Psicothema

Psicothema 2017, Vol. 29, No. 1, 133-138
doi: 10.7334/psicothema2016.144

ISSN 0214 - 9915 CODEN PSOTEG

www.psicothema.com

Psychometric properties of the Brief Sensation Seeking Scale in peruvian teenagers

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Abstract

Background: The *Brief Sensation Seeking Scale – BSSS* measures sensation seeking in teenagers based on Zuckerman's theory, covering the need for a brief instrument that might be useful for research contexts and capable of correcting some defects in the SSS-V. The aim of this study was to adapt the BSSS for research purposes with students schoolchildren in Lima and determine its psychometric properties. **Method:** 1,033 high school students from four public schools in Lima completed the final version of the BSSS. A confirmatory factor analysis was conducted to test scale structure and gender invariance and criterion validity were assessed. **Results:** CFA evidenced a good fit of the unidimensional model (S-Bχ^2= 56.74, *df* = 18, *p*<0.001; TLI = .972, CFI = .982, SRMR = .026; RMSEA = .046). Moreover, the multi-group invariance analysis found metric invariance between boys and girls, but no scalar invariance. In addition, a composite reliability coefficient of .82 was obtained. Finally, the BSSS scores demonstrate differences in the use of alcohol, tobacco and marijuana, as well as the curiosity and intention to try marijuana. **Conclusion:** Psychometric results obtained from the BSSS are promising; making it a suitable instrument for measuring sensation seeking in adolescents from Lima.

Key words: BSSS, sensation-seeking, teenagers.

Resumen

Propiedades psicométricas de la Brief Sensation Seeking Scale en adolescentes peruanos. **Antecedentes:** la *Brief Sensation Seeking Scale - BSSS* mide la búsqueda de sensaciones en adolescentes desde la teoría de Zuckerman y cubre la necesidad de una medida breve para la investigación que corrija algunos defectos de la SSS-V. El objetivo del estudio fue adaptarla para utilizarla con adolescentes escolares limeños y obtener sus propiedades psicométricas. **Método:** la versión final del BSSS fue aplicada a 1.033 estudiantes de Secundaria de cuatro colegios públicos de Lima. Se probó la estructura factorial de la escala mediante el AFC y su invarianza según género y se recolectaron evidencias de validez de criterio. **Resultados:** el CFA demostró que el modelo unidimensional presentaba buen ajuste (S-Bχ^2= 56.74, *df* = 18, *p*<0.001; TLI = .972, CFI = .982, SRMR = .026; RMSEA = .046). Se encontró invarianza métrica entre hombres y mujeres, pero no invarianza escalar. Asimismo, se obtuvo un coeficiente de fiabilidad compuesta de .82. Finalmente, los puntajes de la BSSS muestran diferencias significativas en quienes usan alcohol, tabaco y marihuana, así como en quienes tienen curiosidad y la intención de probar marihuana. **Conclusión:** las propiedades psicométricas de la BSSS son prometedoras, por lo que resulta adecuada para medir la búsqueda de sensaciones en adolescentes limeños.

Palabras clave: BSSS, búsqueda de sensaciones, adolescentes.

Sensation seeking is a biological-based psychological construct which describes the tendency for the regular seeking of sensations and stimulant, new and different activities as well as the willingness to the take risks (social, physical, economical) that this implies (Zuckerman, 1979, 1994). The key terms "sensation" and "seeking" in this construct suggest that the person actively selects the external stimuli that will maximize their sensations, which is different from intellectual curiosity (Chico, 2000).

Scientific literature consistently finds that sensation seeking moderately correlates with different risky behaviors in teenagers, such as alcohol and tobacco consumption (Cohen & Fromme, 2002; Read, Wood, Kahler, Maddock, & Palfai, 2003; Pokhrel, Sussman, Sun, Kniazer, & Masagutov, 2010; Stephenson & Helme, 2006). There is also strong evidence that higher levels of sensation seeking predict marijuana use (Brook, Brook, Arencibia-Mireles, Richter, & Whiteman, 2001; Palmgreen, Lorch, Stephenson, Hoyle, & Donohew, 2007; Ravert et al., 2009; Vink, Nawijn, Boomsma, & Willemsen, 2007). Likewise, practicing extreme sports (Goma-i-Freixanet, 2004; Roberti, 2004), engaging in sexually risky behaviors (Bornovalova, Gwadz, Kahler, Aklin, & Lejuez, 2008; Hoyle, Fejfar, & Miller, 2000), driving recklessly (Heino, van der Molen, & Wilde, 1996; Jonah, 1997; Rosembloom, 2003) and gambling (Breslin, Sobell, Cappel, & Poulos, 1999; McDaniel & Zuckerman, 2003; Primi, Narducci, Benedetti, Donati, & Chiesi, 2011) are all related with high levels of sensation seeking.

These results show that sensation seeking is an important construct to measure when researching problematic or maladaptive behaviors in adolescent populations. Thus, the need for valid and reliable instruments that measure the construct easily and effectively, especially for epidemiological and large-scale studies, is evident.

Received: May 10, 2016 • Accepted: October 25, 2016
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Globally, the most often employed scale to measure sensation seeking is the Sensation Seeking Scale - V Form (SSS-V, Zuckerman, Eysenck, & Eysenck, 1978) which consists of 40 forced-choice items. Research studies consistently find a four-dimension structure for the SSS-V: a) *experience seeking,* which describes the sensation and experience seeking through the mind and the senses (trips, music, art) and reveals a dynamic lifestyle; b) *susceptibility to boredom,* which represents the aversion to stillness and monotonous conditions; c) *adventure and strong emotions seeking;* which is the desire to do activities filled with experiences and unusual sensations (sports or extreme activities such as climbing, paragliding, etc.) perceived as risky but rewarding; and finally d) *disinhibition,* which is the search for sensations on the basis of a hedonistic and hectic lifestyle (Clayton, Segress, & Caudill, 2007; Hoyle, Stephenson, Palmgreen, Lorch, & Donohew, 2002; Roberti, Storch, & Bravata, 2003; Zuckerman, 1994, 2007).

Although this scale is used extensively, it has some problems that make it inadequate for some research contexts. Some disadvantages include: the number of items, which makes its inclusion in longitudinal and large-scale studies difficult; the forced-choice response format, which may be inconvenient for adolescents because it forces them to choose between alternatives that may not describe themselves in a developmental moment where contradictions and shifts in thinking occur; and finally, some phrases and colloquial words that comprise the item phrasing are no longer used or have a different meaning for adolescents these days (Hoyle et al., 2002; Primi et al., 2011).

Therefore, these difficulties have led to the construction of shorter scales, some of them based on the SSS-V. Among these we can find the Brief Sensation Seeking Scale, which has eight items (BSSS, Hoyle et al., 2002), a trial version with four items (Stephenson, Hoyle, Plamgreen, & Slater, 2003) and one version with two items (Slater, 2003). However, the eight-item version is more consistent due to the low reliability of the other two instruments (Vallone, Allen, Clayton, & Xiao, 2007). The BSSS scale arises then as a necessary and suitable alternative to bridge this gap related to having proper sensation seeking research instruments targeted at teenagers.

Hoyle et al. (2002) developed the BSSS considering five criteria: 1) adherence to the SSS-V content in such way that the new instrument represents the construct properly and the outcomes derived from it can be easily integrated to the great body of knowledge and literature of the construct; 2) use of a Likert type response format instead of forced choice to avoid the technical difficulties that these items may pose; 3) use of familiar terminology for contemporary teenagers; 4) construction of a limited number of items to keep the measure brief; and finally, 5) making sure that the instrument has documented psychometric properties and that it works properly and in a similar way with different groups (ethnicity, age and gender). Eight items from the SSS-V were selected, two per factor in order to maintain completeness and brevity. Then the researchers and experts in the field reviewed them and kept them if they met the requirement of being appropriate for teenagers. No items related to substance use were considered since they could overlap with the prediction of substance abuse, which is a common research question in sensation seeking literature.

The 8-item resulting scale was completed by 1263 students, from 8th to 11th grade, 602 girls and 658 boys. While some literature states that boys tend to have a higher score than girls in sensation seeking (Chen et al., 2013; Zuckerman, 1994), Hoyle et al. (2002) and Stephenson et al. (2003) did not find these differences using the BSSS. Additionally, they found that BSSS scores are stable during adolescence (13 to 17 years).

This scale has been extensively used in its original language and has been translated and adapted to Italian and Chinese samples with adequate psychometric properties (Chen et al., 2013; Primi et al., 2011). Regarding its dimensionality, the confirmatory factor analysis presented by the Hoyle et al. (2002) original study showed one factor with adequate goodness of fit indicators. This was also found in Primi et al. (2011) study, which obtained a unidimensional model with satisfactory goodness of fit indicators after including covariances between items 1 and 5 (experience seeking) and 4 and 8 (disinhibition). Conversely, Chen et al. (2013) revised and changed the phrasing of some of the items to make them less culture specific and conducted CFA modeling for a four factor structure and found that the 8 items correspond with the four-factor model presented in the SSS-V (Hoyle et al., 2002; Stephenson, Velez, Chalela, Ramírez, & Hoyle, 2007).

With regard to the concurrent criterion validity evidence, the original scale inversely correlated with negative attitudes on drug use and positively with drug use as expected. Additionally, the BSSS proved to be an important predictor of marijuana use in the future and its regular consumption (Hoyle et al., 2002). Primi et al. (2011) study in Italy found a positive correlation between sensation seeking and pathological gambling. Moreover, regarding predictive validity evidence, Chen et al. (2013) found that the BSSS significantly predicted the intention of alcohol consumption, binge drinking and the intention to smoke, among other findings.

When testing the internal consistency of the BSSS, Hoyle et al. (2002) found alpha coefficients between .74 and .79 for the total scale in six different sample groups classified by gender and ethnicity. The reliability obtained for the entire sample was .76. All the item-test correlations were higher than .30 and ranged between .31 and .58. Primi et al. (2011) study in Italy found a Cronbach's Alpha for the entire scale of .73 (CI 95% = .70 - .75) with the 8 items and item-test corrected correlations higher than .30. Finally, Chen et al. (2013)'s study showed a .90 reliability for the entire sample and between .89 and .92 for sub-samples grouped by genre, age and place of residence. Regarding the Cronbach's alpha for the four areas, coefficients between .45 and .67 were found for experience seeking, between .39 and .67 for susceptibility to boredom, between .75 and .85 for adventure seeking and between .71 and .87 for disinhibition. Some of these coefficients are unacceptable but are attributed to having only two items per factor.

Given the advantages of having a brief measure of sensation seeking for teenagers useful for research contexts to study different risky or problematic behaviors, the purpose of this study was to test the validity and reliability of the BSSS scale in teenagers of public schools in Lima. Specifically, we intended to assess its dimensionality and prove that the translation to Spanish still preserves the unidimensional structure. Additionally, we aimed to test the invariance of the scale according to gender. Finally, we wanted to gather evidence of its criterion related validity.

Method

Participants

The sample consisted of 1033 students from 2nd to 5th year of secondary public schools of Metropolitan Lima, 538 (52.1%) were boys and 495 (47.9%) were girls. Their ages ranged between 13

and 18 years old (M = 15.19, SD = 1.09) but 85.4% of the students were between 14 and 16 years old. The distribution of the students was similar for the three years of secondary school, having 343 students in the 3rd year (32.3%), 365 students in the 4th year and 325 students in the 5th year (31.5%). Participating public schools were selected due to the big number of pupils they gather. Every participant was included in the study only after signing an informed consent. Additionally, the study was conducted after obtaining the approval of the schools' authorities and informing the parents about the research purpose through a circular note.

Instruments

The BSSS is an 8-item measure created by Hoyle et al. (2002). The response format follows a 5-level Likert type scale: "strongly disagree", "disagree", "neither agree nor disagree", "agree", "strongly agree". As mentioned before, the scale has proper reliability and validity evidence in its original version (Hoyle et al., 2002), its Chinese adaptation (Chen et al., 2013) and its Italian adaptation (Primi et al., 2011).

Additionally, the students completed an ad hoc questionnaire to measure sociodemographic variables and variables related to substance use for collecting criterion related evidence. Some sample questions were "Would you try marijuana if you had the chance to do so?", "Have you ever consumed alcohol?", "Have you ever smoked?" etc. For these questions, the response format was dichotomic (yes/no).

Procedure

First, a translation of the scale was made using the translation and back-translation method. Two psychology professors with advanced levels of English translated the scale to Spanish. Once the independent translations were available, they were discussed and a final version was obtained. A professional translator translated this final version back into English in order to compare it with the original version. Both English versions proved to be very similar. Afterwards, a pilot with 83 students was carried out, which showed evidence that the items and the instructions were understandable. Finally, for the main study, students took the survey in their classrooms and in groups.

Data analysis

Before analyzing the dimensionality of the BSSS, data distribution had to be examined to test for univariate and multivariate normality. To assess univariate normality, the item distribution statistics were gathered: mean, standard deviation, skewness and kurtosis. To test multivariate normality, Mardia test (Mardia, 1970) and Henze-Zirkler's test (Henze & Zirkler 1990) were used.

To carry out the CFA, Maximum Likelihood robust estimation was used. Since univariate and multivariate kurtosis statistics indicated non-normality, the Satorra Bentler scaled Chi-Square for continuous non-normal outcomes was reported (Satorra & Bentler, 2001). Chi-Square is known to be sensitive to sample size so other goodness of fit measures had to be used. Particularly we considered the Root Mean Square Error of Approximation (RMSEA), the Standardized Root Mean Square Residual (SRMSR), the Comparative Fit Index (CFI) and the Tucker-Lewis index (TLI). Theoretically acceptable values for this indices are RMSEA <.06, SRMR <.08, CFI and TLI >.95 (Hu & Bentler, 1999).

Then, to analyze the invariance of the BSSS structure according to gender, a multi-group analysis was conducted following a series of hierarchically ordered steps. The baseline model tested if a single factor model held in the two samples with no invariance constraints imposed. The metric model addressed the invariance of factor loadings across groups and finally, in the scalar model, factor loadings and intercepts were constrained to be invariant across groups.

Regarding reliability, due to the concerns raised about Cronbach's alpha coefficient underestimation or overestimation of reliability under certain conditions, composite reliability was used instead (Peterson & Kim, 2013; Raykov, 2004). Finally, to analyze concurrent criterion validity, we conducted a Student's t-test mean comparison. The sample was divided in two separate groups considering their answers to each of the following indicators: the use of alcohol, tobacco and marihuana, curiosity for trying marijuana and the intention to try it if there was a chance to do so. Then the Student's t-Test results would indicate if the mean scores were different according to the students answers, because based on numerous studies, adolescence is a critical period where risky behaviors increase (Steinberg et al., 2008; Zuckerman, 1994). To account for the mean differences, Cohen's d effect size estimator and its interpretation guidelines were used (Cohen, 1992). For all statistical analysis, R version 3.1.1 and SPSS v.22 were used.

Results

In order to obtain evidence regarding dimensionality, we conducted a confirmatory factor analysis, but first, univariate and multivariate normality were tested. Table 1 shows the descriptive statistics for the BSSS items. Kurtosis in five of the eight items is negative and above the cutoff point of -1/1, revealing a slight departure from normality. Regarding multivariate normality, the Mardia's standardized estimator of the multivariate kurtosis was 8.75 and the Henze-Zirkler's multivariate normality test was not significant (HZ = 3.65; p= 0) both showing non-normality.

Table 1
Descriptive data of the BSSS items

	M	SD	Skewness	Kurtosis
1. I would like to explore strange places	3.35	1.388	-.484	-1.005
2. I would like to make a trip without any previously planned routes or schedules	3.18	1.419	-.267	-1.247
3. I feel restless when I spend much time at home	3.15	1.399	-.198	-1.248
4. I'd rather have exciting and unpredictable friends	3.22	1.279	-.264	-.941
5. I like doing scary things	2.85	1.354	.114	-1.165
6. I would like to practice extreme sports such as bungee jumping	3.56	1.441	-.636	-.975
7. I like wild parties	2.75	1.358	.185	-1.126
8. I would like to have new and exciting experiences, even if they are illegal	2.24	1.305	.777	-.510

Regarding the CFA, three models were tested. All of them showed significant Satorra-Bentler Scaled Chi-squares ($S\text{-}B\chi^2$). Theoretically, this test is expected not to be significant, which would indicate that there are no significant differences between the proposed theoretical model and the sample data. However, it is well documented that relatively large samples might produce a significant Chi-square test (Byrne, 1998). In that regard, it is necessary to assess other adjustment indices. Table 2 shows the goodness of fit indices of the three models. The baseline model, which corresponds to the unidimensional BSSS structure showed acceptable values for the SRMR but failed to meet the standards for CFI, TLI and RMSEA according to Hu and Bentler (1999). Modification indices suggested adding the error covariances between items 1 and 2. This constitutes Model B, which showed acceptable values for CFI, and SRMR, but not for TLI and RMSEA. Modification indices then suggested adding the error covariances between items 7 and 8. This addition constituted Model C, which had a good fit. All the indices proved to be acceptable.

Table 2
Goodness of fit indicators for the tested unidimensional models for the BSSS

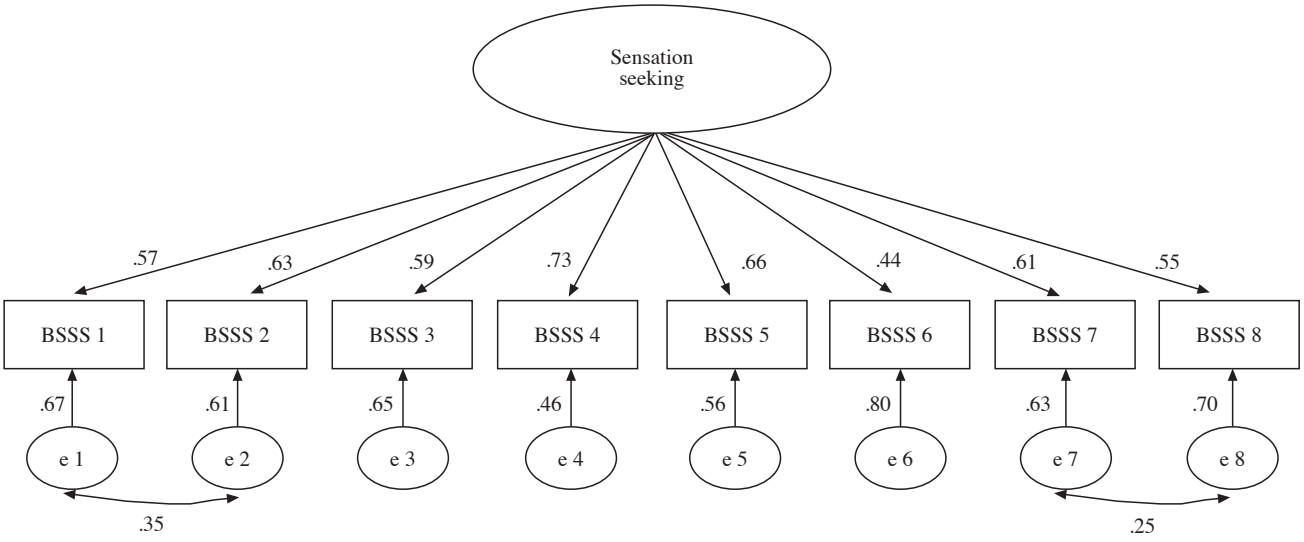
Model	S-Bχ^2	df	S-B$\Delta\chi^2$	Δdf	CFI	TLI	SRMR	RMSEA
Model A	186.249**	20	-	-	.922	.891	.045	.090
Model B	98.205**	19	88.044	1	.963	.945	.034	.064
Model C	56.740**	18	129.509	2	.982	.972	.026	.046

Note: S-B χ^2 = Satorra-Bentler chi square; *df* = degrees of freedom; S-B$\Delta\chi^2$ = Satorra-Bentler scaled difference; Δdf = difference in degrees of freedom between nested models. CFI= Robust Comparative Fit Index; TLI = Robust Tucker-Lewis Index; SRMS=Standardized Root Mean Square Residual; RMSEA= Robust Root Mean Square Error of Approximation. Model A = Baseline unidimensional model. Model B = Baseline model including covariances between items 1 and 2. Model C = Model B plus covariances between items 7 and 8.

** p<.01

In the same way, in Graphic 1, Model C is displayed. The standardized factor loadings were significant and higher than .47, exceeding the cut-off point proposed by Stevens (1992). Additionally, the BSSS1 and BSSS2 errors, as well as those from BSSS7 and BSSS8 were correlated.

As a specific aim of the study, the gender invariance property of the BSSS was analyzed. These analyses were run with a sample of 1031 participants because two of them did not indicate their gender, thus having 537 boys and 494 girls. When the metric invariance was tested, the change in chi-square was not significant ($\Delta\chi^2(7) = 7.47$, $p = .38$). These results indicate that there are no important differences in the factor loadings across the samples and that they attribute the same meaning to the latent construct. Furthermore, the scalar invariance was tested. As a result, the difference of the chi-squares was significant ($\Delta\chi^2(14) = 41.54$, p<.000), which means that there is no scalar equivalence between the samples and that their scores can´t be compared with those on the latent variable. Regarding reliability, composite reliability coefficient is .82.



Graphic 1. CFA modeling of the Brief Sensation Seeking Scale (Model C)

Table 3
Mean differences in sensation seeking according to various risk behaviors

	Yes			No			T	p	d
	M	DE	n	M	DE	n			
Curiosity for trying marijuana	3.46	.85	309	2.85	.88	715	10.24	.000	.64
Would try it if there is a chance	3.74	.94	74	2.97	.88	947	7.16	.000	.45
Use marijuana	3.80	.83	60	2.98	.90	957	6.84	.000	.43
Use alcohol	3.33	.83	498	2.77	.91	524	10.10	.000	.63
Use tobacco	3.45	.85	172	2.95	.90	850	6.68	.000	.42

Finally, in order to gather evidence of criterion validity a Student's T-Test mean comparison was conducted. Results gathered from the questionnaire showed that in terms of substance use, 498 (48.2%) adolescents claim to have used alcohol, 172 (16.7%) claim to have used tobacco and 60 (5.8%) claim to have used marijuana at some point in their lives. Likewise, 309 (29.9%) teenagers claim to be curious about trying marijuana and 74 (7.2%) claim they would try it if they had the chance to do so. As shown in Table 3, those who are curious about trying marijuana, those who would try it if they had the chance to and those who use marijuana, alcohol and tobacco have higher levels of sensation seeking than those who do not. All the effect sizes were higher than .42, showing medium to large effect sizes.

Discussion

The aim of this study was to collect validity and reliability evidence from the BSSS in Metropolitan Lima high school pupils in order to have an efficient measure of sensation seeking for teenagers that can be used in research contexts, especially, regarding substance use. Based on the results, the scale presents proper functioning.

Regarding its factor structure, results support the unidimensional model as in Hoyle et al. (2002) and Primi et al. (2011). Moreover, results indicate that the goodness of fit indices improve when including covariances between errors of two pairs of items: item 1-2 and 7-8. It is important to note that Hoyle et al. (2002) also found that their model fit improved when adding the covariances between items 1-5 (items number 1-2 in our study), χ^2 (18, n = 6281) = 215.75, CFI = .98, RMSEA = .04. Also Primi et al., (2011) obtained a model with satisfactory goodness of fit indicators: S-B χ^2 = 67.20; p<.001, CFI = .95, TLI = .93; RMSEA = .05 only after including covariances among items 1-5 (items number 1-2 in our study) and 4-8 (items number 7-8 in our study). We believe that the covariances among these pairs of items are not problematic because both pairs of items have shared meaning and they would theoretically belong to the experience seeking and disinhibition areas of the SSS-V, respectively (Hoyle et al., 2002; Stephenson et al., 2007).

Moreover, one of the strengths of the BSSS is that it reflects the SSS-V's contents (Zuckerman et al., 1978). Even though we did not test the four-factor model like in the Chinese version (Chen et al., 2013), and although it is brief, the BSSS keeps an excellent correspondence with the construct that it measures, which is also observable in the results obtained in this study. We believe that the unidimensional model is more parsimonious than a four-factor model, especially when the BSSS only has eight items.

Regarding the gender invariance, when testing the metric invariance, no significant important differences were found in the factor loadings across the samples. This model tests if different groups respond to the items in the same manner, meaning that the strength of the relationships between the scale items and the underlying construct are the same across groups (Milfont & Fisher, 2010). In this case, ratings of boys and girls in sensation seeking can be compared and observed item differences in the BSSS can indicate group differences in sensation seeking. However, scalar invariance was not fulfilled, which means that the item intercepts were not invariant between boys and girls. The only adaptation study that tests the gender invariance is the italian one (Primi et al., 2011). Contrary to our results, they did find scalar invariance across gender. These results call for the need of further study to understand which intercepts are generating the differences.

Likewise, in terms of reliability, the composite reliability coefficient is .82, which is higher than .70 as proposed by Hair, Anderson, Tatham and Black (1998). Our results are similar to what is reported in several studies with the scale (Chen et al., 2013; Hoyle et al., 2002; Primi et al., 2011; Stephenson et al., 2003) and are sufficient for conducting research studies, which is the main use that the scale will have.

Finally, regarding criterion validity evidence, it was found that those who are curious about trying marijuana, those who would try it if they had the chance to, and those who already use marijuana, alcohol and tobacco present higher levels of sensation seeking than those who do not. This finding is consistent with sensation seeking in teenagers literature (Brook, Brook, Arencibia-Mireles, Richter & Whiteman, 2001; Cohen & Fromme, 2002; Palmgreen, Lorch, Stephenson, Hoyle, & Donohew, 2007; Pohkrel et al., 2009; Ravert et al., 2009; Read, Wood, Kahler, Maddock, & Palfai, 2003; Stephenson & Helme, 2006; Vink, Nawijn, Boomsma, & Willemsen, 2007) and it demonstrates the ability of the BSSS to give account of the behavior related to the construct it measures.

With regard to the limitations of this study, it is important to note that the measurement was made in a cross-sectional manner. Longitudinal studies would be useful in order to obtain evidence of predictive criterion validity as well as to test the test-retest reliability. Similarly, other psychological constructs of the nomological network can be used to obtain evidence of convergent and discriminant validity. In addition, in terms of the study sample, it is important to emphasize that participants were teenagers of public schools, which due to their particular characteristics, do not sufficiently represent the reality of Lima's teenagers so the results cannot be generalized to the teenagers in Lima. Therefore, extending the study of the instrument's psychometric properties to teenagers from private schools in Lima is suggested.

Despite the limitations, the BSSS in its Spanish version applied to teenager students of public schools in Lima is considered a consistent and adequate tool to measure sensation seeking in this population.

Acknowledgements

This work was funded by the Dirección de Gestión de la Investigación - PUCP through grant DGI-2014-0032.

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