81*, 417–430.

Marsh, H.W. (1989b). Sex differences in the development of verbal and mathematics constructs: The high school and beyond study. *American Educational Research Journal, 26*, 191–225.

Marsh, H.W. (1993). The multidimensional structure of physical fitness: Invariance over gender and age. *Research Quarterly for Exercise and Sport, 64*, 256–273.

Marsh, H.W. (1998). Age and gender effects in physical self-concepts for adolescent elite athletes and nonathletes: A multicohort-multioccasion design. *Journal of Sport and Exercise Psychology, 20*, 237–259.

Marsh, H.W., Asçi, F.H., & Marco, I.T. (2002). Multi-trait multi-method analyses of two physical self-concept instruments: A cross-cultural perspective. *Journal of Sport and Exercise Psychology, 24*, 99–119.

Marsh, H.W., Barnes, J., Cairns, L., & Tidman, M. (1984). Self-description questionnaire: Age and sex effects in the structure and level of self-concept for pre-adolescent children. *Journal of Educational Psychology, 76*, 940–956.

Marsh, H.W., Parker, J., & Barnes, J. (1985). Multidimensional adolescent self-concepts: Their relationship to ages, sex, and academic process. *American Educational Research Journal, 22*, 422–444.

Marsh, H.W., & Redmayne, R.S. (1994). A multidimensional physical self-concept and its relations to multiple components of physical fitness. *Journal of Sport and Exercise Psychology, 16*, 43–55.

Marsh, H.W., Smith, I.D., Marsh, M.R., & Owens, L. (1988). The transition from single-sex to coeducational high schools: Effects on multiple dimensions of self-concept and on academic achievement. *American Educational Research Journal, 25*, 237–269.

McAuley, E., & Burman, G. (1993). The social physique anxiety scale: Construct validity in adolescent females. *Medicine and Science in Sports and Exercise, 25*, 1049–1053.

Meece, J.L., Parsons, J.E., Kaczala, C.M., Goff, S.B., & Futterman, R. (1982). Sex differences in math achievement: Toward a model of academic choice. *Psychological Bulletin, 91*, 324–348.

Motl, R.W., Conroy, C., & Horan, P.M. (2000). The social physique anxiety scale: An example of the potential consequences of negatively worded items in factorial validity studies. *Journal of Applied Measurement, 1*, 327–345.

Motl, R.W., & Conroy, D.E. (2000). Validity and factorial invariance of the social physique anxiety scale. *Medicine and Science in Sports and Exercise, 32*, 1007–1017.

Niven, A., Fawkner, S., Knowles, A.-M., Henretty, J., & Stephenson, C. (2009). Social physique anxiety and physical activity in early adolescent girls: The influence of maturation and physical activity motives. *Journal of Sports Sciences, 27*, 299–305.

Obradovic, J., van Dulmen, M.H.M., Yates, T.M., Carlson, E.A., & Egeland, B. (2006). Developmental assessment of competence from early childhood to middle adolescence. *Journal of Adolescence, 29*, 857–889.

Satorra, A., & Bentler, P.M. (1988). *Scaling corrections for statistics in covariance structure analysis*. Los Angeles, CA: University of California at Los Angeles, Department of Psychology.

Shelly, G., Ward, L.M., & Hyde, J.S. (2008). The role of the media in body image concerns among women: A meta-analysis of experimental and correlational studies. *Psychological Bulletin, 134*, 460–476.

Smith, A.L. (2004). Measurement of social physique anxiety in early adolescence. *Medicine and Science in Sports and Exercise, 36*, 475–483.

Stice, E., & Shaw, H.E. (1994). Adverse effects of the media portrayed thin-ideal on women and linkages to bulimic symptomatology. *Journal of Social and Clinical Psychology, 13*, 288–308.

Strong, H.A., Mack, D.E., Martin Ginis, K.A., & Wilson, P.M. (2006). Examining self-presentational exercise motives and social physique anxiety in men and women. *Journal of Applied Biobehavioral Research, 11*, 209–225.

Whitehead, J.R. (1995). A study of children's physical self-perceptions using an adapted physical self-perception profile questionnaire. *Pediatric Exercise Science, 7*, 132–151.

Whittaker, T.A., & Stapleton, L.M. (2006). The performance of cross-validation indices used to select among competing covariance structure models under multivariate nonnormality conditions. *Multivariate Behavioral Research, 41*, 295–335.