

Arantzazu Rodríguez-Fernández¹
Inge Axpe¹
Alfredo Goñi¹

Psychometric properties of a shortened version of the Physical Self-Concept Questionnaire (PSQ-S)

¹Universidad del País Vasco (UPV/EHU)

Introduction. The four-dimensional model of physical self-concept which differentiates the physical self-perceptions of ability, condition, attractiveness and strength is widely accepted. In the last two decades much research has been done on the physical self-concept and its relations with the psychological well-being/distress, anxiety disorders or Eating Behavior Disorders (EBD).

Objective. To validate a shortened version of the Physical Self-Concept Questionnaire (PSQ-S) and verify its ability to discriminate between people with different levels of EBD.

Method. Responses of 1478 subjects between 13 and 21 years old to the shortened version of the PSQ were analyzed in order to check indexes of reliability and validity. Furthermore, the scores of 96 women aged 14 to 23 years old diagnosed of EBD were compared to 96 others without clinical diagnosis.

Results. The results indicate a reliability of 0.93 and confirm the tetrafactorial structure of the physical self-concept. The highest physical self-concept is that of those without a clinical diagnosis of EBD.

Conclusions. The Shortened-PSQ is a simple, reliable and suitable screening tool both for educational and clinical settings. It also provides a sufficient measure of physical self-concept for research purposes.

Keywords: Physical self-concept, Physical Self-Concept Questionnaire (PSQ), Shortened questionnaire, Eating Behavior Disorders (EBD)

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Propiedades psicométricas de una versión abreviada del Cuestionario de Autoconcepto Físico (CAF)

Introducción. Está ampliamente aceptado el modelo tetradimensional del autoconcepto físico que diferencia las autopercepciones físicas de habilidad, condición, atractivo y fuerza. En las dos últimas décadas es mucho lo investigado sobre el autoconcepto físico y sobre sus relaciones con el bienestar/malestar psicológico, la ansiedad o los trastornos de la conducta alimentaria.

Objetivo. Validar una versión abreviada del Cuestionario de Autoconcepto Físico (CAF) y verificar su capacidad de discriminación entre personas con distintos grados de TCA.

Método. Se analizan las respuestas al CAF-Abreviado (CAF-A) de 1478 sujetos entre 13 y 21 años de edad para comprobar índices de fiabilidad y validez. Por otra parte, se relacionan las respuestas a este cuestionario con las dadas al EDI-2 por 96 mujeres entre 14 y 23 años con diagnóstico TCA versus otras 96 sin TCA.

Resultados. Los resultados indican una fiabilidad del cuestionario de 0.93 y confirman la estructura tetrafactorial del autoconcepto físico. Es más alto el autoconcepto físico de quienes no tienen diagnóstico clínico de TCA.

Conclusiones. El CAF-A se muestra como una herramienta sencilla, adecuada y fiable para usarla como cribado en la detección tanto en entorno educativo como clínico. Proporciona además una medida suficiente del autoconcepto físico con fines de investigación.

Palabras clave: Autoconcepto físico, Cuestionario de Autoconcepto Físico (CAF), Escala breve, Trastornos de Conducta Alimentaria (TCA)

Correspondence:

Departamento de Psicología Evolutiva y de la Educación (UPV/EHU)
Juan Ibáñez de Santo Domingo, 1
01006 Vitoria-Gasteiz, Álava (Spain)
E-mail: arantza.rodriguez@ehu.es

INTRODUCTION

In the last two decades, many investigations have identified direct relations of physical self-concept with physical activity,^{1,2} balanced eating³ or psychological well-being,^{4,5} and an inverse relation with Eating Behavior disorders^{6,7} or with drug use.⁸

The physical self-concept is understood as a combination of physical self-perceptions that would be hierarchically structured into four dimensions corresponding to the self-perceptions of physical skill, physical condition, strength and attractiveness. Based on this model, the Physical Self-Concept Questionnaire (PSQ-S),⁹ with proven psychometric guarantees,¹⁰ was constructed.

There are many studies on the physical self-concept that have been performed based on responses given to the PSQ, having verified differences in the same associated to variables such as gender, age, frequency and type of sports activity,¹¹ or a healthy lifestyle.¹² Physical self-concept shows an inverse relation with Eating Behavior Disorder (EBD, this making it possible to postulate poor physical self-concept as a diagnostic alert of EBD.¹³ On the other hand, different dimensions of it have shown a relationship with psychological well-being/stress¹⁴ and even with physiological indexes such as blood pressure.¹⁵

Regarding variability of physical self-concept and relationship to gender, differences have been confirmed repeatedly in favor of men, although they decrease with more physically active persons.¹⁶ These differences adjust to the gender stereotypes,¹⁷ in such a way that women tend to show more unfavorable perceptions in the dimensions of physical self-concept, especially in physical skill and attractiveness,^{17,18} and in the general physical self-concept.¹⁸ Given that physical attractiveness is closely related with global physical evaluation,¹⁹ it is not surprising that physical attractiveness is a subject dominating the conversations of women from adolescence, being able to cause anxiety,⁴ and acquiring greater importance than even achievements in other domains such as education or sports.²⁰

This combination of backgrounds favors the construction of a shortened version of the PSQ (PSQ-S) which, maintaining its psychometric quality, permits its use as a screening instrument and facilitates its administration.²¹ In fact, brief tools make it possible to minimize the response bias due to tiredness compared to longer instruments²² and offer a rapid initial evaluation which, on facilitating early identification,²³ would make it possible to ease more future adverse conditions.²³⁻²⁵ This is especially important in the EBD, an important health problem²⁶ given the extreme difficulty to treatment it and its very long course.²⁷

This work has aimed to validate the PSQ-S and to verify its capacity to discriminate between persons with different degrees of EBD. At present, there is no questionnaire having

these characteristics in Spanish, although extended experience in the validation of shortened versions indicates both the viability of the objective^{21,28} as well as the difficulty to repeat the same quality of psychometric indexes with a reduced number of items.²⁹

METHOD

Participants

A total of 1478 subjects (between 13 and 21 years; $M=16.28$; $\sigma=1.91$) participated. After eliminating incomplete questionnaires and purging outliers cases, the sample was finally made up of 1471 students, 611 men (41.34%) and 867 women (58.66%). The subjects came from 12 public and charter schools (Secondary Schools, Training Cycles Sites and Universities) chosen randomly in the Regional Communities of the Basque Country, La Rioja and Burgos, with a middle social-economical and cultural level. In addition, 96 women diagnosed of some type of EBD were randomly selected from the Basque Health Service, the most frequent diagnoses being Bulimia (49) followed by Anorexia Nervosa (43) and disorders not otherwise specified (4), with a range of evolution of the disorder from 1 to 6 years. Minimum age was 14 years and maximum 23 years old ($M=18.25$ years; $\sigma=2.82$).

Variables and measurement instruments

To evaluate the *physical self-concept*, a shortened version of the Physical Self-concept Questionnaire (PSQ) was used.⁹ This was made up of 8 items, two per scale, these being: physical skill, physical condition, physical attractiveness and strength. The sum of the scales made it possible to obtain a global score in general self-concept. The psychometric properties of the original PSQ (of 36 items) were adequate, the internal consistency coefficient Cronbach's alpha for the skill scale being $\alpha=0.84$, for condition $\alpha=0.88$, for physical attractiveness $\alpha=0.87$, and for strength $\alpha=0.83$. These four components account for 61.34% of the variance, with a total internal consistence of $\alpha=0.93$.

The presence of behaviors associated to the EBDs was studied using the Eating Disorders Inventory-2 (EDI-2) questionnaire.³⁰ Eight of its 11 scales were administered (a total of 64 items): drive for thinness, bulimia, body dissatisfaction, ineffectiveness or negative self-evaluation, perfectionism, interpersonal distrust, interoceptive awareness and maturity fears. Its internal consistency is found between $\alpha=0.83$ and $\alpha=0.93$ for EBD population. No data has been found on the total reliability of the questionnaire in non-clinical population, although the alpha indexes for each scale are located between $\alpha=0.70$ and $\alpha=0.93$.

Age, gender and Body Mass Index (BDI) of the participants were collected in order to obtain a comparator group from the general population as most homogeneous as possible to the sample diagnosed with EBD.

Procedure

Data collection phase was performed between October and February 2012-13. The non-clinical sample completed the battery of questionnaires during class hours. Filling it out was individual and simultaneous (all the students in the same class room). The response time ranged from twenty to thirty minutes.

To avoid biases that would put the validity of the data into question, the following measures were adopted: a) the random intragroup clinical equipoise was performed with different sequences of questionnaires being administered to different classes selected in order to avoid response contamination; b) the purpose of the research was not disclosed to the participants, thus overcoming responses in the direction of the hypothesis of the investigators; and c) in order to reduce the tendency to social desirability, the anonymity and voluntary character of the participation was guaranteed, informing the subjects about their right to leave the study at any time of the process.

No subject from the non-clinical sample refused to participate and the patients diagnosed of EBD signed the informed consent before beginning to answer the consultation questionnaires.

RESULTS

Previous analyses

The structure of the PSQ-S was tested with the LISREL 8.80 program³¹ based on the confirmatory factorial analysis

(CFA) of added models,^{32,33} which compares different factorial structures of a single questionnaire using the same items in all the factorial structures. To do so, the suppositions of multivariate normality were previously verified, so that after the multiple allocation of the lost values (less than 1%), the outlier subjects were detected and eliminated with the SAS program (Statistical Analysis System)³⁴ from the calculation of the Mahalanobis distance, this not accounting for more than the 3% allowed in any case. As a last and final step in the analysis of sampling normality, it was subjected to univariate and multivariate testing with the Mardia Test. Positive results were obtained, accepting the hypothesis of the univariate and multivariate normal distribution of the sample.

With a view to a possible replicability of the study, the matrix of covariances of the sample used to test the internal structure of the questionnaire is available to those investigators who so desire it.

To verify the suitability of performing a factorial analysis to the questionnaire, the Kaiser-Meyer-Olkin measurement of appropriateness of the sample and the Bartlett sphericity test were calculated, the results being adequate in both cases. For the KMO, values that were the closest possible to the unit were accepted, with the recommendations that these should exceed 0.75. Even though the number of items (8) was not very high, the KMO reached 0.942. Bartlett's sphericity test ($\chi^2_{(276)}=19649.70$, $p<0.000$) rejected the hypothesis of diagonality of the correlations matrix, showing the relevance of performance the CFA of the PSQ-S.

Confirmatory factorial analysis

Two different factorial models were subjected to verification in non-clinical population: a first unidimensional model, in which all the items made up a single factor called physical self-concept and a second four dimensional model formed by the factors of skill, condition, attractiveness and strength (see table 1).

Table 1		Adjustment parameters of the PSQ-S models							
Model	χ^2	gl	χ^2/gl	p	RMSEA	ECVI (IC 90%)	NNFI	CFI	RSMR
M ₁	1237.20	20	61.86	0.000	0.203	0.86 (0.79-0.94)	0.66	0.76	0.16
M ₄	34.00	11	3.00	0.000	0.038	1.16 (0.048-0.072)	0.99	1.00	0.018
Min			≤3	<0.05	<0.08/<0.05		>0.95	>0.95	<0.05

M₁= unidimensional model; M₄= tetradimensional model; M_{4c}= tetradimensional model with correlations between items; Min= minimum established as apt for the adaptation of the parameter to the data; RMSEA: Root Mean Square Error of Approximation; ECVI: Expected cross validation index; NNFI: Tucker-Lewis index; CFI: Comparative fit index; RSMR: Root mean square residual

The best adjustment is seen in Table 1 when the tetra-factorial model is used. The parameters indicate good adjustment ($\chi^2/df=3.00$; RMSEA=0.038; NNFI=0.99; CFI=1.00; RSMR=0.018) verifying that the internal structure of the PSQ-S questionnaire corresponds with the theory that postulates four dimensions of the physical self-concept: physical skill, physical condition, physical attractiveness and strength with only 8 items in all.

The internal tetrafactorial structure being confirmed, the factorial loads obtained in both the exploratory factorial analysis and confirmatory one (which corroborates and ensures the internal structure obtain in the exploratory analysis) remained to be analyzed. As can be seen in table 2, all the factorial loads are very high, both in the exploratory and confirmatory analyses, exceeding the 0.70 considered as optimal, except the i5 (i23 in the original scale; see annex) which is close to the lower limit with a factorial load of 0.52 in the confirmatory and i7 (i33 in the original scale) with a load of 0.661 in the exploratory.

Cronbach's alpha coefficient achieved a value for the total scale of 0.797, this being indicative of adequate internal consistency with a total variance explained of 81.68%. Good values were also obtained in the dimensions of attractiveness ($\alpha=0.807$) and physical condition ($\alpha=0.825$). Although strength ($\alpha=0.751$) and physical skill were somewhat lower ($\alpha=0.624$), the values were within acceptable limits, even more so if it is considered that this parameter is very biased due to the number of items used for its calculation.³⁵ To overcome said bias, the composite reliability and mean variance obtained from the saturations and errors of means

from the confirmatory factorial analysis were also calculated,³⁶ obtaining an excellent global reliability of 0.931 and good reliability by scales (Strength=0.756; Attractiveness=0.798; Skill=0.642 and Condition=0.832), the mean variance obtained in all the cases exceeding the minimum 0.500 value.

Correlation between the PSQ-S scales and EDI-2 scales are shown in table 3.

Except for the perfectionism scale, which positively and significantly correlates with all the PSQ-S scales and the bulimia scale, which significantly correlates with strength, negative and elevated correlations between the physical self-concept and EDI-2 scales are observed in general. Physical skill, condition scales and total score in physical self-concept are those showing a correlation with a greater number of EDI-2 scales.

Finally, when the mean scores of the 96 girls diagnosed of EBD were compared with 96 girls without clinical diagnosis (see table 4), it could be verified how, except for on the skills scale, in which the difference was not statistically significant, the young girls with EBD obtained significantly lower scores on all the scales of physical self-concept (condition $t=2.79$; $p<0.05$; attractiveness $t=9.70$; $p<0.001$; strength $t=4.97$; $p<0.001$; and total physical self concept $t=5.58$; $p<0.001$). The standardized mean difference (d) was calculated to know the size of effect of these differences between groups. In accordance with the interpretation of Cohen,³⁷ who considers low sizes at about 0.20, mean ones as about 0.50 and elevated one as those values close to 0.80, a low size of effect was

Table 2 Exploratory and confirmatory factorial loads of the PSQ-S, percentage of variance explained reliability

	Exploratory factorial loads				Confirmatory factorial loads			
	Stren	Atr	Skill	Con	Stren	Atr	Skill	Con
i6	0.892				0.76			
i2	0.868				0.80			
i8		0.917				0.80		
i3		0.901				0.83		
i5			0.954				0.52	
i7			0.661				0.91	
i4				-0.929				0.80
i1				-0.856				0.89
	Internal structure α				Composite reliability (Mean variance obtained)			
	0.751	0.807	0.624	0.825	0.756 (0.069)	0.798 (0.664)	0.642 (0.549)	0.832 (0.716)
Total	0.797				0.932 (0.635)			
Variance explained: 81.68%								
Stren= Strength; Atr= Attractive; Con= Condition								

		Drive for thinness	Bulimia	Body dissatisfaction	Self-evaluation	Perfectionism	Interpersonal distrust	Interoceptive awareness	Maturity fears	EDI total
Skill	r	-0.274	-0.436**	-0.526**	-0.345**	0.287**	-0.669**	-0.257	-0.499**	-0.510**
	p	0.059	0.002	0.000	0.016	0.048	0.000	0.077	0.000	0.000
Con	r	-0.414**	-0.209	-0.583**	-0.450**	0.598**	-0.725**	-0.383**	-0.471**	-0.533**
	p	0.003	0.154	0.000	0.001	0.000	0.000	0.007	0.001	0.000
Atr	r	-0.169	-0.036	-0.536**	-0.268	0.692**	-0.251	-0.233	-0.160	-0.232
	p	0.250	0.806	0.000	0.066	0.000	0.085	0.112	0.277	0.113
Strength	r	-0.067	0.483**	0.070	-0.043	0.633**	-0.404**	0.126	-0.404**	0.059
	p	0.652	0.001	0.634	0.773	0.000	0.004	0.393	0.004	0.688
PC-total	r	-0.295**	-0.007	-0.478**	-0.322**	0.655**	-0.635**	-0.233	-0.474**	-0.383**
	p	0.036	0.963	0.000	0.021	0.000	0.000	0.111	0.001	0.007

*p < 0.05, **p < 0.001; Atr= Attractive; Con= Condition; PC= Physical concept

	Diagnosis	M	SD	t	gl	p	d	CI 95%	
Skill	Normal	8.64	2.00	1.398	108	0.165	0.27	-0.02	0.55
	EBD	8.08	2.20						
Condition	Normal	6.72	2.63	2.793	108	0.006**	0.54	0.25	0.83
	EBD	5.42	2.16						
Attractiveness	Normal	7.74	2.06	9.702	108	0.000**	10.87	10.53	20.21
	EBD	4.08	1.82						
Strength	Normal	6.47	2.55	4.979	107.99	0.000**	0.94	0.64	10.23
	EBD	4.33	1.95						
PS-C total	Normal	29.58	7.42	5.588	108	0.000**	10.07	0.77	10.38
	EBD	21.91	6.75						

*p < 0.05, **p < 0.001

obtained on the skill scale ($d=0.27$), mean on the condition scale ($d=0.54$) and elevated sizes of effect on the strength, global physical self-concept and attractiveness scales, the highest magnitude being recorded in the latter.

DISCUSSION

The purpose of this study was, on the one hand, to provide evidence regarding the validity of the PSQ-S and on the other, to verify its utility as a discriminant tool of EBD.

The CFA revealed good fit to the tetrafactorial measurement model that postulates self-perceptions of physical skill, physical condition, physical attractiveness and strength as dimensions making up the physical self-concept. Furthermore, the factorial loads obtained were very high (greater than 0.70), which guarantees the internal structure obtained.

Equally, it has been verified that its consistency is very acceptable (total variance explained is 81.68%), also obtaining excellent reliability coefficients for the total scale (0.93) and adequate ones in the four subscales, even though

they are made up of only 2 items each, for that the PSQ-S can be considered as appropriate and valid for evaluate physical self-concept as the extensive original version, showing, in line with previous studies, the possibility of obtaining short scales with adequate psychometric characteristics.^{21,28}

Regarding the utility of the instrument as an EBD screening tool, the significant and negative correlation of most of the PSQ-S scales with those of the EDI-2 is observed in agreement with other research.¹³ It is also verified that girls diagnosed of EBD are precisely those who systematically show significantly lower score in physical self-concept than non-diagnosed young females. This demonstrates, once more, the close relation between low physical self-concept and risk of developing EBD⁶ and makes it possible to establish low physical self-perception as an alert¹³ for the detection of possible conditions. The weight taken on by the dimension of physical attractiveness for the young girls diagnosed of EBD takes on special importance, this dimension being especially devalued in relation with persons without clinical diagnosis. Thus, this would be one of the facets needing special attention due to its close relation with body dissatisfaction, psychological malaise and anxiety.^{4,6,13}

Given the incidence of physical self-concept in physical health and in psychological well-being in individuals,¹⁻⁸ the availability of a short questionnaire as that evaluated in this study is very useful since it allows for a rapid initial evaluation at low cost²² that can detect subjects at risk of developing disorders with such elevated severity and prevalence as is EBD.²³⁻²⁶

However, the limitations of this work must also be taken into account and one must be aware of the need to perform new studies making it possible to corroborate the results obtained in different age ranges with a larger clinical sample, including both genders and even specific studies that make it possible to analyze the behavior of the questionnaire with different diagnoses and different variables related with the eating disorders as, for example, BMI. It would also be necessary to extend and fully corroborate the validity of the PSQ-S with other reliability data as the test-retest, also verifying its potential convergent or discriminant validity.

At present, the data obtained indicate the reliability and validity of the PSQ-S to measure physical self-concept and the different dimensions within it in the young and adolescent population. Because of its shortness and ease of application, it could be an effective and useful screening tool in primary prevention settings.²³ Given the fact that there are more EBD cases in the school population than those estimated in the clinical investigations,^{23,24,26} it is crucial to have tools such as the PSQ-S which, by means of indications of low physical self-concept, facilitate the initial detection of the disorder, favoring the prognosis²⁵ and

contributing, ultimately, to well-being and adjustment of all the students.

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Annex	PSQ-S Questionnaire					
PSQ	Physical Self-Concept Questionnaire - Shortened Version					
		False	Almost always false	Sometimes True/false /falso	Almost always true	True
1	I have much physical strength.....	1	2	3	4	5
2	I have more strength than most people of my age.....	1	2	3	4	5
3	I feel comfortable with my body image	1	2	3	4	5
4	I can run and exercise for a long time without tiring.....	1	2	3	4	5
5	I am among those who find it hard to learn a new sport.....	1	2	3	4	5
6	I am strong	1	2	3	4	5
7	I am clumsy at sports.....	1	2	3	4	5
8	I like my face and body	1	2	3	4	5
Skill Condition	<input type="text"/>	Attractiveness Strength	<input type="text"/>	General Physical Self-Concept General Self-concept	<input type="text"/>	<input type="text"/>

PLEASE VERIFY THAT YOU HAVE ANSWERED ALL THE QUESTIONS