Social Physique Anxiety Scale

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Social physique anxiety (SPA) is the anxiety experienced when a person believes they are being observed or judged on their appearance; it is considered to be a subtype of social anxiety.

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1. Introduction

Social physique anxiety (SPA) is the anxiety experienced when a person believes they are being observed or judged on their appearance; it is considered to be a subtype of social anxiety [1]. SPA manifests in an individual's inability to view themselves as desirable to others. Crawford and Eklund [2] introduced self-presentation theory into the conceptual understanding of SPA. According to Goffman [3], anxious people always aim to make a good impression on others to seek positive evaluations, and SPA is the result of anxiety about self-presentation. Empirical research has suggested that people with a high level of SPA prefer settings that de-emphasise the physique rather than settings that emphasise the physique, which is aligned with the self-presentation explanation of SPA [2]. Studies have also found that more perfection-seeking people have higher SPA [4]. Hence, self-presentation and SPA are connected by the concept of perfection-seeking. The more strongly individuals seek to present a perfect image to others, the higher their SPA and the lower their body esteem [5][6].

Women were reported as having a higher level of SPA than men [5][7][8][9]. The limited research about the correlation between age and SPA showed the level of SPA grew with females' age whereas decreased with males' age with the participants aged from 11 to 24 [5], which means that college-aged women will have higher SPA level. The concept of SPA is highly overlapping with Body Image Dissatisfaction (BID) in the previous literature, with the goal of creating a good impression [10][11], which was found to be presented at higher levels in women as well [12]. Ålgars, Santtila [12] also reported females (aged 18 to 26) possessed the highest level of BID, which can be a reference for the characteristics of people with high SPA levels.

SPA was first proposed in a fitness context and has a strong connection with exercise [1][2][4][13]. The concept of SPA is therefore widely applied in the field of exercise psychology. People with a higher level of SPA are less likely to participate in exercise due to a fear of presenting themselves in front of others [2][13][14][15]. This observation is supported by Gammage, Ginis [16], who proposed a negative relationship between SPA and self-presentational exercise efficacy. Recent studies have also found that exercise may contribute to the mitigation of SPA [17]. This finding reflects the two approaches to cope with SPA proposed by Hart, Leary [1], which are avoidance and remedial behaviour. Avoidance is considered to be the primary behavioural tendency for coping with anxiety in general [18]. Remedial behaviour is regarded as a healthy behaviour to cope with SPA [19][20][21]. SPA also has a significant effect on dietary habits, which can influence physique presentation [7][22][23].

In addition to its physical effects, SPA influences the psychological dimension of self-esteem. Higher SPA is associated with lower self-esteem [24][25][26]. People with high levels of SPA also experience the emergence of social anxiety due to a lack of confidence in how the self presents to others [27][28]. Furthermore, a number of studies have reported that SPA reduces mental well-being and life satisfaction [29], and life satisfaction has been used as a measure of the impact of mental disorders [30]. Thus, it is possible to predict the impact of SPA on mental disorders, and relationships between SPA, analogue generalised anxiety disorder and analogue social anxiety disorder were confirmed [31].

The findings discussed above suggest that accurate measurement of SPA levels is of great significance in healthcare. To operationalise SPA, the Social Physique Anxiety Scale (SPAS) was originally proposed by Hart, Leary [1] in the context of gym fitness assessment. Although many studies have demonstrated satisfactory stability and validity of the 12-item unidimensional SPAS, its factor structure was much discussed. The plausibility of a second-order model was identified by scholars who argued that comfort with physique presentation (items 1, 2, 5, 8 and 11) and expectations of negative

physical evaluation (items 3, 4, 6, 7, 9, 10 and 12) are factors subordinate to SPA [8][13][32]. As such, Eklund, Kelley [8] identified item 2 as problematic but did not modify it in their model. However, although the second-order model had a good model fit, it was eliminated as a methodological artefact without substantive meaning [33][34].

There was further controversy related to the item composition of the SPAS. Martin, Rejeski [33] extended Eklund, Kelley's [8] view of item 2 and identified problems with items 1 and 5. They developed a 9-item unidimensional scale by excluding items 1, 2 and 5 and concluded that the unidimensional model was "more parsimonious and conceptually clear" than the two-factor model (p. 359). In a study on college students in America, Motl and Conroy [34] found that items 11 and 12 were problematic and proposed a 7-item unidimensional scale (items 3, 4, 6, 7, 8, 9, 10). This scale has been widely used in various countries [17][35][36][37][38]. Hagger, Aşçı [39] proposed an 8-item version after removing items 1, 5, 8 and 11, which is considered suitable for some European countries but remains controversial [40].

The development of an SPAS scale for the Chinese context is still in its initial stages. Isogai, Brewer [41] evaluated several scales on samples of female university students in Asian countries, including China, Japan, Korea and Thailand. A new 7-item scale (including items 3, 4, 6, 7, 9, 10 and 12) was found to improve the goodness-of-fit index in a Chinese sample [41]. However, despite the controversy related to the factor structure of the SPAS, there has been no further study to evaluate the SPAS scales in the Chinese context.

2. Construct Validity

Table 1 shows the CFA results for the five versions of SPAS proposed in previous studies. The results for SPAS-12 [1] and SPAS-9 [33] did not reach all of the cut-off values of the selected indexes in both Study 1 and the combined datasets. SPAS-8 [39], SPAS-7a [34] and SPAS-7b [41] fulfilled most of the cut-off criteria for a good model fit. However, item 3 had factor loadings below 0.3 in all of the above models and in both datasets, which is commonly regarded as an unacceptable value for factor loading [42][43]. For SPAS-8, the factor loadings for item 3 were 0.20–0.21, whereas the factor loadings for other items ranged from 0.58 to 0.87. For SPAS-7a, the factor loadings for item 3 ranged from 0.21 to 0.23, while other items' factor loadings ranged from 0.71 to 0.86. For SPAS-7b, factor loadings for item 3 were 0.19–0.21, whereas those of other items ranged from 0.51 to 0.85.

Table 1. Confirmatory Factor Analysis of the five versions of SPAS.

Model	χ^2	Df	χ^2/df	RMSEA [90% CI]	CFI	TLI	SRMR
Study 1 (*n* = 273)							
SPAS-12 [1]	462.202	54	8.56	0.167 [0.153–0.181]	0.964	0.956	0.103
SPAS-9 [33]	160.815	27	5.96	0.135 [0.115–0.155]	0.981	0.975	0.075
SPAS-8 [39]	27.574	20	1.38	0.037 [0.000–0.068]	0.999	0.998	0.039
SPAS-7a [34]	25.945	14	1.85	0.056 [0.019–0.089]	0.997	0.996	0.043
SPAS-7b [41]	15.848	14	1.13	0.022 [0.000–0.065]	0.999	0.999	0.031
Combo (*n* = 466)							
SPAS-12 [1]	623.530	54	11.55	0.151 [0.140–0.161]	0.964	0.956	0.094
SPAS-9 [33]	230.778	27	8.55	0.127 [0.113–0.143]	0.977	0.970	0.070
SPAS-8 [39]	37.591	20	1.88	0.043 [0.021–0.065]	0.998	0.997	0.036
SPAS-7a [34]	34.131	14	2.44	0.058 [0.035–0.082]	0.996	0.994	0.040
SPAS-7b [41]	27.652	14	1.98	0.046 [0.019–0.071]	0.998	0.997	0.033

Note. RMSEA = root mean square error of approximation, CFI = comparative fit index, TLI = Tucker–Lewis index, SRMR = standardized root mean square residual, Combo = Study 1 plus Study 2.

Hence, a new version of SPAS is required. We performed CFA for SPAS-7a, SPAS-7b and SPAS-8, excluding item 3. The results for SPAS-6b (developed from SPAS-7b) and SPAS-7 (developed from SPAS-8) showed good model fit in both datasets, while SPAS-6a (developed from SPAS-7a) failed to reach the cut-off value of χ^2/df with the combined data (χ^2/df = 3.29). To eliminate differences between genders, we divided the combined data into male and female datasets and performed CFA with different gender groups. SPAS-6b failed to fulfil the criteria for good model fit in the female group, with

χ^2/df = 3.16. The results suggested that our newly proposed SPAS-7 (items 2, 4, 6, 7, 9, 10 and 12) showed the best fit index values for all indicators and with all datasets (see **Table 2**).

Table 2. Confirmatory factor analysis of newly proposed 7-item SPAS.

Dataset	χ^2	Df	χ^2/df	RMSEA [90% CI]	CFI	TLI	SRMR
Study 1 (*n* = 273)	**13.623**	**14**	**0.97**	**0.000 [0.000–0.057]**	**0.999**	**0.999**	**0.035**
Combo (*n* = 466)	**21.990**	**14**	**1.57**	**0.035 [0.000–0.062]**	**0.999**	**0.998**	**0.032**
Male (*n* = 125)	**11.285**	**14**	**0.81**	**0.000 [0.000–0.071]**	**0.999**	**0.999**	**0.038**
Female (*n* = 341)	**35.635**	**14**	**2.55**	**0.067 [0.040–0.095]**	**0.996**	**0.993**	**0.045**

Note. RMSEA = root mean square error of approximation, CFI = comparative fit index, TLI = Tucker–Lewis index, SRMR = standardized root mean square residual. Combo = Study 1 plus Study 2.

3. Factorial Validity

In the subsequent sections, we evaluate the factorial validity of the 7-item SPAS with items 2, 4, 6, 7, 9, 10 and 12 by EFA. The factor analysis results show KMO values and Bartlett's test of sphericity for SPAS-7 of 0.889 (χ^2 = 487.202, p < 0.001). The EFA result reveals that the new SPAS-7 has a single factor, and one factor extracted from the SPAS-7 explains 53.8% of the variance. The factor loadings for all items ranged from 0.58 to 0.80 (n = 193).

4. Internal Consistency

Descriptive statistics and correlations for the 7-item SPAS (n = 273 for Study 1; n = 193 for Study 2) are shown in **Table 3**. All seven items were normally distributed (skewness < 10; kurtosis < 3). All items were significantly correlated with each other (p < 0.01). The Cronbach's alpha and McDonald's omega results indicate that the SPAS-7 has good internal consistency (α = 0.86–0.89; ω = 0.86–0.89).

Table 3. Descriptive statistics and correlations for the items of SPAS-7 in Studies 1 and 2.

	Study 1							**Study 2**						
Item	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**	**(7)**	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**	**(7)**
(1) SPAS2	**-**							**-**						
(2) SPAS4	**0.46 ****	**-**						**0.41 ****	**-**					
(3) SPAS6	**0.43 ****	**0.67 ****	**-**					**0.40 ****	**0.55 ****	**-**				
(4) SPAS7	**0.47 ****	**0.70 ****	**0.70 ****	**-**				**0.49 ****	**0.59 ****	**0.64 ****	**-**			
(5) SPAS9	**0.35 ****	**0.62 ****	**0.55 ****	**0.54 ****	**-**			**0.39 ****	**0.48 ****	**0.42 ****	**0.46 ****	**-**		
(6) SPAS10	**0.30 ****	**0.50 ****	**0.55 ****	**0.56 ****	**0.55 ****	**-**		**0.33 ****	**0.45 ****	**0.39 ****	**0.47 ****	**0.51 ****	**-**	
(7) SPAS12	**0.47 ****	**0.60 ****	**0.58 ****	**0.58 ****	**0.51 ****	**0.55 ****	**-**	**0.39 ****	**0.47 ****	**0.44 ****	**0.50 ****	**0.41 ****	**0.46 ****	**-**
M	**3.3**	**3.5**	**3.4**	**3.1**	**3.6**	**3.6**	**3.5**	**3.6**	**3.7**	**3.5**	**3.1**	**3.8**	**3.9**	**3.5**
SD	**1.2**	**1.1**	**1.1**	**1.2**	**1.1**	**1.1**	**1.2**	**1.2**	**1.2**	**1.1**	**1.1**	**1.1**	**1.0**	**1.2**
r_{it}	**0.52**	**0.77**	**0.75**	**0.77**	**0.66**	**0.63**	**0.70**	**0.53**	**0.67**	**0.64**	**0.82**	**0.60**	**0.58**	**0.60**
α_{iid}	**0.89**	**0.86**	**0.86**	**0.86**	**0.88**	**0.88**	**0.87**	**0.85**	**0.83**	**0.83**	**0.82**	**0.84**	**0.84**	**0.84**
Skewness	**−0.48**	**−0.59**	**−0.44**	**−0.19**	**−0.66**	**−0.48**	**−0.44**	**−0.71**	**−0.80**	**−0.70**	**−0.35**	**−0.80**	**−0.85**	**−0.56**

	Study 1							Study 2						
Item	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**	**(7)**	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**	**(7)**
Kurtosis	**−0.72**	**−0.48**	**−0.62**	**−0.85**	**−0.25**	**−0.44**	**−0.67**	**−0.48**	**−0.26**	**−0.35**	**−0.77**	**−0.09**	**0.14**	**−0.68**

Note. **. Correlation is significant at the 0.01 level (2-tailed), rit = Corrected item-total correlations, αiid = Cronbach's alpha, if item deleted.

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