


Validation and Adaptation of the Brief Self-Control Scale With Spanish Adolescents: Factorial Structure and Evidences of Reliability, Validity, and Factor Invariance Across Gender and Age

Assessment
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Abstract

During adolescence, the difficulty to control impulses is especially notable. The Brief Self-Control Scale has been used in different countries for years to study associations between self-control and other variables. However, its factor structure is not completely clear, and it is necessary to have a scale with psychometric assurances that evaluates self-control in adolescents. The aim of this study was to examine the factorial structure of the Brief Self-Control Scale and to provide evidences of reliability, validity, and factor invariance across gender and age in a sample of Spanish adolescents. Participants were 693 adolescents from Southeastern Spain, aged 13 to 18 years. Data supported an excellent fit to a two-dimensional model and evidences of reliability, validity and factor invariance across gender and age were obtained. This study provides new data on the two-dimensionality of self-control. The need of this tool becomes increasingly relevant to the susceptibility of new emerging addictions, such as mobile phones or internet.

Keywords

Brief Self-Control Scale, factorial analysis, self-discipline, impulse control, adolescents

Background

Self-control is defined as the ability to inhibit impulses and control thoughts, emotions, and actions (Baumeister et al., 2007). It involves a conscious effort to reduce undesirable behaviors and enhance the desirable ones, and is one of the most powerful skills of the human being (De Ridder et al., 2012; Finkenauer et al., 2005; Tangney et al., 2004). Although the terms self-control and self-regulation have often been used interchangeably, some authors argue that self-regulation is a broader process, encompassing self-control (Baumeister et al., 2007; Vohs & Baumeister, 2011).

Self-control can have a direct influence on people's lives. For instance, we know that people with greater self-control tend to achieve better academically (Duckworth et al., 2010), are better adjusted and present greater psychological well-being (Ghorbani et al., 2014; Ronen et al., 2016), better physical health (Moffitt et al., 2011; Tsukayama et al., 2010), and better social relations (Tangney et al., 2004). In contrast, low self-control is related to numerous negative variables, mainly behavioral ones (De Ridder et al., 2012). In this line, some researchers have found a relationship between impulsivity and addictive behaviors

(Ferrari et al., 2009; Visser et al., 2013), mobile phone addiction (Kim et al., 2016), predisposition to infidelity (McIntyre et al., 2015), suicidal behavior (Brezo et al., 2006), violent behavior (Turanovic et al., 2015), eating disorders (Konttinen et al., 2009) and obesity (Schag et al., 2013), among others. According to some studies, girls have greater self-regulatory skills than boys, although these differences are often small (Bembenuitty, 2009; Hoerger et al., 2011; Silverman, 2003). In addition, younger adolescents tend to show lower levels of self-control than older adolescents (Steinberg et al., 2008).

Detection of individual differences in self-control requires correct evaluation. However, Maloney et al. (2012) emphasize that the instruments aimed at their evaluation present validity limitations and are designed for specific populations (Tangney et al., 2004). In addition, although

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involvement in undesirable risk behaviors such as the consumption of alcohol, tobacco, and other drugs becomes more important in adolescence, most studies on self-regulation processes have been carried out with university samples (Ferrari et al., 2009; Reyna & Wilhelms, 2017; Romer et al., 2010).

Tangney et al. (2004) developed the Brief Self-Control Scale (BSCS) from a previous 36-item version developed by the same authors. Since its elaboration, this scale of 13 items has been used in a generalized way due to its simplicity and brevity (Garrido et al., 2018). The BSCS has been adapted and translated into multiple languages and cultures, with validations with adults in the United States (Morean et al., 2014), Argentina (Garrido et al., 2018), Belgium (Brevers et al., 2017) and Turkey (Nebioglu et al., 2012); and with university students in China (Unger et al., 2016). The German adaptation included a sample of secondary school students and university students (Bertrams & Dickhäuser, 2009) and the study carried out by Maloney et al. (2012) both adults and university students. Confirmatory factor analysis (CFA) was carried out in all previous studies. In addition, the studies performed in Belgium (Brevers et al., 2017), the United States (Maloney et al., 2012; Morean et al., 2014) and Turkey (Nebioglu et al., 2012) also included exploratory factor analyses (EFAs). However, its factorial structure is not without contradictions. While some authors defend the unidimensionality of the instrument, others support the multidimensionality of self-control, indicating discrepancies in the items that compose each factor (Lindner et al., 2015; Maloney et al., 2012; Morean et al., 2014).

The single-dimensional structure of the BSCS was defended by the authors who developed the scale (Tangney et al., 2004) and subsequently confirmed by studies carried out in Belgium (Brevers et al., 2017) and Germany (Bertrams & Dickhäuser, 2009). On another hand, in China, it was concluded that the BSCS was composed of five factors, like the full scale (Self-Control Scale; SCS). In recent years, some studies with American population have yielded results that support a two-factor structure (Maloney et al., 2012; Morean et al., 2014), as in other countries such as Turkey (Nebioglu et al., 2012), although with different assignment of items to factors. In Argentina (Garrido et al., 2018), the fit of several models was compared, finding better goodness-of-fit indices of the model proposed by Maloney et al. (2012). However, these authors (Garrido et al., 2018) concluded that the one-dimensional structure defended by Tangney et al. (2004) showed better psychometric properties. Finally, a recent study (Hagger et al., 2018), analyzed the factorial structure of the BSCS in university samples of four countries (Estonia, Spain, United Kingdom, and Luxembourg), obtaining an adequate fit to the two-factor model proposed by Maloney et al. (2012).

The variability in the factorial structure of the BSCS generates conceptual and methodological problems, compromising the interpretability of the results and making it difficult to understand this construct (Morean et al., 2014). The inconsistency in results derived from EFA and CFA in different cultures, and the need to carry out studies in other populations and at different ages in order to generalize the results (Brevers et al., 2017; Duckworth & Kern, 2011) underline the need for greater empirical support for the BSCS. It should be noted that, although Spanish is one of the most widely speaking languages (Lewis et al., 2014), there are great cultural differences between Spanish-speaking countries (Vallejo-Medina et al., 2017). In order to avoid possible errors of measurement (Grisay, 2003, 2007; Grisay & Monseur, 2007), cultural differences and linguistic expressions specific to the specific context must be taken into account when adapting and translating the assessment instruments (Vallejo-Medina et al., 2017). On the other hand, the broad scientific knowledge about the associations between greater self-control and better people's psychological well-being is surprising, given the scarcity of validated methods (Dick et al., 2010).

The present study was aimed at determining the suitability of the BSCS for use with Spanish adolescents, establishing the following objectives: (a) to examine the psychometric properties of the BSCS; (b) to analyze the goodness-of-fit indices of the model obtained after carrying out an exploratory factorial analysis (EFA); (c) to compare the suitability of the unifactorial model proposed by Tangney et al. (2004) with the two-factor models proposed by Maloney et al. (2012) and Morean et al. (2014); and (d) test factor invariance of the BSCS across gender and age. In accordance with other studies, it was expected to obtain adequate psychometric properties, a fit to a one-dimensional model, and a higher level of self-control at higher ages and in the female gender.

Method

Participants

A total of 693 students from the province of Alicante (Southeastern Spain), whose age ranged from 13 to 18 years ($M = 15.16$, $SD = 1.34$), participated. The age distribution was as follows: 13 years (8.5%), 14 years (22.7%), 15 years (28.9%), 16 years (25.7%), 17 years (11.3%), and 18 years (2.9%). Most of the participants have Spanish nationality (92.6%), and all of them were Spanish speakers. The total sample was randomly divided into two subsamples in order to carry out an EFA, and a confirmatory factorial analysis (CFA) of the BSCS structures obtained by other authors. At the same time, the first subsample (targeted for the EFA) was again divided into two parts in order to obtain a first factorial approximation of the BSCS in the Spanish

Table 1. Sociodemographic Characteristics of the Samples.

	Analyses	Total, N	Boys, n (%)	Girls, n (%)	Age, M (SD)	Socioeconomic level (%)		
						Low	Medium	High
Total Sample	Psychometric properties BSCS; reliability and validity and factorial invariance	693	347 (50.1)	346 (49.9)	15.16 (1.34)	32.8	56.7	10.5
Sample 1								
Sample 1a	EFA	196	91 (46.4)	105 (53.6)	15 (1.17)	34.2	35.2	30.6
Sample 1b	CFA model obtained in EFA	176	98 (55.7)	78 (44.3)	15.19 (1.17)	34.5	38.7	26.8
Sample 2	CFA models obtained by Tangney et al. (2004), Maloney et al. (2012) and Morean et al. (2014)	321	158 (49.2)	163 (50.8)	15.23 (1.51)	30.9	42.4	26.7

Note. EFA = exploratory factorial analysis; CFA = confirmatory factorial analysis.

population (Sample 1a) and to obtain of goodness-of-fit indices of this structure (Sample 1b). More information on the participants is presented in Table 1.

Measures

Family Affluence Scale—III (Torsheim et al., 2016). This revised scale assesses the socioeconomic level of the participants. Teenagers report how many bathrooms, computers, and cars they have at home, whether they have a dishwasher and their own room, and how many times they have travelled abroad. The total score allows classifying the socioeconomic status at three levels: low (20%), medium (60%), and high (80%; Meinck et al., 2017).

Brief Self-Control Scale (Tangney et al., 2004)

This 13-item scale, rated on a 5-point Likert-type scale ranging from 1 (*not at all*) to 5 (*very much*), evaluates self-control. The maximum score is 65, with higher scores indicating a greater capacity for self-control. The reliability index obtained in the original study was good ($\alpha \geq .83$; Tangney et al., 2004).

Strengths and Difficulties Questionnaire (SDQ; Goodman, 1997)

The participants completed the Spanish version of this instrument (www.sdqinfo.org). This scale evaluates four difficulties (emotional, behavioral, peer problems, and hyperactivity) and one strength (prosocial behavior). The full scale consists of 25 items rated on a 3-point Likert-type response scale: 0 (*not true*), 1 (*somewhat true*), and 2 (*certainly true*). This instrument provides subscale scores, a total score, and scores referring to internalizing (sum of subscales, emotional and behavioral problems) and externalizing problems (sum of subscales, peer problems and hyperactivity). Several studies have found adequate levels of reliability of the Spanish

Version of the SDQ (Ortuño-Sierra et al., 2016). The ordinal alpha found in the present work for the total score was adequate ($\alpha_{\text{ordinal}} = .82$), with the following indices for the subscales: Emotional Symptoms ($\alpha_{\text{ordinal}} = .79$), Behavioral Problems ($\alpha_{\text{ordinal}} = .66$), Hyperactivity ($\alpha_{\text{ordinal}} = .67$), Peer Problems ($\alpha_{\text{ordinal}} = .69$), Prosocial Behavior ($\alpha_{\text{ordinal}} = .71$), Externalizing Problems ($\alpha_{\text{ordinal}} = .76$), and Internalizing Problems ($\alpha_{\text{ordinal}} = .80$).

Children's Depression Inventory (CDI; Kovacs, 1992). The Spanish version of this instrument was used (Del Barrio & Carrasco, 2004). This scale is made up of 27 items that evaluate symptoms of depression (including sad mood and low self-esteem). The range of responses identifies the absence of symptoms (0), some presence and intensity of symptoms (1), and unequivocal presence of symptoms (2). The sum of the scores provides a maximum total score of 54 points. Del Barrio et al. (2001) obtained a Cronbach's alpha of .82. In the present study reliability evidence was obtained ($\alpha_{\text{ordinal}} = .92$).

Delaying Gratification Inventory (DGI; Hoerger et al., 2011). The Spanish version of the instrument was used (Espada et al., 2019). It consists of a 35-item self-report rated on a 5-point Likert-type scale ranging from 1 (*strongly disagree*) to 5 (*strongly agree*). It assesses adolescents' ability to self-regulate, delaying immediate gratification in order to achieve greater long-term success in five areas (food, physical pleasure, achievement, social area, and money). The internal consistency obtained in this study was adequate ($\alpha_{\text{ordinal}} = .86$). As for the subscales, the reliability indices obtained were: Food ($\alpha_{\text{ordinal}} = .63$), Physical Pleasure ($\alpha_{\text{ordinal}} = .61$), Social Area ($\alpha_{\text{ordinal}} = .51$), Money ($\alpha_{\text{ordinal}} = .80$), and Achievements ($\alpha_{\text{ordinal}} = .75$).

Procedure

Three secondary schools from different areas of the province of Alicante were contacted by email. After presenting an

informative letter with the objectives of the study, two of the school directors agreed to collaborate in the study. Once the informed consent was signed by parents of the participants, the application of the self-reports was carried out in two 50-minute sessions (in groups of 10 to 34 adolescents). Two evaluators previously trained by the main investigators of the study were present during the completion of the instruments to resolve any possible doubts. The participation rate in the study was high (about 96%). Adolescents received no incentive for their participation. Eight weeks later, a subsample ($n = 247$, 35%) again completed the self-reports in order to test the temporal stability of the BSCS. The ethics committee's approval for this study was provided by the Miguel Hernández University (DPS.JPE.01.18).

The Spanish version of the BSCS was developed following the back-translation method of Hambleton (2005). Two bilingual psychologists were in charge of the translation. First, one of them translated the scale into Spanish, and later, the English back-translation could be performed by the other expert. After this process, small differences were corrected, leading to the final version of the scale.

Data Analysis

Descriptive statistics were analyzed for each item of the BSCS. The internal consistency of the full scale and subscales was estimated using the ordinal alpha due to the ordinal nature of the data. We analyzed the temporal stability of the BSCS using the intraclass correlation coefficient (ICC). According to the European model for the evaluation of the quality of the tests (Hernández et al., 2016), the ICC indicator must be equal to or greater than .65. To ensure equivalence between samples, possible differences in self-control (BSCS) and sociodemographic variables were analyzed between adolescents who participated in the retest and those who did not, using t test for quantitative data and cross tables and chi-square statistic for categorical data.

The total sample was randomly divided into two subsamples in order to analyze the factorial structure of the BSCS (Sample 1 and Sample 2). In turn, Sample 1 was again randomly divided into two subsamples (Subsample 1a and Subsample 1b). In order to ensure equivalence between the two samples, possible differences between the BSCS, gender and age were analyzed. First, an EFA was carried out on Subsample 1a using Direct Oblimin Main Axis Factoring. A parallel analysis was carried out with polychoric correlations in order to determine the optimal number of factors derived from EFA. In order to analyze the fit to the model obtained in the previous phase, a CFA was performed in Subsample 1b. Next, a CFA of three factorial structures that have been supported by other authors was carried out in Subsample 2: (a) the single-factor structure (Tangney et al., 2004); (b) the two-factor correlated structure of Maloney et al. (2012); and (c) the two-factor

correlated structure obtained by Morean et al. (2014). To carry out the CFAs, the Robust Weighted Least Squares was used, which is a robust estimator highly recommended when normality is not met and it provides the best option for modelling ordinal data (Brown, 2006). The following indicators were used to evaluate the fit to the models analyzed: Comparative Fit Index (CFI), Tucker–Lewis index (TLI), and Root Mean Square Error of Approximation (RMSEA), with the recommended values for CFI and TLI close to .95, and for RMSEA \leq .08. (Hu & Bentler, 1999). In addition, two descriptive indices were calculated, the Akaike Information Criterion (AIC) and the Bayesian Information Criterion (BIC). The model that obtains the lowest indices of AIC and BIC scores will be considered the most parsimonious option (Vandenberg & Grelle, 2009). Due to the lack of normality of the sample distribution in the BSCS scores—confirmed through the Kolmogorov–Smirnov test (Steinskog et al., 2007), nonparametric correlations (Spearman rho) were used to determine the validity of the instrument. All analyses were performed with the Statistical Package for Social Sciences (v25), except for the CFA, which was calculated with the Lavaan package in *R* Studio (*R* Studio Team, 2016).

Multigroup CFA was run in the whole sample to test gender (males vs. females) and age (13-15 years old vs. 16-18 years old) invariance of the best-fitting model. For each variable (gender and age), four steps of invariance were considered, based on Timmons's recommendations (2010): Configural invariance (Model 1), weak or metric invariance (Model 2), strong invariance (Model 3), and strict invariance (Model 4). Model 1 tested the structure of latent variables, and results were considered as a baseline model. Model 2 tested the results of Model 1 with factor loading equivalence constraints imposed to ensure similarity of the indicators by gender and age. Model 3 tested the results of Model 2 and in which intercepts were constrained. Last step was Model 4, in which factor loadings, variable intercepts, and error variance constraints equally set. Changed in CFI, TLI and RMSEA were used to test invariance; Δ CFI \leq 0.01, Δ TLI \leq 0.01, and Δ RMSEA \leq 0.015 were considered evidences of invariance (Chen, 2007; Cheung & Rensvold, 2002).

Results

Psychometric Properties

The descriptive statistics for each item of the BSCS were analyzed: means, standard deviations, item-test correlations, and reliability of the scale if the item is removed (Table 2).

Exploratory Factor Analysis

An EFA was carried out with Subsample 1a. The Kaiser–Meyer–Olkin (KMO) measure was adequate for the 13

Table 2. Scale Properties of the BSCS.

	M	SD	r_{it}^c	$\alpha_{ordinal}^{-i}$
1. Soy capaz de resistir tentaciones ^a	3.13	1.09	.21	.67
2. Me cuesta acabar con mis malos hábitos	2.93	1.19	.44	—
3. Soy perezoso	2.38	1.22	.44	—
4. Digo cosas inapropiadas	3.25	1.19	.53	—
5. Hago cosas perjudiciales para mí, si son divertidas ^a	3.83	1.19	.48	.61
6. Rechazo cosas que son malas para mí	3.69	1.30	.22	—
7. Me gustaría ser más disciplinado	2.69	1.22	.24	—
8. La gente piensa que soy muy disciplinado ^a	3.08	1.13	.30	.66
9. El placer y la diversión a veces me impiden hacer mis tareas ^a	2.70	1.21	.45	.64
10. Tengo problemas para concentrarme	2.83	1.29	.45	—
11. Soy capaz de trabajar eficazmente hacia metas a largo plazo ^a	3.62	1.06	.28	.66
12. A veces no puedo parar de hacer algunas cosas, aunque sepa que están mal ^a	3.24	1.22	.52	.60
13. A menudo actúo sin pensar en todas las alternativas posibles ^a	3.17	1.20	.46	.61

Note. BSCS = Brief Self-Control Scale; r_{it}^c = corrected item-total correlation; α^{-i} = alpha if the item is removed; $\alpha_{ordinal}$ = ordinal alpha.

^aSelected final items.

items (KMO = .83). This analysis yielded a matrix structure of three factors: Factor 1 (Items 1, 8, and 11), Factor 2 (Items 2, 3, 7, 9, and 10), and Factor 3 (Items 4, 5, 6, 12, and 13). After performed the parallel analysis, six models suggested a three-factorial solution. The review of the previous literature on the BSCS did not find support for a three-factor structure.

Confirmatory Factor Analysis

Model 1: Structure of Three Correlated Factors. After obtaining the model derived from the EFA, its factorial structure was tested in Subsample 1b. The CFI and TLI exceeded .90, and RMSEA was less than .08 (Table 3).

Three CFAs were then carried out to analyze the goodness-of-fit of three different structural models (Models 2, 3, and 4) proposed by Tangney et al. (2004), Maloney et al. (2012), and Morean et al. (2014), respectively. These analyses were performed on Subsample 2 (Table 3).

Model 2: One Single-Factor Structure (Tangney et al., 2004). First, the fit to the factorial structure defended by the original authors of the scale was tested (Tangney et al., 2004). These authors proposed a one-dimensional composition of self-control, including the initial 13 items. The results yielded TLI and CFI values below .87, so the fit obtained was not acceptable.

Model 3: Two-Factor Correlated Structure (Maloney et al., 2012). The corresponding analyses were then carried out to test the model obtained by Maloney et al. (2012) with an American sample. The first factor (Restraint) consisted of Items 1, 2, 7, and 8 and the second (Impulsivity) of Items 5, 9, 12, and 13. The CFI and TLI values were adequate ($\geq .95$ and $< .90$, respectively).

Model 4: Two-Factor Correlated Structure (Morean et al., 2014). Last, a new structure of two correlated factors was analyzed. Morean et al. (2014) found a similar structure to that proposed in the previous model in a study with an American population. Thus, the first factor (Self-Discipline) was formed by Items 1, 8, and 11, and the second factor (Impulse Control) by Items 5, 9, 12, and 13. After the CFA, the results obtained were excellent. The values obtained were perfect (CFI = 1; TLI = 1).

Of the models analyzed, three offered a good fit to the target population if we use the laxer criterion of Hu and Bentler (1999), in which CFI and TLI should be above .90 (Models 1, 3, and 4). However, the only model that shows CFI values greater than .95 and lower RMSEA, AIC, and BIC values was Model 4 (Morean et al., 2014), offering an excellent fit to the Spanish adolescent population. The factor loadings of all items exceeded the value of .30, except for the Item 1 (.24; Figure 1).

Internal Consistency and Test–Retest Reliability

The internal consistency of the BSCS was calculated from the total sample of participants. After the choice of Model 4, the final scale was reduced from 13 to 7 items, and the evidences of reliability were adequate for the total score ($\alpha_{ordinal} = .67$). The ordinal alpha obtained for the subscales was .45 for the Self-Discipline scale and .71 for the Impulse Control scale.

Eight weeks after the first evaluation, 35% of the adolescents ($n = 247$; 47.8% girls), with a mean age of 15.5 ($SD = 1.04$), completed the scale again, obtaining an excellent test–retest temporal stability index for the overall score (ICC = .82). This index was good for the Impulse Control subscale (ICC = .76) and appropriate for the Self-Discipline subscale (ICC = .69).

Table 3. Factor Loading and Fit Indices for Factor Analyses for the Brief Self-Control Scale (BSCS).

	Sample 1												Sample 2										
	EFA						CFA						CFA										
	Pattern matrix			Structure matrix			Model 1			Model 2			Model 3 (Maloney, 2012)			Model 4 (Morean., 2014)							
	F1	F2	F3	F1	F2	F3	F1	F2	F3	F1	F2	F3	F1	F2	F3	F1	F2	F3	F1	F2	F3		
BSCS1	-.01	.49	-.02	.09	.50	-.22	.34	—	—	—	.07	.60	.24	—	—	—	—	—	—	—	—	—	
BSCS2	.47	-.12	-.19	.52	.05	-.31	—	.56	—	—	.49	.53	—	—	—	—	—	—	—	—	—	—	
BSCS3	.57	.26	-.05	.64	.39	-.36	—	.56	—	—	.41	—	—	—	—	—	—	—	—	—	—	—	
BSCS4	.39	.05	-.35	.52	.27	-.51	—	—	.68	—	.63	—	—	—	—	—	—	—	—	—	—	—	
BSCS5	.05	.06	-.54	.26	.29	-.59	—	—	.61	—	.62	—	—	—	—	—	—	—	—	—	—	.62	
BSCS6	-.18	.12	.27	-.06	.20	-.26	—	—	.26	—	.27	—	—	—	—	—	—	—	—	—	—	—	
BSCS7	.53	-.06	.01	.51	.04	-.16	—	.33	—	—	.20	.20	—	—	—	—	—	—	—	—	—	—	
BSCS8	.14	.38	-.19	.28	.48	-.39	.52	—	—	—	.25	.24	.54	—	—	—	—	—	—	—	—	—	
BSCS9	.51	.15	-.01	.54	.24	-.25	—	.58	—	—	.57	—	—	—	—	—	—	—	—	—	—	.53	
BSCS10	.53	.26	-.01	.58	.36	-.31	—	.57	—	—	.49	—	—	—	—	—	—	—	—	—	—	—	
BSCS11	.07	.59	.02	.17	.59	-.24	.47	—	—	—	.22	—	.43	—	—	—	—	—	—	—	—	—	
BSCS12	.29	-.12	-.68	.51	.21	-.73	—	—	.68	—	.57	—	—	—	—	—	—	—	—	—	—	.65	
BSCS13	.28	.04	-.49	.46	.29	-.60	—	—	.58	—	.50	—	—	—	—	—	—	—	—	—	—	.51	
χ^2									124.36		133.38												10.82
df									62		65												13
χ^2/df									2		2.05												0.83
CFI									.95		.87												1
TLI									.94		.85												1
RMSEA									.04		.06												.01
90% CI									[0.03, 0.05]		0.07												[0.01, 0.07]
AIC									26859.674		.49												6649.30
BIC									26990.772		.41												6705.87

Note. df = degrees of freedom; CFI = comparative fit index; TLI = Tucker-Lewis fit index; RMSEA = root mean square error of approximation; 90% CI = RMSEA 90% confidence interval; AIC = Akaike information criteria; BIC = Bayesian information criteria.

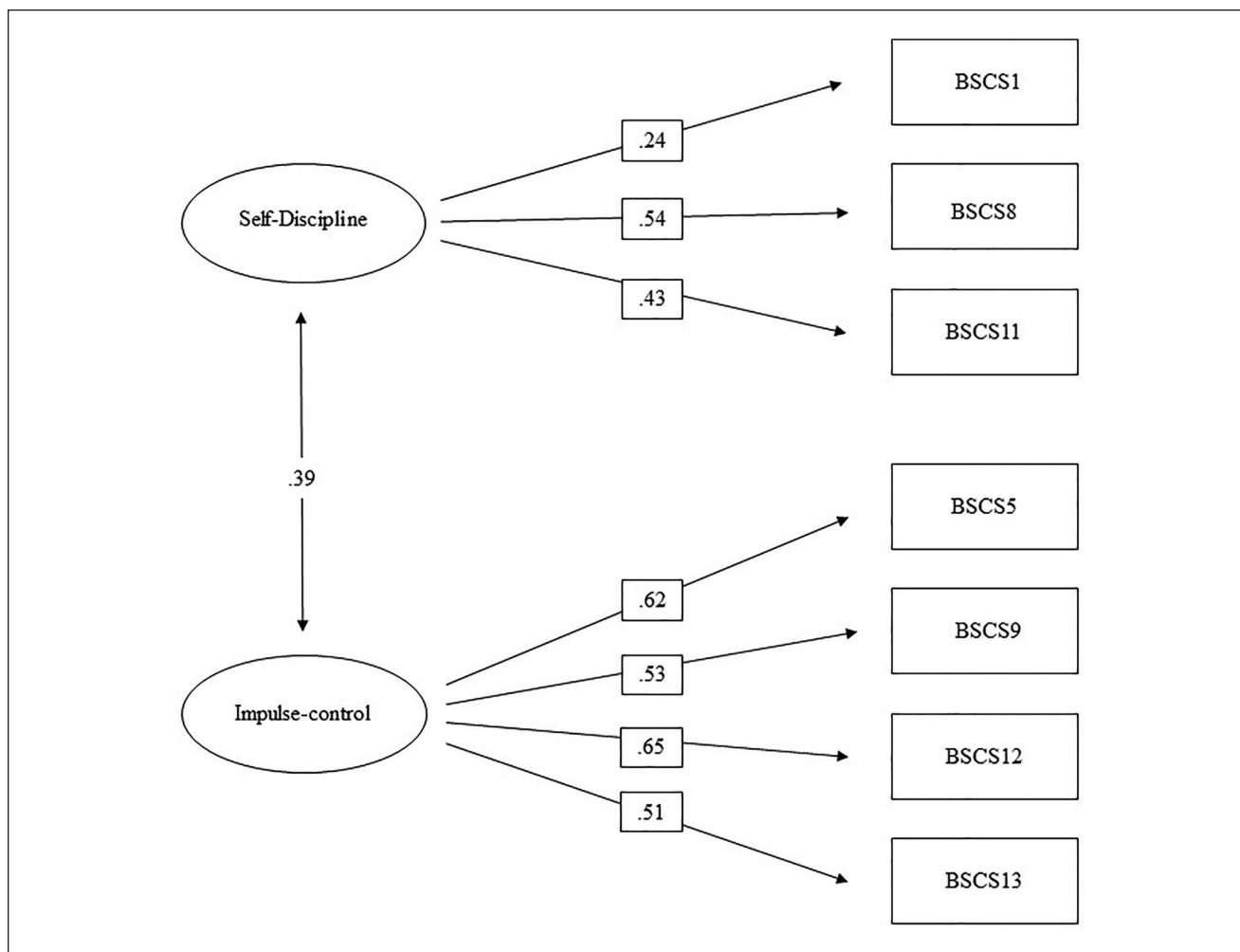


Figure 1. Factor loadings of Model 4.

Attrition analyses showed equivalence between the two samples in gender ($p > .05$), total score in BSCS ($p > .05$), and BSCS subscales: Self-Discipline ($p > .05$) and Impulse Control ($p > .05$). Differences were found between the two samples in age and socioeconomic level. Fewer adolescents who participated in the retest belonged to a low socioeconomic level and more of them belonged to a high socioeconomic level ($p \leq .001$) than those who did not participate and, in addition, they were older than those who did not perform this second evaluation ($p \leq .001$).

Relation Between the BSCS and Other Variables

Spearman correlations between self-control (BSCS), psychological difficulties (SDQ), depression (CDI), and delaying gratification (DGI) were calculated in the total sample in order to obtain validity evidence of the scale (Table 4). The correlations obtained between the BSCS and related measures (DGI) were direct, moderate, and significant ($\rho = .16, .56$). The

correlation between the BSCS total score and the DGI Physical Pleasures subscale yielded the highest index. On another hand, correlations between the BSCS and unrelated measures (SDQ and CDI) yielded inverse, moderate, and significant scores ($\rho = -.11, -.55$). The highest inverse scores were obtained between BSCS and externalizing problems; and the lowest between BSCS and internalizing problems and depression.

Factorial Invariance Across Gender and Age

The results indicated that the two-factor model of the BSCS is an excellent fit of the data in both males and females and by age group (13-15 years old vs. 16-18 years old). Results of multigroup CFA revealed the measurement invariance across gender and age groups was entirely supported at the factorial structure and the strict level (Table 5). The ΔCFI and ΔTLI were lower than 0.01, and $\Delta RMSEA$ coefficients were lower than 0.015, suggesting that gender and age

Table 4. Spearman Correlations Between the BSCS and SDQ, CDI, and DGI.

	Self-Discipline	Impulse Control	BSCS
SDQ			
Total score	-.26**	-.44**	-.46**
Behavior problems	-.20**	-.43**	-.42**
Hyperactivity problems	-.32**	-.45**	-.49**
Externalizing score	-.32**	-.52**	-.55**
Internalizing score	-.11**	-.18**	-.19**
CDI	-.23**	-.30**	-.33**
DGI			
Total	.42**	.46**	.56**
Food	.23**	.19**	.27**
Physical	.38**	.42**	.52**
Social	.16**	.25**	.27**
Money	.28**	.34**	.40**
Achievement	.36**	.39**	.47**

Note. BSCS = Brief Self-Control Scale; SDQ = Strengths and Difficulties Questionnaire; CDI = Children's Depression Inventory; DGI = Delaying Gratification Inventory.

**Correlation is significant at the .01 level (2-tailed).

invariance of the BSCS has been confirmed. The BSCS items have the same meanings across gender and age, which indicated that latent mean differences across these groups may be compared.

Discussion

The unidimensionality of self-control has been widely questioned. In this context, numerous factorial structures of the BSCS have been found. Studies aimed at translating and adapting the instrument in different countries have reached very different conclusions about its factorial structure. The factor analyses carried out in the present work made it possible to compare the suitability of different BSCS models in Spanish adolescent population. The results revealed an excellent fit of the two-dimensional model proposed by Morean et al. (2014).

Although three of the factorial models analyzed yielded adequate goodness-of-fit indices, Model 4 proposed by Morean et al. (2014) was chosen for the following reasons: (a) the indices obtained were excellent, with CFI and TLI above the strictest cut-off points proposed by Hu and Bentler (1999) and by Schermelleh-Engel et al. (2003; $\geq .95$ and $\geq .97$, respectively); (b) it is a scale composed of seven items that are distributed in two factors, following the principle of parsimony; (c) the two-factor structure is theoretically supported; (d) it derives from the confirmation of a structure obtained with American population (Morean et al., 2014) and similar to the one previously found by Maloney et al. (2012); and (e) the confirmation of a previous structure can facilitate cross-cultural studies and promote an approach to BSCS consensus.

Therefore, the resulting factors that make up the Spanish version of the BSCS were Self-Discipline (Items 1, 8, and 11) and Impulse Control (Items 5, 9, 12, and 13). The former evaluates the functioning of the person through planned behavior, while the latter refers to the individual's control of impulsive behavior. This structure partially coincides with that proposed by Maloney et al. (2012), in which the impulsivity factor is identical, but differs slightly in the items that make up the Self-Discipline factor (Garrido et al., 2018). In spite of this, the EFA carried out in the first phase of this study yielded a factor identical to that of Self-Discipline, composed of Items 1, 8, and 11. As suggested by some authors (Hofmann et al., 2009), self-control can be predicted through a dual system consisting of impulsive behavior on the one hand and deliberate and controlled behaviors on the other. Therefore, although impulsivity and moderation or restriction affect the process of self-control (Hofmann et al., 2009), these are two different processes, thus supporting the theoretical adequacy of a two-factor structure. In any case, the total score of the instrument is a useful indicator to predict behavioral variables (Lindner et al., 2015).

As for the reliability indices obtained, they were appropriate, except for the Self-Discipline scale, which was low. This may be due to the fact that only three items make up this factor and they are related to general aspects. However, some authors have argued that the test-retest reliability indicator is more powerful to predict the real stability of the instrument (McCrae et al., 2011), and this index was excellent for the overall score (ICC = .82), good for the Impulse-Control subscale (ICC = .76), and adequate for the Self-Discipline subscale (ICC = .69), in accordance with the European model for the evaluation of test quality (Hernández et al., 2016). It may be useful for future studies

Table 5. Fit Statistics for Multigroup Confirmatory Factor Analysis by Participants' Gender (1 = Males vs. 2 = Females) and Age Groups (1 = 13-15 Years Old vs. 2 = 16-18 Years Old).

Level of invariance	S-B χ^2	df	p	RMSEA	CFI	TLI	Δ CFI	Δ TLI	Δ RMSEA
Gender									
Configural invariance (Model 1)	20.12	26	.78	0	1	1	—	—	—
Weak invariance (Model 2)	30.57	31	.48	0	1	1	0	0	0
Strong invariance (Model 3)	32.96	36	.61	0	1	1	0	0	0
Strict invariance (Model 4)	43.48	43	.07	0.006	0.999	0.999	-0.001	-0.001	0.006
Age									
Configural invariance (Model 1)	22.80	26	.64	0	1	1	—	—	—
Weak invariance (Model 2)	33.48	31	.34	0.010	0.996	0.994	0.004	0.006	0.010
Strong invariance (Model 3)	36.63	36	.43	0.007	0.999	0.999	0.003	0.005	-0.003
Strict invariance (Model 4)	44.23	43	.21	0.009	0.998	0.998	-0.001	-0.001	0.002

Note. S-B χ^2 = Santorra-Bentler Scaled Chi-Square; df = degree of freedom; RMSEA = root mean square error of approximation; CFI = comparative fit index; TLI = Tucker-Lewis index.

with adolescent populations to replicate the analyses carried out in order to contrast differences in reliability indices.

On another hand, the relationship analysis carried out between the BSCS and other variables showed that adolescents with less self-control tended to show more behavioral problems, hyperactivity, and externalizing and internalizing problems. In addition, the use of the DGI scale made it possible to analyze the validity of self-control criteria (BSCS) in one of the most complex domains related to impulsivity, delayed gratification. In line with other studies, the results supported that the ability to delay a reward in order to achieve a greater long-term reward is associated with greater self-control and less impulsivity (Casey et al., 2011).

Measurement invariance is needed to be able to compare the true differences across groups, and this was tested for self-control across genders and age groups among Spanish adolescents. The two-factor structure of the BSCS was well fitted to the data in both males and females, and age groups (13-15 years old and 16-18 years old). Multiple confirmatory factors showed that measurement invariance was supported, fully assuming different levels of invariance. The determination of configural invariance suggests that the number of factors and factor patterns of the BSCS is equivalent across gender and age groups. The establishment of weak or metric invariance showed that the observation items and potential factors of the BSCS have an equivalent meaning across groups. Cross-group difference of the observed variable mean may estimate the intergroup difference of the latent variable mean due to that strong level of invariance was supported. The most stringent level of invariance (the strict one) was also met, which indicates cross-group differences in latent variable variation. Findings of the current study confirms that BSCS is strictly equivalent, supporting that the BSCS factors have the same meaning across genders and age groups. Therefore, comparison of scores between males and females, and between

adolescents aged 13 and 15 years old and those aged 16 and 18 years old, are meaningful.

Although differences in age were small, it is important to note that, contrary to our expectations, younger adolescents tended to have more self-control. Although this ability is enhanced throughout the life cycle, in adolescence, immersion in risky behaviors and the search for new sensations also increases, which could justify these results (Reyna & Wilhelms, 2017; Steinberg et al., 2008). In terms of gender, no differences were found in the overall self-control score. This could be due to the existence of a similar pattern between boys and girls in sensation-seeking and impulse control (Shulman et al., 2015). However, in order to determine possible populations at risk with greater specificity, these findings require further study.

This study has some limitations. On the one hand, although participants were randomly assigned to different subsamples for data analysis, random selection for school participation was not possible, making it difficult to generalize the results. On the other hand, the participants belong to the general population, so it is not known whether the BSCS is a useful tool in clinical population. Moreover, the factorial structure found in this work did not coincide with that supported in the original study. However, the results suggest that the bifactorial structure provides the best fit to the Spanish adolescent population. This study also has some strengths. First, it combines the performance of an EFA and a CFA of those models that have shown the greatest empirical support. In addition, the study included a large sample and factor invariance analyses revealed that the measurement properties of the BSCS are equivalent in terms of gender and age. The results obtained in this work are in consonance with what has been found by other authors, who defend that self-control is a multidimensional phenomenon. The importance of achieving an approach to the factorial structure of the BSCS resides in the simplicity and

briefness of the instrument and its predictive power for different behavioral variables. Adolescence is a vulnerable period for immersion in risk behavior. This fact, along with the associations that have been established between lower self-control and negative behaviors such as addictions (Ferrari et al., 2009; Visser et al., 2013) or suicidal behavior (Brezo et al., 2006), justify the need to detect impulsivity at an early stage.

The Spanish version of the BSCS has adequate psychometric properties for the assessment of impulsivity in adolescents. Future studies could use this scale in order to find risk profiles for problematic use of new technologies, video game or substance addictions, for example, in order to carry out early preventive activities. Educational actions aimed at increasing self-control would greatly reduce the costs currently assumed by governments in economic, criminal, and health terms (Moffitt et al., 2011) through the use of this scale to focus on early detection and preventive strategies. This is particularly important nowadays in adolescents and young adults, for whom new challenges emerge, such as internet, gambling, or video game addictions (Han et al., 2007; Yuan et al., 2011).

Authors' Note

All authors have read and agreed to the published version of the manuscript.

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Author Contributions

Conceptualization, methodology, funding acquisition, supervision and writing—review and editing, Mireia Orgilés. Conceptualization, methodology, funding acquisition, supervision and writing—review and editing, José P. Espada. Investigation, resources, writing—original draft preparation, Alexandra Morales. Investigation, resources, formal analysis, writing—original draft preparation, Miriam Rodríguez-Menchón.

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Ethics approval

All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional

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Consent to participate

Informed consent was obtained from all individual participants included in the study.

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