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Research article

Composition Factor Analysis and Factor Invariance of the Physical Appearance State and Trait Anxiety Scale (PASTAS) in Sports and Non-Sports Practitioner Mexican Adolescents

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Abstract

The purpose of the present study was to adapt and validate the Physical Appearance State and Trait Anxiety Scale (PASTAS) for Mexican adolescents, verifying the factor invariance by sports and non-sports practitioners. A sample of 930 Mexican adolescents (46.0% females), aged 11 - 15 years old, voluntarily participated in the study. A total of 415 participants regularly played sports in a club and/or regularly participated in sports competitions and 515 were non-sports practitioners. The adolescents filled out the trait version of the PASTAS questionnaire, which was previously translated and adapted for Mexican-speaking adolescents following the International Test Commission guidelines. The results of the confirmatory factor analyses showed an adequate measurement model for the original two-factor structure (e.g., GFI = 0.913; RMSEA = 0.078; CFI = 0.943). The internal consistency of the two dimensions was excellent (α and Ω = 0.92 - 0.93). Additionally, the results of the factorial invariance analyses showed an appropriate fit of the two-structure model (e.g., GFI = 0.96; CFI = 0.98; RMSEA = 0.04) among both sports and non-sports practitioners. The proposed trait version of the PASTAS questionnaire adapted to a Mexican-speaking population shows adequate psychometric properties among Mexican adolescents. The Mexican version of the PASTAS questionnaire supports the original two-factor structure (i.e., factor related to the body weight and factor not related to body weight) among adolescents. Additionally, the factorial invariance analyses support the equivalence of the two-factor structure among both sports and non-sports practitioners.

Key words: Body image, validity, reliability, psychometric properties, athletes, teenagers.

Introduction

Giving a good impression to feel valued is a common practice in our society, and physical appearance is particularly relevant (Rodgers and DuBois, 2016). Having an attractive body and/or body image facilitates acceptance in certain social and even work environments, so people worry about meeting beauty standards (Rodgers and DuBois, 2016). Therefore, the perfection of physical appearance has been imposed by the sociocultural characteristics of each context (Rodgers and DuBois, 2016), which has permeated the mass media (Frederick et al., 2017). However, instead of working to promote a positive model, on most occasions, the mass media generate a general dissatisfaction regarding people's own body image (Frederick et al., 2017) in all population subgroups, but especially in adolescents (Tiggemann, 2004; Hoffmann and Warschburger, 2018).

Physical appearance standards are increasingly difficult to achieve, which is why anxiety disorders, eating disorders, depression and low self-esteem are triggered (Alleva et al., 2015), with adolescents being an especially vulnerable population (Tiggemann, 2004; Alleva et al., 2015; Rodgers and DuBois, 2016). There is a difference between genders, with women being concerned with aspects related to their weight, while men focus more on the development of muscles (Ricciardelli and Yager, 2016). Adolescents' body image has been unfavorably associated with physical activity barriers related to body image/physical social anxiety (Mayorga-Vega et al., 2018), which, in turn, has been related to sports participation (Pate et al., 2011; Fernández-Prieto et al., 2019).

Traditionally, body image disturbance has been only related to the overestimation of body size (e.g., Garner and Garfinkel, 1981; Penner et al., 1991). However, nowadays disturbed body image is considered as weight preoccupation, shape concern, and appearance-related schema (Tantleff-Dunn and Thompson, 1998). Thus, disturbed body image is not only related to the body weight (e.g., stomach, waist, thighs, buttocks, hips, legs), but also with the non-weight factors (e.g., ears, lips, hands, forehead, neck, chin and feet) (Brown et al., 1990; Reed et al., 1991). Since both anxiety and body image are strongly associated with eating disorders (e.g., Kolotkin et al., 1987; Abood and Chandler, 1997), a tool to assess body image anxiety could be useful for preventing future unhealthy eating patterns. In this line, body image anxiety involves cognitive, affective, and perceptual aspects, being manifested by the individual's dissatisfaction with physical appearance, especially in aspects related to weight and body shape (Urrutia et al., 2010). Body image anxiety seems to persist throughout the individual's life (Tiggemann, 2004), having two components: state and trait (Reed et al., 1991). While state anxiety is a transient emotional situation that can fluctuate or vary in intensity depending on the situation, trait anxiety is a relatively stable or permanent perception in the personality (Spielberger, 1966).

This perspective has been approached in a multidimensional way through various measurement instruments, such as the Physical Appearance State and Trait Anxiety Scale (PASTAS) (Reed et al., 1991). The PASTAS questionnaire was designed to assess how anxious, tense, or

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nervous individuals feel in general about their body, being composed of two dimensions, that is, the one related to body weight (e.g., stomach, waist, thighs, buttocks, hips, or legs) and to body areas not related to body weight (e.g., ears, lips, hands, forehead, neck, chin and feet). Although the PASTAS questionnaire was initially validated for young American women (Reed et al., 1991), it has been later extensively used in different populations such as adolescents (e.g., Hsien-Jin, 2000), males (e.g., Geller et al., 2020) or diverse races/nationalities (e.g., Warren, 2014; Hsien-Ji, 2000).

Identifying the body image anxiety state of a person at a certain point of time is the starting point to establish useful and assertive care strategies that help improve his/her body image, for which it becomes essential to have tools that allow the level and magnitude of the problem to be detected properly (Mokkinka et al., 2010). Before using a questionnaire in a different population, evidence that supports the validity of a translated and culturally adapted version of the questionnaire that reflects adequately the original version of the instrument in a particular population is necessary (i.e., cross-cultural validity) (Mokkinka et al., 2010). Rutt et al. (2002) examined the validity of the trait version of the original PASTAS questionnaire with a sample of English-speaking young women of Mexican descent residing in the USA. However, these authors found that the original two-factor structure for the PASTAS questionnaire had poor goodness of fit, finding acceptable goodness of fit with a three-structure model (i.e., weight-related lower torso, weight-related mid torso, and non-weight-related anxiety). Nevertheless, the previous authors did not perform a cultural adaptation to the questionnaire, which could explain these different findings. Unfortunately, despite adolescence being an especially vulnerable population (Tiggemann, 2004; Alleva et al., 2015; Rodgers and DuBois, 2016), to our knowledge, no previous study has overcome the adaptation and validation of a version of the PASTAS questionnaire for adolescents, including both males and females or sports and non-sports practitioners. Consequently, the purpose of the present study was to adapt and validate the PASTAS questionnaire for Mexican male and female adolescents, verifying the factor invariance by sports and non-sports practitioners.

Methods

Participants

A sample of 930 Mexican adolescents (46.0% females), aged 11 - 15 years old, voluntarily participated in the present study. According to the schools' reports, all the adolescents' families had a middle socioeconomic level. The following inclusion criteria were considered: (1) being free of any disability that would make them unable to fill the questionnaire, (2) presenting the corresponding signed written informed assent by the adolescents, and (3) presenting the corresponding signed written informed consent by their legal guardians. The exclusion criterion was not filling out all the items of the questionnaire. Table 1 shows the general characteristics of the sample. A total of 415 participants (44.6%) played sports in a club and/or regularly participated in sports competitions.

Measures

The trait version of the original PASTAS developed by Reed et al. (1991) is a questionnaire that assesses how anxious, tense, or nervous individuals feel in general (i.e., usually) about their body or specific parts of their body. This questionnaire was originally composed of 16 items belonging to two dimensions related to body weight (8 items; e.g., "My stomach (abdomen)") and to body areas not related to body weight (8 items; e.g., "My lips"). Following the stem "In general, I feel anxious, tense, or nervous about", in the original version participants respond to each item on a five-point Likert scale ranging from 0 ("Never") to 4 ("Almost always").

In order to translate and adapt the trait version of the PASTAS questionnaire to Mexican (Spanish), the International Test Commission guidelines were followed (Muñiz et al., 2013). Two experienced researchers translated the stem, qualitative scales, and items from the original PASTAS into Mexican (Spanish) independently. Afterwards, a professional translator and native English speaker carried out a back-translation. Since the items in English from both the original and the back-translation items matched, corrections were not necessary. On the other hand, in order to adapt the questionnaire scale to Mexican adolescents, since Mexican school-aged children receive the qualifications of scholar marks from 0 to 10, an 11-point Likert-type scale ranging from 0 to 10 was used (Viciana et al., 2017). The qualitative and quantitative scales were combined as follows: "Never" (0), "Rarely" (1 - 3), "Sometimes" (4 - 6), "Often" (7 - 9), and "Almost always" (10).

Procedures

Data collection was carried out in November 2016. The principals of some public high school centers from the city of La Paz (Baja California Sur, Mexico) chosen by convenience were contacted. They were informed about the project, and permission to conduct the study was requested. After the approval of the schools was obtained, students and their legal guardians were fully informed about the features of the project. For each school center, all the students from a classroom of each grade were invited to participate. Adolescents' signed written informed assents and their legal guardians' signed written informed consents were obtained before taking part in the study.

Table 1. General characteristics of the sample.

	Total (n = 930)	Sports (n = 415)	Non-sports (n = 515)
Age (years)	12.3 (1.4)	12.3 (1.5)	12.3 (1.4)
Gender (males/females)	54.0/46.0	65.1/34.9	45.0/55.0
Body mass (kg)	51.2 (13.1)	50.6 (12.9)	51.8 (13.2)
Body height (m)	1.52 (0.14)	1.53 (0.14)	1.51 (0.14)
Body mass index (kg/m^2)	22.2 (5.3)	21.5 (4.5)	22.9 (5.8)

Data are reported as mean (standard deviation), except for gender that percentage is reported instead.

Evaluation was carried out by the same experienced researcher strictly following the same protocol during a unique evaluation session. Evaluation sessions were carried out in groups of participants by school classes for approximately 30 minutes. The questionnaires were administered by computers in the school computer rooms under silent conditions. At the beginning of the evaluation session, the researcher provided a complete explanation of how to correctly fill out the questionnaire and how to access the instrument though the application (Blanco et al., 2013). Participants were asked for their full honesty, and they were guaranteed the confidentiality of the obtained data. Although instructions on how to correctly respond to the questionnaire were written on the first screens, the researcher was present during the whole evaluation session to clarify any question that might arise. Firstly, participants had to self-report information about their general characteristics (i.e., gender, age, if they played sports in a club and/or regularly participated in sports competitions, body mass, and body height). Then, they filled out the above-described adapted version of the PASTAS questionnaire. At the end of the evaluation session, their participation was appreciated. Once the instrument was applied, data were collected using the results editor module of the scale editor version 2.0 (Blanco et al., 2013). Since the first center surveyed was used as a pilot study, the evaluator was instructed to write down all the doubts and comments that might arise from participants when being evaluated (e.g., doubts about items or interpretation of the scale). However, no questions regarding the understanding of the items or any other aspect of the scale were reported by the participants and, thus, no additional modifications were applied to the PASTAS questionnaire for the subsequent school centers. Given such circumstances, data from those participants from the first center were also included in the total sample.

Statistical analysis

Descriptive statistics (mean ± standard deviation) of each item were reported. Skewness and kurtosis of each item were first examined to determine if they met the normality assumption. Additionally, multivariate normality was calculated using the Mardia's multivariate coefficient. Adequate values of normality were considered as follows: skewness < |2|, kurtosis < |7| (Kline, 2011; Byrne, 2013), and Mardia's multivariate coefficient < 70 (Rodríguez and Ruiz, 2008). Then, confirmatory factor analyses of the PASTAS questionnaire were performed. Two measurement models were compared: (1) PASTAS-M2 (i.e., the original two-factor structure with all 16 items distributed according to the original distribution of the items within each factor) and (2) PASTAS-M2b (i.e., the same two-factor structure of the previous model without the items that, according to the modification indexes, were not adequate). The variances of the error terms were specified as free parameters; in the latent variables (factors), one of the structural coefficients associated with one was set, so that its scale was equal to that of one of the observable variables (items). The maximum likelihood estimation method with the application of re-sampling bootstrap procedures for the non-normality cases was used. This method is very robust for non-normality cases, especially if the sample is wide enough and the values of asymmetry and kurtosis are not extreme, as they were in the present study (Kline, 2011; Byrne, 2013). To assess the model's goodness of fit, the chi-squared coefficient (χ^2), the goodness-of-fit index (GFI), and the root mean square error of approximation (RMSEA) were calculated as measures of absolute fit. The adjusted goodness-of-fit index (AGFI), the Tucker-Lewis index (TLI), and the comparative fit index (CFI) were used as incremental fit indices. Chi-squared ratio divided by degrees of freedom (CMIN/DF) and the Akaike information criterion (AIC) were used as measures of parsimonious fit (Gelabert et al., 2011; Byrne, 2013). Goodness of fit was considered as follows: GFI and CFI ≥ 0.90, and RMSEA ≤ 0.08 were considered acceptable, and GFI and CFI ≥ 0.95, and RMSEA ≤ 0.05 were considered optimums (Hu and Bentler, 1999). According to Thompson's (2004) recommendations, the results were interpreted not only corroborating the theoretical model's goodness of fit but also that of various alternative models, employing the maximum likelihood estimation and computing goodness-of-fit indices for those models in order to select the best one.

Afterwards, factorial invariance analysis was conducted for sports and non-sports practitioners. According to Abalo's et al. (2006) recommendations, the best model obtained in the confirmatory factor analyses was used (i.e., PASTAS-M2b). To assess the model's goodness of fit, the χ^2, GFI, normed fit index (NFI), CFI, RMSEA, and AIC were calculated. Then, the difference in mean between the two groups on each factor was estimated using the sample of sports practitioners as a reference point, fixing that sample's means to zero and freely estimating the means for the sample of non-sports practitioners. The constraints to regression coefficients and intercepts needed for the mean comparisons were applied automatically. Finally, the reliability of each obtained factor of the PASTAS-M2 and PASTAS-M2b models was calculated using Cronbach's alpha (α) and Omega coefficient (Ω) (Revelle and Zinbarg, 2009). Reliability values 0.70-0.79 were considered acceptable, 0.80-0.89 good, and 0.90-1.00 excellent (Nunnally and Bernstein, 1995). All statistical analyses were performed using the SPSS version 18.0 and AMOS version 21.0 for Windows (IBM® SPSS® Statistics) (Arbuckle, 2012).

Results

Descriptive analyses, skewness, and kurtosis

Table 2 shows the results of descriptive analyses (mean and standard deviation), skewness, and kurtosis for each of the 16 items of the PASTAS-M2 in the total sample. All skewness and kurtosis values indicated that the distribution was normal. However, according to the result of Mardia's multivariate coefficient, multivariate normality could not be inferred.

Confirmatory factor analysis for the total sample

The overall results corresponding to confirmatory factor analysis for the PASTAS-M2 showed an acceptable measurement model (e.g., GFI = 0.913; RMSEA = 0.078; CFI = 0.943) (Table 3). The two factors of the model explained 65% of the variance. All the items showed a high loading on their predicted dimensions, and the inter-correlations between the two factors were moderate (Table 4).

Table 2. **Descriptive statistics, skewness and kurtosis of all the items of the PASTAS questionnaire (n = 930).**

Item	M	SD	Skewness	Kurtosis
Item 1	3.05	2.55	0.72	0.01
Item 2	2.95	2.60	0.84	0.10
Item 3	2.65	2.78	1.01	0.26
Item 4	2.69	2.55	0.90	0.23
Item 5	3.60	2.86	0.56	-0.53
Item 6	3.21	2.79	0.74	-0.21
Item 7	2.94	2.65	0.76	-0.19
Item 8	3.33	2.73	0.65	-0.28
Item 9	1.77	2.38	1.66	2.55
Item 10	1.93	2.49	1.47	1.69
Item 11	1.74	2.32	1.57	2.25
Item 12	2.02	2.44	1.31	1.24
Item 13	1.88	2.27	1.47	2.07
Item 14	1.85	2.34	1.39	1.52
Item 15	1.64	2.23	1.59	2.36
Item 16	2.42	2.71	1.13	0.54
Mardia's multivariate coefficient				296.44

M = mean, SD = standard deviation

The overall results of the confirmatory factor analysis on the second model tested (i.e., PASTAS-M2b), which corresponds to the factorial structure of the previous model without items 2, 4, 8, 9, 11, and 16, showed that this model is better than the PASTAS-M2 and has an optimal goodness of fit (e.g., GFI = 0.978; RMSEA = 0.049; CFI = 0.987) (Table 3). The two factors of this model explained 70% of the variance. All the items showed a high loading on their predicted dimensions, and the inter-correlations between the two factors were moderate (Table 4).

Confirmatory factor analysis for sports and non-sports practitioners

The skewness and kurtosis values for all 10 items of the PASTAS-M2b in both the sports and non-sports practitioners indicated that the distribution was normal (i.e., skewness < |1.80| and kurtosis < |3.00|) (data not reported for limitation issues). However, since Mardia's multivariate coefficient was above 70 for both subsamples, multivariate normality could not be inferred.

Table 4. **Standardized confirmatory factor analyses solutions for the PASTAS-M2 and PASTAS-M2b models (n = 930).**

	PASTAS-M2		PASTAS-M2b	
Item	**F1**	**F2**	**F1**	**F2**
Factor loadings				
Item 1	0.69		0.65	
Item 2	0.71		-	
Item 3	0.73		0.72	
Item 4	0.81		-	
Item 5	0.78		0.76	
Item 6	0.82		0.83	
Item 7	0.82		0.82	
Item 8	0.72		-	
Item 9		0.68		-
Item 10		0.78		0.77
Item 11		0.79		-
Item 12		0.82		0.79
Item 13		0.78		0.79
Item 14		0.85		0.87
Item 15		0.81		0.82
Item 16		0.75		-
Factor correlations				
F1	-		-	
F2	0.75	-	0.75	-

F1 = Factor related to the body weight; F2 = Factor not related to body weight.

The overall results of the confirmatory factor analysis on the PASTAS-M2b model showed that this model had an optimal goodness of fit for both sports and non-sports practitioners (e.g., GFI = 0.959/0.970; RMSEA = 0.063/0.053; CFI = 0.980/0.984) (Table 5). Additionally, according to the measures of incremental adjustment and parsimony, the model for each subsample was significantly superior to the independent model and very similar to the saturated model (Table 5). Finally, among sports and non-sports practitioners all the items showed a high loading on their predicted dimensions, and the intercorrelations between the two factors were moderate (Table 6).

Table 3. **Absolute, incremental, and parsimonious fit indices for the generated models (n = 930).**

	Absolute indices			Incremental indices			Parsimonious indices	
Model	χ^2	**GFI**	**RMSEA**	**AGFI**	**TLI**	**CFI**	**CMIN/DF**	**AIC**
PASTAS-M2	678.701*	0.913	0.078	0.886	0.934	0.943	6.589	744.701
PASTAS-M2b	106.925*	0.978	0.049	0.963	0.982	0.987	3.240	150.925

χ^2 = chi-squared coefficient; GFI = goodness-of-fit index; RMSEA = root mean square error of approximation; AGFI = adjusted goodness-of-fit index; TLI = Tucker-Lewis index; CFI = comparative fit index; CMIN/DF = chi-squared fit index over degrees of freedom; AIC = Akaike information criterion. * $p < 0.05$.

Table 5. **Absolute, incremental, and parsimonious indices for the PASTAS-M2b model. Confirmatory factor analysis in sports (n = 415) and non-sports practitioners (n = 515).**

	Absolute indices			Incremental indices			Parsimonious indices	
Model	χ^2	**GFI**	**RMSEA**	**AGFI**	**TLI**	**CFI**	**CMIN/DF**	**AIC**
2 factors 10 items	87.536*	0.959	0.063	0.931	0.973	0.980	2.653	131.536
Saturated	0.000	1.000				1.000		110.000
Independent	2749.809*	0.262	0.381	0.098	0.000	0.000	61.107	2769.809
2 factors 10 items	80.207*	0.970	0.053	0.950	0.978	0.984	2.431	124.207
Saturated	0.000	1.000				1.000		110.000
Independent	2940.368*	0.293	0.354	0.136	0.000	0.000	65.342	2960.368

χ^2 = chi-squared coefficient; GFI = goodness-of-fit index; RMSEA = root mean square error of approximation; AGFI = adjusted goodness-of-fit index; TLI = Tucker-Lewis index; CFI = comparative fit index; CMIN/DF = chi-squared fit index over degrees of freedom; AIC = Akaike information criterion. * $p < 0.05$.

Table 6. Standardized confirmatory factor analyses solutions for the PASTAS-M2b model in sports (n = 415) and non-sports practitioners (n = 515).

	Sports practitioners		Non-sports practitioners	
Item	**F1**	**F2**	**F1**	**F2**
Item 1	0.70		0.61	
Item 3	0.70		0.74	
Item 5	0.76		0.76	
Item 6	0.82		0.83	
Item 7	0.83		0.81	
Item 10		0.78		0.77
Item 12		0.80		0.79
Item 13		0.83		0.75
Item 14		0.88		0.86
Item 15		0.86		0.78
F1	-		-	
F2	0.76	-	0.74	-

F1 = Factor related to the body weight; F2 = Factor not related to body weight.

Factorial invariance between sports and non-sports practitioners

The adjustment indices obtained showed the equivalence of the basic measurement models in the two subsamples, thus allowing to accept the factorial invariance compliance (Table 7). Consequently, factor loadings between sports and non-sports practitioners were equivalent. Additionally, the results of the strong factorial invariance showed an appropriate fit of the model, independently assessed or regarding its nesting with the measurement invariance model (Table 7).

Factor means comparison between sports and non-sports practitioners

The results of means comparisons between sports and non-sports practitioners showed that the average of the factor related to the body weight was statistically significantly higher in the non-sports practitioners (0.327, $p < 0.05$). However, regarding the factor not related to body weight, statistically significant differences were not found (0.083, $p > 0.05$).

Reliability

The reliability of the factors obtained in the confirmatory factor analyses in both the PASTAS-M2 and PASTAS-M2b models for the total sample was good to excellent (Table 8). Moreover, the reliability of the factors obtained in the factorial invariance analysis with the PASTAS-M2b models was good to excellent for both sports and non-sports practitioners (Table 8).

Table 7. Goodness of fit indices for each of the models tested in the factor invariance (n = 930).

	Adjusted indices						
Model	χ^2	**gl**	**GFI**	**NFI**	**CFI**	**RMSEA**	**AIC**
Model without restrictions	190.837*	68	0.960	0.966	0.978	0.044	274.837
Metric invariance	196.460	76	0.959	0.965	0.978	0.041	264.460
Strong factorial invariance	201.241*	79	0.958	0.965	0.978	0.041	263.241

χ^2 = chi-squared coefficient; gl = grades of freedom; GFI = goodness-of-fit index; NFI = normed fit index; CFI = comparative fit index; RMSEA = root mean square error of approximation; AIC = Akaike information criterion. * $p < 0.05$.

Table 8. Cronbach's alpha (α) and Omega coefficient (Ω) for the obtained factors.

	PASTAS-M2				PASTAS-M2b			
	(n = 930)		(n = 930)		(n = 415)		(n = 515)	
Factor	**α**	**Ω**	**α**	**Ω**	**α**	**Ω**	**α**	**Ω**
F1	0.915	0.917	0.873	0.871	0.866	0.875	0.858	0.867
F2	0.926	0.927	0.902	0.904	0.916	0.917	0.890	0.893

F1 = Factor related to the body weight; F2 = Factor not related to body weight.

Discussion

Contribution to knowledge

The purpose of the present study was to adapt and validate the PASTAS questionnaire for Mexican adolescents, verifying the factor invariance by sports and non-sports practitioners. The findings of the present study with the PASTAS questionnaire supported the two-factor structure (i.e., factor related to the body weight and factor not related to body weight). The results corresponding to confirmatory factor analysis for the original model of the PASTAS questionnaire showed an acceptable measurement model for the two-factor structure (e.g., GFI = 0.913; RMSEA = 0.078; CFI = 0.943). The two factors of the model explained 65% of the variance, and all the items showed a high loading on their predicted dimensions (i.e., 0.70–0.88). Additionally, the inter-correlations between the two factors were moderate ($r = 0.75$; i.e., 56% of the explained variance), evidencing an acceptable discriminant validity between them. Finally, the reliability of the two dimensions was excellent (i.e., α and Ω = 0.92–0.93). Similarly, the same two-factor structure but removing the worst three items of each factor showed that this model had optimal goodness of fit (e.g., GFI = 0.978; RMSEA = 0.049; CFI = 0.987). Additionally, the explained variance of the model, the items loaded on each factor, the inter-correlations between factors, and their reliability values were similar to the previous model.

The findings of the present study were similar to the original model of the PASTAS questionnaire. Similarly, Reed et al. (1991), examining the validity of the trait version of the PASTAS questionnaire with a sample of American (English-speaking) young women aged 18 years old or older, found a two-factor structure, where a factor was related to body weight and the other not related to body weight (e.g., $\alpha \geq 0.82$ for internal consistency, $r = 0.87$ for two-week test-retest reliability; the inter-correlations between factors were low, $r = 0.32$). Later, Rutt et al. (2002) examined the trait version of the original PASTAS questionnaire with a sample of English-speaking young women of Mexican descent residing in the USA. However, these authors found that the original two-factor structure for the PASTAS questionnaire had a poor goodness of fit with young adult women of Mexican descent. For instance, the trait version of the original PASTAS had a CFI equal to 0.80 and a CMIN/DF equal to 4.5. However, when Rutt et al. (2002) performed the confirmatory factor analysis with a hypothesized three-structure model (i.e., weight-related lower torso, weight-related midtorso, and non-weight-related anxiety), they found an acceptable goodness of fit (e.g., trait version: CFI = 0.89-0.92 and CMIN/DF = 2.6-2.9). The differences between the findings of the present and Reed et al.'s (1991) studies and the study by Rutt et al. (2002) could be due that, despite the fact that the sample was Mexican people, Rutt et al. (2002) did not perform an adaptation to the questionnaire as in the present study. Apart from the fact the English comprehension level may not be adequate enough, a common procedure is to include terms that better represent the conception of a particular culture. However, due to the differences between the sample of the previous and present study (i.e., young adults of Mexican descent living in American vs. Mexican adolescents living in Mexico), the three-factor model could be also used as an explanation. Nevertheless, future research studies should further examine the validity of the PASTAS questionnaire translated and culturally adapted to Mexican young adults.

To our knowledge, there is not any adaptation and validation of the PASTAS questionnaire among Spanish-speaking Mexican and/or adolescents' populations. Nevertheless, Hsien-Jin (2000) examined the convergent validity of the PASTAS questionnaire among a sample of multi-racial female adolescents (i.e., Malays, Chinese, Indians and other races), comparing the PASTAS scores with the body shape dissatisfaction assessed by the Contour Drawing Rating Scale (ideal – current). Yet not surprisingly, while the non-related weight dimension was low and not statistically significant ($r = 0.18$, $p > 0.05$), the weight-related dimension of the trait version was moderately positively associated ($r = 0.48$, $p < 0.01$; i.e., the more body shape dissatisfaction the more anxious, tense, or nervous adolescents feel in general about their body and vice versa). Similarly, among female young adults from the USA and Australia, the weight-related dimension of the PASTAS has showed statistically significantly moderate-to-high association with similar constructs (i.e., convergent validity) such as the tendency to make global ($r = 0.45$, $p < 0.001$) and specific appearance comparisons ($r = 0.67$, $p < 0.001$; Physical Appearance Comparison Scale and Specific Attributes Comparison Scale, respectively), dispositional level of investment in appearance ($r = 0.44$, $p < 0.001$; Appearance Schemas Inventory), body areas satisfaction ($r = 0.63$, $p < 0.001$) and physical appearance ($r = 0.61$, $p < 0.001$) of the body image disturbance (Multidimensional Body Self-Relations Questionnaire), and extent of internalization of the thin ideal ($r = 0.52$-0.54, $p < 0.001$) (Internalization dimension of the Sociocultural Attitudes Towards Appearance Questionnaire) (Peterson et al., 2008; Tiggemann and McGill, 2004). However, to our knowledge, no previous study has examined the convergent validity among male individuals.

During adolescence, sports participation has been showed to reduce body weight, which, in turn, has been related to both body image (Viciana et al., 2015; Parra Saldías et al., 2018) and barriers related to body image/physical social anxiety (Mayorga-Vega et al., 2018). Therefore, factorial invariance analyses that support the equivalence of the two-factor structure among both sports and non-sports practitioners is necessary. Nevertheless, as far as we know, there are no previous studies with factorial invariance with the PASTAS questionnaire. In this context, the results of the present study with the factorial invariance showed an appropriate fit of the two-structure model (e.g., GFI = 0.96; CFI = 0.98; RMSEA = 0.04). These findings suggest strong evidence of cross validation of the measure and, therefore, of the stability of the structure. On the other hand, the results of mean comparisons between sports and non-sports practitioners showed that the average of the factor related to the body weight was higher in the non-sports practitioners. In this line, during adolescence sport participation has been related to body image, which, in turn, has been unfavorably associated to physical activity barriers related to body image/physical social anxiety (Mayorga-Vega et al., 2018). This finding points out that in adolescence the practice of physical activity could also constitute a preventive measure against the development of anxiety due to negative body image (Peinado et al., 2017). However, it is important to determine what characteristics (e.g., frequency, intensity, or mode) and through which mechanisms exercise improves body image (Martin et al., 2012; González et al., 2016). Since the findings of the factorial invariance showed an appropriate fit of the two-structure model among both sports and non-sports practitioners, the adapted and validated version of the PASTAS questionnaire proposed in the present study could help the future body of research.

Rationale of analyses adopted

Confirmatory factor analysis plays an important role within the development and validation of psychometric questionnaires with Likert-type scales such as in the present study (DiStefano and Hess, 2005). With confirmatory factor analysis, the underlying theoretical framework of a questionnaire can be assessed providing a transparent and theoretical description of its psychometric properties (Kline, 2011). For instance, confirmatory factor analysis informs about the relation between indicators (items) and latent factors (dimensions), the factor structure, and the potential interdependencies between the indicators (Kline, 2011). Furthermore, confirmatory factor analysis can also assess the validity of a questionnaire across groups (i.e., factor invariance), indicating if an instrument measures the same (latent) construct across different populations or settings (Abalo et al., 2006). Traditionally, confirmatory factor analysis is performed within a frequentist framework, which normally is used with the maximum likelihood estimation method (Kline, 2011). However, since in a psychometric questionnaire response variables are measured using rating scales (i.e., Likert-type scales), confirmatory factor analysis assumptions are not always met (e.g., Flora and Curran, 2004).

Since Bayesian confirmatory factor analysis tends to have fewer limitations than the maximum likelihood estimation method (Depaoli and van de Schoot, 2017), its application has been lately on the rise (Van de Schoot et al., 2017). For instance, Bayesian confirmatory factor analysis cannot only be used as a different estimator, but it can also provide access to models that are not feasible within a frequentist framework (Depaoli and van de Schoot, 2017). However, the applicability of current fit statistics evaluating model fit within Bayesian confirmatory factor analysis is still limited, presenting some important issues (Hoofs et al., 2018). For example, while current measures for model fit within Bayesian confirmatory factor analysis show positive properties within studies with small samples, within large samples like in the present study, the sensitivity of the overall fit statistic to detect negligible differences between the observed data and the hypothesized model is high. Thus, within empirical settings in which negligible deviations from the hypothesized model are always expected, an increase in sample size inevitably leads to a deterioration of model fit. Given such circumstances, when examining the cross-cultural validity of a questionnaire, for instance, this fact could result in false conclusions with regard to the application of the instrument across countries (Hoofs et al., 2018).

On the other hand, within large samples with data that are not affected by a high proportion of outliers or missingness as in the present study, frequentist confirmatory factor analysis results are robust (Scheines et al., 1999). Moreover, with frequentist confirmatory factor analysis, previous studies found problems with only short rating scales (i.e., six or fewer response options) (Bandalos, 2014; Beauducel and Herzberg, 2006). However, since Mexican school-aged children receive the qualifications of scholar marks from 0 to 10, in the present study an 11-point Likert-type scale was used in order to adapt the questionnaire scale to Mexican culture as it has been done in previous studies (e.g., Viciana et al., 2017). Moreover, although due to the result of Mardia's coefficient, multivariate normality could not be inferred (but the all skewness and kurtosis values indicated that the distribution was normal), in the present study the maximum likelihood estimation method with the application of re-sampling bootstrap procedures for the non-normality cases was used. This method is very robust for non-normality cases, especially if the sample is wide enough and the values of asymmetry and kurtosis are not extreme (Kline, 2011; Byrne, 2013), as they were found in the present study. Finally, besides the fact that with large samples like in the present study the Bayesian approach could be too sensitive (consequently, resulting in false conclusions with regard to the application of the instrument across countries), since the main objective of the present study was to compare the present model with previous ones (in which the frequentist confirmatory factor analysis was used) (i.e., Reed et al., 1991; Rutt et al., 2002), using the same approach makes the models more comparable. Therefore, in the present study the frequentist confirmatory factor analysis with the above-mentioned robust procedures were used instead of the Bayesian approach.

Strengths, limitations and future research directions

An important strength of the present study is that, as far as we know, it is the first to adapt and validate the PASTAS questionnaire for Mexican-speaking adolescents. Moreover, being the first to adapt and validate the PASTAS questionnaire for both males and females is another strength of the present study. Additionally, to the best of our knowledge, the present study is also the first to verify the factor invariance of the PASTAS questionnaire by sports and non-sports practitioners. Furthermore, besides adapting the questionnaire scale to how Mexican school-aged children receive the qualifications of scholar marks (i.e., from 0 to 10) (Viciana et al., 2017), this scale makes the instrument most sensitive (Baumgartner et al., 2015), which is especially important for detecting changes in an intervention program. Finally, due to the fact that data collection was performed by a computer-based application (Blanco et al., 2013), it was possible to obtain more precise and reliable data.

However, the present study also has limitations that ought to be acknowledged. The first limitation is related to the sample. Non-probability technique samples provide lower generalization power than those obtained by probability technique samples. This limits the generalizability of the obtained outcomes to the particular studied population and context. However, because of human and material resource limitations, a probability and larger sample could not be examined. The second limitation comes from the measurement itself, which is based on the self-report instrument; therefore, it may contain biases derived from social desirability. Finally, the third limitation is related to the examined type of validity evidence. Although the construct validity (i.e., factor analysis or structural validity, including the cross-cultural validity) represents the main type of validity evidence that should be examined (always together with a more qualitative validation, that means, the content validity evidence -i.e., face validity evidence-), in order to strengthen the validity evidence of a psychometric questionnaire, using different types of validity evidence is recommended (Baumgartner et al., 2015). For instance, other types of validity evidence such as the convergent or discriminant validity (i.e., examining the association with other tests that supposedly measure the same/different construct) should be also examined. Moreover, since the anxiety that individuals feel about their physical appearance could be used as an indicator of a risk for some future negative health outcome (e.g., eating disorders that could cause health problems with their body composition and, finally, some mobility issues or even mortality), the predictive validity evidence of the PASTAS questionnaire should also be examined. However, due to feasible reasons, the aforementioned issues could be examined in the present study. Therefore, future research studies should examine the above-mentioned types of validity evidence of the PASTAS questionnaire among a representative sample of the Mexican adolescents' population.

Practical implications

The present study represents a great contribution to both scientific and professional practice. On the one hand, the findings of this study further support the evidence of the validity of the PASTAS questionnaire in a different setting (i.e., Mexican culture and language) and population (i.e., adolescents, both males and females/ sport and non-sport practitioners). On the other hand, since it is the first adapted and validated PASTAS questionnaire among (Mexican-speaking) adolescents, it allows to measure the adolescents' anxiety about their physical appearance for different purposes. For instance, one of the purposes is to describe and compare adolescents' anxiety about their physical appearance in order to detect factors (e.g., individuals' characteristics) related to a higher probability of having a less favorable level. Moreover, this questionnaire could be used to study adolescents' anxiety antecedents and consequences that would allow, for example, to empirically examine topic-related hypothesis/ theories or to predict future negative health outcomes. Furthermore, the present version of the PASTAS questionnaire would also allow to diagnose adolescents' anxiety about their physical appearance, for instance, to place adolescents in an intervention program or to prevent future health problems. Lastly, its other use is to examine and compare the effect of different intervention programs that aim to improve adolescents' anxiety about their physical appearance or some of its consequence such as eating disorders. These findings would better guide stakeholders about the potential benefits, harms and costs of any intervention and also indicate them what works in each particular setting.

Conclusion

The proposed trait version of the PASTAS questionnaire adapted to a Mexican-speaking population shows adequate psychometric properties among Mexican adolescents. The Mexican version of the PASTAS questionnaire supports the original two-factor structure (i.e., factor related to the body weight and factor not related to body weight) among adolescents. Additionally, the factorial invariance analyses support the equivalence of the two-factor structure among both sports and non-sports practitioners.

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Key points

- The proposed trait version of the PASTAS questionnaire adapted to Mexican-speaking population shows adequate psychometric properties among Mexican adolescents.
- The Mexican version of the PASTAS questionnaire supports the original two-factor structure (i.e., factor related to the body weight and factor not related to body weight) among adolescents.
- Factorial invariance analyses support the equivalence of the two-factor structure among both sports and non-sports practitioners.

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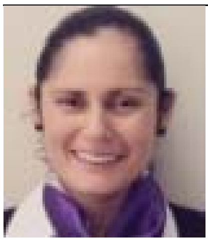

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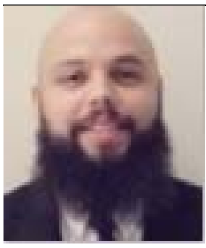

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