

# Dimensional structure of the Brief Symptom Inventory with Spanish college students

Noemí Pereda, Maria Forns and Maribel Peró  
University of Barcelona

The Brief Symptom Inventory is designed to assess symptoms of psychological disorders in adolescents and adults. The dimensional structure of the inventory, using exploratory and confirmatory factor analyses, was examined with a cross-sectional design in a Spanish sample of college students ( $N = 1,033$ , aged between 18 and 30 years old). Two hypotheses were tested: the original distribution of the items in nine factors, and the unidimensionality of the inventory. According to the results, a nine-factor structure seemed to be confirmed, although the strong intercorrelations found among the subscales indicated that these were measuring closely related constructs. The importance of cultural influences when assessing psychological symptoms and the need to develop national and sex norms for instruments that assess psychopathology, are also discussed.

*Estructura dimensional del Brief Symptom Inventory con universitarios españoles.* El Brief Symptom Inventory es un autoinforme que permite evaluar síntomas de trastornos psicológicos en jóvenes y adultos. En el presente estudio se analizó la estructura dimensional del cuestionario mediante análisis factorial confirmatorio. La muestra utilizada fueron 1.033 estudiantes universitarios de entre 18 y 30 años, pertenecientes a distintas facultades y centros adscritos de la Universidad de Barcelona. Se testaron dos hipótesis: la distribución original de los ítems en nueve factores y la unidimensionalidad del cuestionario. Los resultados obtenidos parecen confirmar la estructura de nueve factores, si bien las fuertes correlaciones entre las subescalas indican que éstas evalúan constructos muy relacionados. Se discuten también la importancia de las diferencias culturales al evaluar síntomas psicológicos y la necesidad desarrollar datos normativos en función del país y del sexo.

The Brief Symptom Inventory (BSI, Derogatis, 1975, 1993) is a 53-item self-report questionnaire designed to offer rapid screening of the symptoms of psychological disorders. The BSI was developed as a brief form of the Symptom Checklist (SCL-90-R), a self-report clinical rating scale comprising 90 items that reflect nine primary symptom dimensions (Derogatis, 1977). It comprises those items from the SCL-90-R which best reflect the nine primary symptom dimensions (Somatization, SOM; Obsessive-Compulsive, O-C; Interpersonal Sensitivity, I-S; Depression, DEP; Anxiety, ANX; Hostility, HOS; Phobic Anxiety, PHOB; Paranoid Ideation, PAR; and Psychoticism, PSY), along with four items of significant clinical interest but which are not subsumed under any of the primary symptom dimensions. It also presents the three original global indices of distress from the SCL-90-R: the Global Severity Index (GSI), the Positive Symptom Distress Index (PSDI) and the Positive Symptom Total (PST). Because correlations between similar symptom dimensions on the SCL-90 and the BSI range from .92 to .99, the BSI can be used in place of the SCL-90 for rapid assessment purposes.

The BSI has been developed and used in a wide variety of settings and applications, such as discriminating between violent and non violent male relationship partners (Gavazzi, Julian, & McKenry, 1996); assessing psychological distress following a traumatic event (Allen, Coyne, & Huntoon, 1998), such as rape (Frazier & Schauben, 1994), war (Sutker, Davis, Uddo, & Ditta, 1995), or a natural disaster (Cook & Bickman, 1990); measuring psychological response and distress with respect to physical illness and disability (Endermann, 2005; Kellett, Beail, Newman, & Frankish, 2003); assessing age differences in psychological symptoms (Hale & Cochran, 1992; Hale, Cochran, & Hedgepeth, 1984); measuring psychological distress in college students (Hayes, 1997; Sher, Wood, & Gotham, 1996); and assessing college students who were victims of child sexual abuse (Bennett & Hughes, 1996; Braver, Bumberry, Green, & Rawson, 1992).

It has also been used to assess ethnic differences in psychological symptoms between Caucasian Americans and Asians (Cheng, Leong, & Geist, 1993), Caucasian Americans, Latinos and African Americans (Hemmings, Reimann, Madrigal, & Velasquez, 1998), Caucasian Americans and Hispanic Americans (Acosta, Nguyen, & Yamamoto, 1994), Canadians and Indians (Watson & Sinha, 1999), and Irish, Polish and Filipinos (Aroian, Patsdaughter, Levin, & Gianan, 1995). In addition, the BSI has frequently been used as an index of clinical change or improvement, and treatment outcome in adults (Carscaddon, 1990; Piersma, Reaume, & Boes, 1994), and adolescents (Handal, Gist, Gilner, & Searight, 1993).

The BSI has been translated and adapted into several languages and for different cultures including Italian (De Leo, Frisoni, Rozzini, & Trabucchi, 1993), British (Francis, Rajan, & Turner, 1990), Israeli (Canetti, Shalev, & Kaplan, 1994; Gilbar, & Ben-Zur, 2002), Hindi (Watson & Sinha, 1999), and Spanish (Aragón, Bragado, & Carrasco, 2000; Ruipérez, Ibáñez, Lorente, Moro, & Ortet, 2001), and shows reliable and valid psychometric properties.

Although the questionnaire was designed to measure psychiatric symptoms multidimensionally, the factor structure obtained by a number of researchers has shown variations with respect to the original form. Derogatis and Melisaratos (1983) reported a structure of nine factors and stated that although there were certain minor differences between the empirical factor structure and the hypothesized dimensional structure, there was more agreement than disagreement between the two. However, structures of five factors (Johnson, Murphy, & Dimond, 1996), six factors (Hayes, 1997; Ruipérez et al., 2001), eight factors (Kellett, Beail, Newman, & Hawes, 2004), and one single factor of general distress (Aragón et al., 2000; Endermann, 2005; Piersma, Boes, & Reaume, 1994) have also been reported.

In Spain, Ruipérez et al. (2001) conducted an exploratory factor analysis of Principal Components with Oblimin rotation, and defended, for non-clinical populations, the six-factor structure: depression, phobic anxiety, paranoid ideation, obsession-compulsion, somatization, and hostility/aggressivity. None of the subscales replicated the original BSI's factor structure. However, the authors did not include two items from the original BSI in their analyses (items 7 and 9). They concluded that the six-factor solution was not incompatible with the use of the BSI as a measure of general psychological distress.

Aragón et al. (2000) replicated the studies of Boulet and Boss (1991), and Piersma, Boes, et al. (1994) with Spanish parents of children under psychiatric care. The authors argued that the BSI measures a unidimensional construct of general psychological distress, as although they obtained a four-factor solution in the exploratory factor analysis of Principal Components with Varimax rotation, the first factor accounted for more than 68% of the total variance (85%).

Variations in factor structure have mainly been attributed to differences in the factor analysis procedure (Hayes, 1997; Ruipérez et al., 2001), and also to the use of different samples (e.g., college students, psychiatric in-patients, and the elderly). Thus, the proposed factor structure of the BSI appears to require further research (Hayes, 1997; Ruipérez et al., 2001).

The main aim of the present study was to extend the psychometric evidence base of the BSI by examining the dimensional structure of its Spanish adaptation in a non-clinical sample of college students. As stated by Cochran and Hale (1985), college students report a different pattern of distress than do normal adults or adolescents. Authors have documented the typical and sometimes unique mental health issues faced by college students that arise from both developmental and environmental demands (Hayes, 1997). Although the BSI has been previously used with college students (Brodoy & Mason, 1991; Cheng et al., 1993; Cochran & Hale, 1985), its construct validity with this type of sample has not been determined. In this work, the nine-factor structure proposed by Derogatis and colleagues (Derogatis & Melisaratos, 1983; Derogatis & Spencer, 1982), and the unidimensionality proposed by others (Aragón et al., 2000;

Boulet & Boss, 1991; Piersma, Boes et al., 1994) were tested with a confirmatory factor analysis. In addition, the internal consistency reliability of the Spanish version was reported. Sex and age differences were examined due to the differences found by Derogatis and Melisaratos (1983), and other authors (Canetti et al., 1994; Cochran & Hale, 1985; De Leo et al., 1993; Francis et al., 1990; Gilbar & Ben-Zur, 2002; Hale et al., 1984; Sher et al., 1996).

## Method

### *Participants*

The Spanish version of the BSI was applied to a non-clinical sample of 1,033 undergraduate students attending the University of Barcelona, ranging in age from 18 to 30.6 years old ( $M= 22.1$ ;  $SD= 31.46$ ). The sample was composed of 317 males (30.7%), of mean age 22.3 years ( $SD= 31.82$ ), and 716 females (69.3%), of mean age 22 years ( $SD= 31.28$ ).

Participants were recruited by randomly cluster sampling from different Faculties and Schools at the University of Barcelona, and a proportional sample from each Academic Division was obtained (academic year 2001/2002). A cross-sectional design for obtaining data was used.

### *Measure*

The BSI (Derogatis, 1975; 1993) can be completed in ten minutes (Derogatis & Melisaratos, 1983), and it is rated on a 5-point scale of distress, ranging from «not at all» (0) to «extremely» (4). The standard time set given with the BSI is «the past seven days including today», although other specific periods of time may be established (Derogatis, 1977; Derogatis & Spencer, 1982).

Earlier data for the BSI show an acceptable internal consistency ranging from .71 on the PSY dimension to .85 on DEP (Derogatis & Melisaratos, 1983; Derogatis & Spencer, 1982). Other studies with different samples have found a similar internal consistency for the nine original dimensions (Aragón et al., 2000; Aroian et al., 1995; Brodoy & Mason, 1991; Canetti et al., 1994; Endermann, 2005; Gilbar & Ben-Zur, 2002; Hayes, 1997; Kellett et al., 2003; Watson & Sinha, 1999). The internal consistency for the three global indices has been also calculated (GSI: .90; PSDI: .87; PSTS: .80), showing a good reliability of the measure over time, especially for the GSI (Derogatis & Melisaratos, 1983; Derogatis & Spencer, 1982). Other studies have also shown excellent reliability coefficients on the GSI (Aragón et al., 2000; Aroian et al., 1995; Canetti et al., 1994; Gilbar & Ben-Zur, 2002; Johnson et al., 1996; Ruipérez et al., 2001; Watson & Sinha, 1999) (see Table 1).

### *Procedure*

#### *Adaptation of the BSI*

The Spanish translations of the BSI carried out previously by Aragón et al. (2000), and Ruipérez et al. (2001) were analyzed; however, these studies did not report the process of translation, and some of the translated items did not correspond fully to the content of the original English items. In addition, Ruipérez et al. (2001) did not include two items from the original BSI in their

analyses (items 7 and 9). Also, the use of the respectful third person pronoun (*usted*) was not suitable for college students. The need for a new adaptation to use with college students was therefore confirmed. A new translation of the BSI, both forwards and backwards, was done by two psychologists from the University of Barcelona who were fluent in both English and Spanish. The third person pronoun (*usted*) was also changed to a more informal form (*tú*) in keeping with the young sample of our study. The correspondence between the original inventory and the forward and back translations was assessed by a clinical psychologist, who agreed with the content of the items in the Spanish version.

#### *Application of the instrument*

Verbal consent to participate in the study was obtained from the directors of the Faculties and Schools of the University of Barcelona. The objective of the study was explained to the students, and they all provided informed consent; none of them refused to participate. The inventory was anonymous and administered in groups of 20 to 90 students. Confidentiality of the data was assured. The time set given with the BSI was «the past month including today», since it was administered as part of a comprehensive battery of questionnaires with this period of reference. Upon completion of the study a summary containing the most significant results was given to the director of studies. In addition, a counseling service was offered to the students who had participated.

#### *Data analysis*

Two confirmatory factor analyses were carried out in order to test the original nine-factor structure proposed by Derogatis and Melisaratos (1983), and the unidimensionality hypothesized by

other authors (Aragón et al., 2000; Boulet & Boss, 1991; Piersma, Boes et al., 1994). The method of parameter estimation used in the confirmatory factor analyses was elliptic robust least squares (ERLS), due to the nature of the items (Likert format and biased distribution) (Bentler & Dijkstra, 1985). The analyses did not include the Additional Items since the authors (Derogatis & Spencer, 1982) argue that they are not hypothesized to have univocal loadings on any of the nine primary BSI dimensions.

The internal consistency reliability of the Spanish version was reported. In addition, a multivariate analysis of variance was conducted in order to test for sex differences. Age of the students was correlated with the BSI subscales.

The data obtained were analyzed with the SPSS version 11.0 and EQS version 6.1 statistical packages.

## Results

#### *Sample characteristics*

A significant relationship was found between sex and Schools ( $\chi^2= 77.57, p<.01, T^2= .033$ ). There were more females ( $n= 716$ ) than males ( $n= 317$ ) in the sample, with the exception of the Associated Schools, although this is in accordance with the number of female students at the University of Barcelona.

The medians for the scores on each item were all below the midpoint of the scale and ranged from 0 to 2 (with standard deviations of .58 and 1.11). The sample used all the scores (from 0 to 4) to mark each item, with the exception of item number 2, «*Faintness or dizziness*» (from 0 to 3).

Descriptive data applied to the subscales are shown in Table 2. The means for the subscales were also below the midpoint of the scale. These results were expected since the questionnaire was applied to a non-clinical sample.

*Table 1*  
Internal consistency for the BSI

Authors and year of publication	Nationality	Population	Sample characteristics		Internal Consistency ( $\alpha$ )	
			N	Mean age	Original nine subscale	GSI
Derogatis & Spencer (1982)	North-American	Adults non-patient	719	46 $\pm$ 14.7	.71 (PSY) to .85 (DEP)	.90
Brodsky & Mason (1991)	North-American	Counseling Center clients	343	24 yrs. old	.70 (PSY) to .88 (DEP)	-
Johnson et al. (1996)	North-American	Bereaved parents	260	?	.63 (INT) to .83 (ANX)	.97
Hayes (1997)	North-American	Counseling Center clients	2,078	23.2 $\pm$ 6.2	.66 (PHOB) to .86 (DEP)	-
Aragón et al. (2000)	Spanish	Parents of children attending a Counseling Center	743	40.5 yrs. old	.87 (PHOB) to .96 (SOM)	.98
Kellett et al. (2003)	British	Adults with mild intellectual disabilities	200	36.11 $\pm$ 10.5	.63 (PSY) to .78 (O-C)	-
Endermann (2005)	German	Patients with epilepsy and mild intellectual disabilities	91	39.5 $\pm$ 14.5	.64 (PHOB) to .79 (ANX & PAR)	.96
Gilbar & Ben-Zur (2002)	Israeli	Adults non-patient	510	45.6 $\pm$ 8.61	.71 (PSY) to .83 (SOM)	.96
Canetti et al. (1994)	Israeli	High School students	840	16.77 $\pm$ .99	.66 (PSY) to .83 (DEP)	.95
Watson & Sinha (1999)	Indian	Undergraduate students	199	19.6 $\pm$ 2.32	.59 (PAR) to .73 (SOM & DEP)	.95
	Canadian	Undergraduate students	347	20.08 $\pm$ 1.41	.70 (PSY) to .86 (DEP)	.95
Aroian et al. (1995)	Polish	Adults non-patient	25	43.9 $\pm$ 15.2	.48 (PSY) to .91 (ANX)	.96
	Filipino	Adults non-patient	29	37.4 $\pm$ 11.2	.57 (PSY) to .88 (HOS)	.96
	Irish	Adults non-patient	25	33.9 $\pm$ 9.6	.85 (PSY) to .97 (PHOB)	.99

*Table 2*  
Means and standard deviations by sex for the Spanish version of the BSI

Scales	Male		Female		p
	M	SD	M	SD	
SOM	.38	.49	.56	.53	p<.001
O-C	1.00	.70	1.01	.71	n.s.
I-S	.76	.74	.98	.85	p<.001
DEP	.83	.71	.96	.79	p<.001
ANX	.80	.63	1.00	.65	p<.001
HOS	.77	.70	.79	.69	n.s.
PHOB	.34	.53	.42	.56	p<.01
PAR	.75	.70	.81	.69	n.s.
PSY	.62	.66	.69	.69	n.s.
GSI	.70	.50	.81	.53	-
n	317	716			

*Internal Structure*

*Confirmatory Factor Analysis*

The confirmatory factor analysis carried out tested two different hypothetical structures: the original nine-factor solution and the unidimensional structure, as previously described.

As table 3 shows, the indices of adjustment for the two confirmatory factor analyses indicated a good adjustment for the nine-factor model, and the unidimensional model (*BBNFI*,

*Table 3*  
Fit index for the nine-factor and unifactorial model for the confirmatory factor analysis

Fit index	Nine factors (N= 1.033)	One factor (N= 1.033)
$\chi^2$	3868.834 df.= 1091 p<.00001	6868.269 df.= 1127 p<.00001
<i>BBNFI</i>	0.948	0.908
<i>BBNNFI</i>	0.959	0.919
<i>CFI</i>	0.962	0.922
<i>IFI</i>	0.962	0.922
<i>RMR</i>	0.047	0.055
<i>SRMR</i>	0.051	0.061
<i>RMSEA</i>	0.050	0.070
Models' comparison		
$\Delta \chi^2$	$\Delta df.$	p
1-9	2999.435	36 <.001
Tuker Lewis Index		
1-9	0.500	

$\chi^2$ : chi square; df: degrees of freedom; *BBNFI*: Bentler-Bonett normed fit index; *BBNNFI*: Bentler-Bonett non-normed fit index; *CFI*: comparative fit index; *IFI*: Bollen fit index; *RMR*: root mean squared residual; *SRMR*: standardized root mean squared residual; and *RMSEA*: root mean

*BBNFI*, *CFI*, *IFI*, *RMR*, *SRMR*, and *SMSEA*). The values for the various fit indices were in line with those suggested by Russell (2002) (see also Bados, Solanas, & Andrés, 2005; Cecchini Estrada, González González-Mesa, & Montero Méndez, 2007; García, Musitu, y Veiga, 2006). However, it is worth noting that the nine-factor structure was significantly better than the unidimensional structure, as shown by the test of chi-square ( $\Delta \chi^2= 2999.44, p<.001$ ). The structural parameters estimated for the two models were significant, their standardized values ranging between .33 and .83.

In accordance with the results obtained in the confirmatory factor analysis, and following Derogatis and Melisaratos (1983) original distribution, it was decided to choose a nine-factor model for further analysis.

*Correlations*

The correlation matrix among subscales was calculated. As can be seen in Table 4, correlations among subscales were moderate-to-high.

*Internal Consistency*

Internal consistency for the subscales was calculated using Cronbach's  $\alpha$  coefficient. The reliability was calculated following Derogatis (1975; 1993) distribution of the items in the nine subscales. The subscales showed moderate reliability indices: .74 for SOM, .79 for O-C, .80 for I-S, .84 for DEP, .77 for ANX, .78 for HOS, .72 for PHOB, .73 for PAR, .72 for PSY, and .95 for GSI.

*Differences within groups*

To test the differences between means for 'sex', multivariate analyses of variance were conducted with sex as the independent variable and the nine subscales as dependent variables. The Kolmogorov-Smirnov test applied to the scale scores yielded z values ranging from 7.59 for PHOB ( $p<.001$ ), to 3.58 for O-C ( $p<.001$ ), so data were not normally distributed on any subscale and presented positive asymmetry. Therefore, a square root conversion for each subscale was carried out before subsequent analysis (Hair, Anderson, Tatham, & Black, 2001). The conversion did not normalize any subscale. However, a Box test showed that

*Table 4*  
Correlations for the original distribution of the items in nine subscales

	F1 SOM	F2 O-C	F3 I-S	F4 DEP	F5 ANX	F6 HOS	F7 PHOB	F8 PAR	F9 PSY
F1 SOM	-								
F2 O-C	.523**	-							
F3 I-S	.447**	.563**	-						
F4 DEP	.466**	.592**	.708**	-					
F5 ANX	.607**	.613**	.592**	.634**	-				
F6 HOS	.449**	.472**	.515**	.570**	.557**	-			
F7 PHOB	.519**	.478**	.526**	.501**	.592**	.378**	-		
F8 PAR	.432**	.513**	.648**	.586**	.545**	.566**	.494**	-	
F9 PSY	.486**	.577**	.706**	.810**	.620**	.547**	.550**	.631**	-

\*\*Significant at  $p<.01$

a multivariate analysis of variance (MANOVA) could acceptably be applied to the standardized data (Box test before conversion:  $F = 1.46$   $p = .023$ ; Box test after conversion:  $F = .859$ ;  $p = .737$ ). The test showed significant differences between sexes on SOM ( $F_{(1, 1031)} = 34.75$ ;  $p < .001$ ;  $\eta = .010$ ), I-S ( $F_{(1, 1031)} = 22.57$ ;  $p < .001$ ;  $\eta = .005$ ), DEP ( $F_{(1, 1031)} = 7.26$ ;  $p < .01$ ;  $\eta = .001$ ), ANX ( $F_{(1, 1031)} = 27.18$ ;  $p < .001$ ;  $\eta = .003$ ), and PHOB ( $F_{(1, 1031)} = 7.49$ ;  $p < .01$ ;  $\eta = .003$ ) scales, with females scoring higher than males.

The correlation matrix among subscales and age also showed a significant relationship, with younger students scoring higher than older students on HOS ( $r = .097$ ;  $p < .01$ ;  $r^2 = .009$ ).

### Discussion

This research has reported the first confirmatory structure and internal consistency of the BSI (Derogatis, 1975) with Spanish college samples. The provision of factor analytic information regarding the construct validity of the BSI would be an invaluable addition to the expanding field of psychometric assessment of psychological symptomatology. The current study has contributed to considerations of the validity and utility of the BSI with college students.

The good fit index values obtained in the confirmatory factor analysis for the nine-factor solution showed the adequacy of the original structure hypothesized by the authors in contrast to the unidimensional structure suggested by others (Aragón et al., 2000; Boulet & Boss, 1991; Piersma, Boes et al., 1994). In addition, a distribution of the items in nine subscales allows to do a more accurate clinical screening than just a total score. However, the strong intercorrelations among the subscales, as well as the high internal consistency of the GSI for the total group, indicated that these were measuring closely-related constructs (Ruipérez et al., 2001). Regarding the six factor structure found by Ruipérez et al. (2001) on their study with a non-clinical adult Spanish sample, it should be noticed that the authors did not include two items of the original BSI in their analysis. Such omission may have had an effect on their reported results.

The reliability coefficients obtained were quite acceptable, ranging between .72 (PHOB, PSY) and .95 (GSI), and they correspond closely to the values reported in the manual (Derogatis & Spencer, 1982). Other studies also have reported good alpha values, but based on slightly different factor structures (Aragón et

al., 2000; Aroian et al., 1995; Broday & Mason, 1991; Gilbar & Ben-Zur, 2002; Hayes, 1997; Ruipérez et al., 2001). Consequently, the internal consistency of the Spanish translation is as valuable as that obtained in the previous studies.

The sample presented several differences in relation to sex, with female students scoring significantly higher than male students on Somatization, Interpersonal Sensitivity, Depression, Anxiety, and Phobic Anxiety. The results are consistent with numerous studies that have applied the scale, and indicate that women may display more somatic and anxiety-based symptoms, and also symptoms related to inferiority and social distress (Canetti et al., 1994; De Leo et al., 1993; Derogatis & Melisaratos, 1983; Francis et al., 1990; Gilbar & Ben-Zur, 2002; Hale et al., 1984). Although these results were not found in Cochran and Hale's (1985) college sample, they were reported in Hayes's (1997) study of college and university students attending a counseling center. As stated elsewhere (Canetti et al., 1994; Watson & Sinha, 1999), differences in willingness to report psychological symptoms are often cited as an explanation for sex differences in psychological symptomatology. The design of the present research does not permit any meaningful answer to this question.

Also, a significant difference was found in relation to age, with a decline of hostility in females and males (De Leo et al., 1993). This result is consistent with other studies which have found a decrease on general distress measured by the BSI in students over the course of 4 years of college (Sher et al., 1996).

### Conclusions

As a result of the psychometric properties illustrated, this study supports the utilization of the BSI, a scale that provides a rapid and reliable way of measuring symptoms of psychological distress, with Spanish college students. The psychometric properties of the inventory found in the present study confirmed the original nine-factor structure presented by the authors (Derogatis & Melisaratos, 1983). In addition, in terms of screening accuracy the original nine-factor distribution should be considered the best solution.

The results underline the importance of developing specific norms for college and national samples, and also for different sex groups (Cochran & Hale, 1985). Additional research with different samples is needed to document further the validity and utility of this scale and its internal structure.

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