

## The Social Phobia Inventory: Screening and Cross-Cultural Validation in Spanish Adolescents

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Availability of brief, self-report measures to be used as screening instruments is crucial to detect correctly youth with social anxiety disorder and therefore, reach those otherwise under-detected and under-treated. A previous study revealed that the *Social Phobia Inventory* (SPIN) was potentially an appropriate measure for screening social anxiety among US adolescents. However, there is a lack of information concerning its properties as a screening test in other cultures and languages. This is the main objective of this study, although further validity of the scale is provided as well. The sample consisted of 192 adolescents (a sample composed of 114 subjects with a principal diagnosis of social anxiety disorder; and a group consisting of 78 subjects with no diagnosis of social phobia). Results suggest that the Social Phobia Inventory has demonstrated good psychometric properties and indeed may be used as a screening tool in Spanish-speaking adolescents.

*Keywords:* adolescence, cross-cultural, screening, social anxiety.

Resulta crucial poder disponer de instrumentos de evaluación con un formato breve de cara a poder detectar correctamente a aquellos adolescentes con trastorno de ansiedad social que de otra manera no serían detectados, y por consiguiente, no recibirían tratamiento. Un estudio previo reveló que el Inventario de Fobia Social (*Social Phobia Inventory*, SPIN) era una medida potencialmente apropiada como criba o *screening* para detectar ansiedad social entre adolescentes estadounidenses. Sin embargo, hay una falta de información sobre sus propiedades psicométricas en otras lenguas y culturas. Éste es el principal objetivo de este estudio, aunque también se proporcionan nuevos datos sobre su validez. La muestra se compuso de 192 adolescentes (114 sujetos con un trastorno principal de trastorno de ansiedad social, y 78 sujetos sin este trastorno). Los resultados sugieren que el Inventario de Fobia Social ha confirmado sus propiedades psicométricas en población adolescente española, y puede ser usado como una herramienta de criba o *screening*.

*Palabras clave:* adolescencia, transcultural, screening, ansiedad social.

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Social anxiety disorder (SAD) tends to be a chronic, stable condition with an early age of onset that severely disrupts long-term functioning (Dalrymple, Herbert & Gaudino, 2007; Garcia-Lopez, Piqueras, Diaz-Castela & Ingles, 2008). Lifetime prevalence of social anxiety disorder in adolescents usually ranges between 2 and 9% (Essau, Conradt, & Petermann, 1999; Fehm, Pelissolo, Furmark, & Wittchen, 2005; Gren-Landell et al., 2009; Ranta, Kaltiala-Heino, Rantanen, & Marttunen, 2009). Its most negative detrimental effects include substantially increased risks of depression, suicide attempts, substance abuse, severe social restrictions, leaving school early, and lower educational attainment (Beidel, Turner, & Morris, 1999; Beidel et al., 2007; Essau, Conradt, & Petermann, 2002; Essau et al., 1999; Ranta, Kaltiala-Heino, Koivisto et al., 2007; Wittchen, Stein, & Kessler, 1999). Despite this, however, adolescents with social anxiety disorder are commonly under-detected and, therefore, under-treated. Given the serious consequences of childhood anxiety, as well as the lifelong suffering usually associated with the disorder and the economic costs to society, it is essential that anxiety be addressed as effectively and as early as possible. In this regard there is a crucial need for self-report instruments that might be used as screening measures.

One relatively promising self-report measure, which in the last decade has received considerable attention, is the Social Phobia Inventory (SPIN; Connor et al., 2000). This 17-item instrument measures behavioral, physiological and cognitive symptoms associated with social phobia. Six of its items assess fear in social situations, seven items measure avoidance of performance of social situations and four items evaluate physiological discomfort in social situations. Subjects are asked to rate the frequency with which they experienced each symptom over the last week, using a five-point Likert-type scale (0-4). Thus, the range of scores is 0-68, with higher scores reflecting higher levels of social anxiety symptomatology. Due to its brevity and easy scoring format the SPIN is becoming a popular measure for screening social anxiety.

The original SPIN was designed for adults and showed high internal consistency (Cronbach's  $\alpha = .82-.94$ ) and test-retest reliability ( $r = .78-.89$ ), as well as high concurrent and divergent validity. Furthermore, a cut-off score of 19 was proposed to differentiate subjects with SAD from those without this disorder. Further studies have confirmed that the SPIN possesses high internal consistency and convergent, construct and discriminant validity, as well as unidimensionality and sensitivity to treatment changes in an adult population (Allgulander et al., 2004; Antony, Coons, McCabe, Ashbaugh, & Swinson, 2006; Rickels, Mangano, & Khan, 2004; Stein, Versiani, Hair, & Kumar, 2002).

Although initially developed for adults, research conducted over the last five years has also demonstrated its validity and reliability in adolescent community populations in countries such as the USA, Finland and Brazil. Thus,

Vilete, Coutinho & Figueroa (2004) reported high internal consistency (Cronbach's  $\alpha = .88$ ) and test-retest reliability ( $r = .78$ ) in a community, Brazilian population. In another community sample, Johnson, Inderbitzen-Nolan and Anderson (2006) found the SPIN to have high concurrent and divergent validity, it showing positive correlations with the Social Anxiety Scale for Adolescents (SAS-A; La Greca & Lopez, 1998) and the Social Phobia Anxiety Inventory for Children (SPAI-C; Beidel, Turner, & Morris, 1995), but only moderate correlations with scales measuring depression (i.e. the Children's Depression Inventory; CDI). These authors also stated that a cut-off score of 21 on the SPIN was the most suitable for discriminating between adolescents with SAD and those without this disorder. Internal consistency (Cronbach's  $\alpha = .92$ ) and test-retest reliability ( $r = .86$ ) indexes were also good. In a community, Finnish population Ranta, Kaltiala-Heino, Koivisto et al. (2007) also found the SPIN to show high internal consistency (Cronbach's  $\alpha = .89$ ) and test-retest reliability ( $r = .81$ ). These authors suggested an alternative three-factor structure of the SPIN. Another study by Ranta et al. (2007) revealed that the SPIN may also discriminate between adolescents with sub-clinical levels of social anxiety and SAD, as well as between adolescents diagnosed with SAD and those with other anxiety disorders or disruptive disorders. A cut-off score of 24 was proposed to identify adolescents with SAD.

Overall, these findings demonstrate that the SPIN has strong internal consistency, test-retest reliability and construct validity for adolescents in three languages: English, Finnish and Portuguese. However, no data have yet been published regarding the use of this scale in Spanish-speaking adolescents. Moreover, there are differences across the above three studies, particularly with respect to cut-off scores. In this regard it should be remembered that cultures may have different ways of expressing social anxiety disorder in adolescence. Thus, given that cultural differences may affect the evaluation of the social anxiety construct (Dinnel, Kleinknecht, & Tanaka-Matsumi, 2002; Hong & Woody, 2007), further research is needed to examine the psychometric properties of this scale with adolescent populations in other countries, languages and cultures.

The main aim of the present study was to examine the potential use of the SPIN as a screening measure for Spanish-speaking adolescents and to determine an optimal cut-off score. A second objective was to analyze the reliability and factor structure of the SPIN in adolescents with a DSM-IV diagnosis of social phobia and in those without. In order to evaluate further the psychometric properties of the SPIN, the study also examined its sensitivity as a measure of symptom change following a school-based, cognitive-behavioral intervention aimed at overcoming social anxiety in adolescents. This is the first study to report on the potential utility of the SPIN as an outcome measure following psychological treatment in adolescents.

## Method

### Participants

The sample was composed of 192 adolescents (63% girls) from three private and eight public high-schools in a medium-size state in the south of Spain. Schools were selected by a clustered random sampling method from the school lists of the Department of Education. The mean age of this sample was 15.91 years (*SD*: .81, range: 15-17). Table 1 provides a detailed description of the age and gender characteristics for the SAD and control samples. Of those participants given a primary diagnosis of generalized social phobia according to DSM-IV-TR (APA, 2000), sixteen completed a twelve-week, school-based, cognitive-behavioral treatment, with the SPIN being part of the outcome assessment battery.

### Measure

#### *Spanish translation of the Social Phobia Inventory (SPIN)*

The SPIN was translated into Spanish by two clinical child psychologists with experience in social anxiety measures and proficiency in English. The final version was obtained by consensus, and this Spanish version was then back-translated by a bilingual psychologist. The inter-translation agreement reached was .97 in the first case and .98 in the second. This is consistent with evidence of validity for Spanish and English versions of anxiety scales, as reported by Novy, Stanley, Averill, and Daza (2001).

*Social Phobia and Anxiety Inventory (SPAI)*. Turner, Beidel, Dancu and Stanley (1989) developed a self-report

inventory that assesses behavioral, physiological and cognitive symptoms associated with social anxiety disorder. The SPAI is comprised of two scales: the 32-item Social Phobia subscale (Likert-type scale: 1-7) and the 13-item Agoraphobia subscale. The difference score is calculated by subtracting the Social Phobia and Agoraphobia subscales. Research has demonstrated that the SPAI is a valid and reliable measure for Spanish-speaking adolescent populations (Garcia-Lopez, Olivares, Hidalgo, Beidel, & Turner, 2001; Garcia-Lopez, Olivares, & Hidalgo, 2005; Olivares, Garcia-Lopez, Hidalgo, Turner, & Beidel, 1999). Here, only the social phobia subscale was used, since the social phobia subscale score and the difference score are highly correlated and a number of studies suggest that the social phobia subscale score has superior psychometric properties to those of the difference score (for a review, see Garcia-Lopez, Piqueras et al., 2008). A cut-off score of 70 on the Social Phobia subscale has been shown to produce the highest agreement rate (Olivares, Garcia-Lopez, Hidalgo et al., 2002).

*Social Phobia and Anxiety Inventory-Brief (SPAI-B)*. A brief version of the SPAI for adolescents has recently been published (Garcia-Lopez, Beidel et al., 2008). The SPAI-B consists of sixteen items (Likert-type scale: 1-5) and, as with the original scale, assesses cognitive, somatic and behavioral symptoms of social anxiety. No cut-off scores are available at present.

*Social Anxiety Scale for Adolescents (SAS-A)*. This questionnaire is an adaptation of the Social Anxiety Scale for Children-Revised (SASC-R) for an adolescent population (La Greca & Lopez, 1998). Similar to the SASC-R, the SAS-A contains 22 items (Likert-type scale: 1-5): eighteen

Table 1  
Gender and age of subjects for each samples

<i>Total Sample</i>				
	15 years	16 years	17 years	Total
Boys	30 (15.6%)	17 (8.9%)	24 (12.5%)	71 (37.0%)
Girls	43 (22.4%)	47 (24.5%)	31 (16.1%)	121 (63.0%)
Total	73 (38.0%)	64 (33.3%)	55 (28.6%)	192 (100%)
<i>SAD subsample</i>				
	15 years	16 years	17 years	Total
Boys	13 (11.4%)	11 (9.6%)	17 (14.9%)	41 (36.0%)
Girls	26 (22.8%)	28 (24.6%)	19 (16.7%)	73 (64.0%)
Total	39 (34.2%)	39 (34.2%)	36 (31.6%)	114 (100%)
<i>Control subsample</i>				
	15 years	16 years	17 years	Total
Boys	17 (21.8%)	6 (7.7%)	7 (9.0%)	30 (38.5%)
Girls	17 (21.8%)	19 (24.4%)	12 (15.4%)	48 (61.5%)
Total	34 (43.6%)	25 (32.1%)	19 (24.4%)	78 (100%)

Note: The Table shows frequency (percentages) for each sample

descriptive self-statements and four filler items. The SAS-A includes three subscales: Fear of Negative Evaluation (FNE; eight items), Social Avoidance and Distress specific to new situations or unfamiliar peers (SAD-New; six items), and Social Avoidance and Distress that is experienced more generally in the company of peers (SAD-General; four items). A similar factor structure was found in a Spanish-speaking population by Olivares et al. (2005). A cut-off of 44 in the total score has been demonstrated to produce the highest agreement rate (Olivares, Garcia-Lopez, Hidalgo et al., 2002).

*Anxiety Disorders Interview Schedule for DSM-IV: Child Version (ADIS-IV-C; Silverman & Albano, 1996).* The ADIS-IV-C assesses anxiety and mood disorders and screens for the presence of disruptive behavior disorders, psychosis and eating disorders. The social phobia module assesses the extent to which a child fears and avoids various social and performance situations. In this module, 22 situations are assessed and the informant assigns a fear rating (ranging from 0 to 8) to indicate the extent to which the child fears that situation. The ADIS-IV-C has moderate to strong inter-rater reliability, adequate concurrent validity and strong retest reliability (Lyneham, & Rapee, 2005; Pulifacio, Comer, & Kendall, 2007; Rapee, Barrett, Dadds, & Evans, 1994; Silverman, Saavedra & Pina, 2001; Wood, Piacentini, Bergman, McCrackne, & Barrios, 2002). A diagnosis is assigned if a severity rating of 4 or more on a 0-8 rating of distress/impairment is given.

### Procedure

This study is part of a larger three-phase project. Phase I involved screening students, this being a necessary step in order to conduct phase II. Specifically, phase I began by obtaining consent from a parent or legal guardian, and then two trained research assistants administered the scales and gave instructions for completing the SPAI and SAS-A. Students completed the self-report inventory in their classrooms. Because a group situation might artificially increase anxiety or create a situation where social desirability may influence the results, students left a space between seats. Students whose parents or legal guardian signed the consent forms and returned it by the assessment date participated in the study (parent consent rate: 89%). On phase II, the diagnostic interview and self-report measures were administered to: 1) 142 students who scored higher than the combination of 70 and 53 on the SPAI and the SAS-A, respectively (these being the cut-off scores defined by Olivares, Garcia-Lopez, Hidalgo et al., 2002); and 2) a random sample of 50 control students who had not exceeded the cut-off scores. As a result, 192 students were assessed in phase II and provided the sample for the present study. Of these, and using the ADIS-IV-C as the diagnostic instrument, 114 adolescents met DSM-IV criteria for social anxiety disorder. The research assistants were trained by the first author in how to administer the

interview. Inter-rater reliability was calculated using the kappa coefficient method. The results (mean kappa coefficients of .82) indicated excellent inter-rater reliability according to the criteria of Landis and Koch (1977).

In phase III, adolescents with a clinical diagnosis of generalized social phobia were invited to receive a free, school-based, CBT intervention called IAFS (Intervencion para Adolescentes con Fobia Social/Therapy for Adolescents with Social Phobia: Garcia-Lopez, 2007; Olivares & Garcia-Lopez, 1998), the design of which was based on Social Effectiveness Therapy for Children and Adolescents (SET-C; Beidel, Turner, & Morris, 2003) and Cognitive Behavioral Group Therapy for Adolescents (CBGT-A; Albano & DiBartolo, 2007). The IAFS consists of twelve, weekly group sessions, each lasting 90 minutes. Techniques include social skills, exposure and Beck's cognitive restructuring techniques. Treatment also includes exposure to social situations using peer assistants and video-feedback. Along with group sessions, weekly individual counseling may be scheduled as needed. This school-based, cognitive-behavioral intervention has been shown to be effective at one- and five-year follow-ups (Garcia-Lopez et al., 2002, 2006; Olivares, Garcia-Lopez, Beidel et al., 2002). Subjects in the clinical sample were treated by the first author, who holds a PhD in psychology and has twelve years experience of treating social anxiety, and six co-therapists (doctoral students or advanced master's level students, who had received 25 hours of seminars).

Of the sample diagnosed with SAD ( $n = 114$ ), 21 agreed to participate in the treatment protocol. In this sub-group the SPIN was administered both before and after the therapy program. Reasons for refusal to enter the trial were the lack of parental consent, reported non-availability of time, transport problems, and low self-perception of social phobia as a treatable condition. Sixteen adolescents (76% girls), with an age range of 15 to 18 years ( $M = 16.9$ ,  $SD = .68$ ), finished the treatment protocol and were assessed pretest and posttest using the SPIN as one of the treatment outcome measures. Adolescents were randomly assigned to three groups (range of participants per group: 5-6).

### Statistical analyses

Analyses of variance (ANOVA) were conducted for the total SPIN score achieved by both the total sample and the SAD sub-sample, with gender and age as the between-subjects factors.

To test the reliability of the questionnaire Cronbach's alpha was used to examine internal consistency, and a classical item analysis was also carried out.

The factor structure of the SPIN with Spanish students was examined by means of confirmatory factor analysis (CFA). Two alternative factor models were suggested: (a) a one-factor model, which predicted that all the items would load on the same factor; and (b) the three-factor model proposed by Ranta, Kaltiala-Heino, Koivisto et al.

(2007). The correlation matrix and computed fit indexes from maximum likelihood factor analysis estimation were analyzed to confirm the unidimensionality of the SPIN in adolescents. CFA enables the adequacy of a proposed factor structure to be evaluated, and here the overall fit of the models to the data was assessed in several ways. Ideally, a small, non-significant chi-square statistic represents a good fit. However, because the chi-square statistic is fairly sensitive to sample size it was not computed, and additional fit indexes were examined. A fit was considered to be good if: (a) the goodness-of-fit index (GFI) was .90 or above; (b) the adjusted goodness-of-fit index (AGFI) was .85 or greater; and (c) the standardized root mean-square residual (SRMR) had a value of less than .10. Additional fit indexes were the normed fit index (NFI), the non-normed fit index (NNFI) and the comparative fit index (CFI). The models were examined using the statistical program LISREL, version 8.20 (Jöreskog & Sörbom, 1999).

Evidence of construct validity was sought by calculating Pearson's product-moment correlation coefficients between the SPIN total score and the SPAI-B, the total score of the SAS-A, the total score of the three SAS-A subscales and the SPAI. As stated by Cohen (1988), scores between .10 and .30 show a weak correlation, those between .30 and .49 a moderate correlation, and scores of .50 or higher indicate a strong correlation.

Discriminant analysis was conducted to analyze the predictive capacity of the SPIN as regards diagnosing social phobia.

Finally, the receiver operating characteristic (ROC) curve and the area under the curve (AUC) were examined in order to determine the optimal cut-off score for making a diagnosis of social phobia.

## Results

### *Gender and age differences in social anxiety*

The results of the analysis of variance (ANOVA) for the total sample ( $N = 192$ ) with gender and age as the between-subjects factors showed that girls scored higher ( $M = 23.23$ ,  $SD = 14.39$ ) than boys ( $M = 20.37$ ,  $SD = 11.74$ ) on social anxiety as measured by the SPIN. However, there were no statistically significant differences related to the gender or age variables ( $p > .05$ ), and neither was there a significant interaction between gender and age ( $p > .05$ ). Table 2 presents the SPIN scores as a function of gender and age.

In the SAD sample ( $n = 114$ ), the analysis of variance (ANOVA) for gender by age again showed that girls scored higher ( $M = 30.55$ ,  $SD = 13.05$ ) than boys ( $M = 25.89$ ,  $SD = 10.73$ ), although no statistical differences were found.  $F(1, 108) = 3.30$ ,  $p = .07$ . Using age as covariate, differences were revealed,  $F(1, 109) = 4.167$ ,  $p = .04$ . However, the effect size for this difference was low (.38), according to the criteria by Cohen (1988), in which .2 means a low effect size, .5 means average and .8 means high. Further, there were no differences between age groups or any significant interaction between gender and age ( $p > .05$ ). Given the small size of the control sample for the 16- and 17-year-old age cells, ANOVAs could not be computed for that sample. Means and standard deviations for the total sample and for each sub-sample can be found in Table 2.

### *Internal consistency and item analysis*

The internal consistency estimate (Cronbach's alpha; Cronbach, 1951) was .92, while the average inter-item

Table 2  
*SPIN Mean and Standard Deviation of subjects for each sample*

<i>Total Sample</i>				
	15 years	16 years	17 years	Total
Boys	17.87 (12.38)	23.12 (12.41)	21.54 (10.19)	20.37 (11.74)
Girls	23.12 (15.01)	23.04 (13.93)	23.68 (14.68)	23.23 (14.39)
Total	20.96 (14.14)	23.06 (13.44)	22.75 (12.85)	22.17 (13.51)
<i>SAD subsample</i>				
	15 years	16 years	17 years	Total
Boys	25.31 (12.19)	28.27 (11.74)	24.76 (9.25)	25.89 (10.73)
Girls	31.23 (13.29)	29.57 (12.68)	31.05 (13.86)	30.55 (13.05)
Total	29.26 (13.08)	29.21 (12.28)	28.08 (12.17)	28.87 (12.43)
<i>Control subsample</i>				
	15 years	16 years	17 years	Total
Boys	12.18 (9.32)	13.67 (7.17)	13.71 (8.30)	12.83 (8.47)
Girls	10.71 (6.66)	13.42 (9.52)	12.00 (5.54)	12.10 (7.64)
Total	11.44 (8.01)	13.48 (8.87)	12.63 (6.52)	12.38 (7.92)

Note: The Table shows mean (standard deviation) for each sample

correlation was .41 (minimum = .12; maximum = .71). The results from the classical item analysis showed acceptable item-test correlations, ranging from .37 for item 4 to .82 for item 14. The average item-test correlation was .66 (CI-95%: .605-.721). The mean item scores ranged from .44 ( $SD = .85$ ) for item 8 to 2.02 ( $SD = 1.38$ ) for item 11.

### Confirmatory factor analysis

Although Ranta, Kaltiala-Heino, Rantanen, Tuomisto, & Marttunen (2007) suggested a one-factor model they also encouraged researchers to examine an alternative three-factor model in other adolescent populations for replication purposes. This alternative model was composed of one factor comprising items 1, 2, 5, 6, 7, 12, 13, 14, 15 and 17, a second factor including items 3, 4, 8, 10 and 16, and a third factor based on items 9 and 11. Both models were tested here.

According to the results the one-factor model fitted the data very well: GFI = .98, AGFI = .97, SRMR = .07, NFI = .97, NNFI = .99 and CFI = .99. All items in the CFA loaded .45 or greater, ranging between .45 (item 4) and .86 (item 14) (see Table 3). The three-factor model also fitted the data well: GFI = .98, AGFI = .98, SRMR = .07, NFI = .98, NNFI = .99 and CFI = .99. However, in this case the factor inter-correlations were very high: .83 (Factor I-Factor II), .91 (Factor I-Factor III) and .85 (Factor II-Factor III). These results indicate that the one-factor solution is more appropriate.

Table 3

#### Confirmatory Factor Analysis Loadings

Item	Factor Loading
1	.66
2	.66
3	.73
4	.45
5	.68
6	.81
7	.66
8	.59
9	.76
10	.71
11	.70
12	.62
13	.72
14	.86
15	.82
16	.62
17	.72

### Concurrent validity: correlations with other anxiety scales

Pearson product-moment correlations were computed between the total SPIN score and conceptually-related social anxiety measures. Correlations between the SPIN and the SPAI-B, the total score of the SAS-A, and the SPAI were very high ( $r_s = .83, .83, \text{ and } .81$ , respectively). The SPIN also correlated strongly with the FNE subscale ( $r = .77$ ) and the SAD subscales of the SAS-A: SAD-N ( $r = .77$ ) and SAD-G ( $r = .72$ ). These high correlations (above .50) suggest that all scores and subscales are highly correlated. The correlation coefficients were statistically significant in all cases ( $p < .01$ ).

### Discriminant analysis

SAD and control subjects were compared by means of independent sample *t*-tests. The SAD sample scored higher ( $M = 28.86, SD = 12.43$ ) than the control sample ( $M = 12.38, SD = 7.92$ ), this difference being significant,  $t(189.169) = -11.22; p < .001$ . Discriminant function analysis revealed that the SPIN correctly discriminated 77.1% of subjects (Wilks' lambda = .64,  $\chi^2 = 84.83, df = 1; p < .001$ ).

### Cut-off scores

At each potential cut-off score (social phobia diagnosis by means of ADIS-IV-C), sensitivity was operationalized as the percentage of adolescents who met the criteria for social anxiety disorder and were correctly classified using the SPIN score. Specificity was operationalized as the percentage of adolescents not meeting SP criteria and who were correctly identified as not having SP. Given the inverse relationship between sensitivity and specificity, determining an optimal cut-off score requires a favorable balance between the two. The positive predictive value (PPV) was determined by calculating the percentage of adolescents classified at each cut-off score as having SP and who indeed met SP criteria. The negative predictive value (NPV) was determined by calculating the percentage of adolescents classified as non-SP and who indeed did not meet the diagnostic criteria for SP. A receiver operating characteristic (ROC) curve and the area under the curve (AUC) were examined to determine the best possible cut-off score.

The results revealed that the AUC for the ROC was .86 (95% CI, .81-.92) and was significant versus chance or a random ROC line ( $p < .001$ ). This suggests that there is an 86% probability that an adolescent with social anxiety disorder will have a higher score on the SPIN than would an adolescent with no such diagnosis.

Although the AUC is the most widely used global index of diagnostic accuracy, the Youden Index (Youden, 1950) is another common measure of overall diagnostic

effectiveness. The Youden index, which is a function of sensitivity and specificity, is the maximum vertical distance or difference between the ROC curve and the diagonal or chance line; it occurs at the cut-off point that optimizes the biomarker’s differentiating ability when equal weight is given to sensitivity and specificity. The Youden Index has an attractive feature not present in the AUC in that it provides a criterion for choosing the “optimal” threshold value. It is also the easiest to apply and does not require further information such as prevalence rates and decision error costs. As a result, the choice of appropriate cut-off in the present study was based mainly on this index.

The results showed that a cut-off score of 21 produced the best balance, with good sensitivity (71.05%; 95% CI, 62.29-79.82), good specificity (85.90; 95% CI, 77.53-94.26), a PPV of 88.04 (95% CI, 80.87-95.22) and a NPV of 67.00 (95% CI, 57.28-76.72). The corresponding Youden Index was .59. Table 4 shows the sensitivity, specificity, PPV, NPV, positive likelihood ratio, negative likelihood ratio and the Youden Index for selected cut-off scores. These data are consistent with the proposal of Matthey and Petrovski (2002), who suggested that a worthwhile cut-off score is one for which at least 70% of actual cases are correctly classified, while at least 80% of non-cases are also correctly classified (i.e. sensitivity = .70; specificity = .80).

*Treatment sensitivity*

The SPIN total score was compared before and after completion of the treatment protocol for the subset of adolescents receiving the IAFS intervention. The results of a paired sample t-test revealed that the total SPIN score was significantly lower at posttest than at pretest ( $t_{4,15} = 22, p < .001$ ). Furthermore, the effect size for this difference was high (.83). The criteria adopted to assess effect size were those proposed by Cohen (1988), in which .2 means a low effect size, .5 means average and .8 means high. A large effect size allows statistical significance with no hazard for the sensitivity of the research.

Discussion

The results support the use of the SPIN as a valid and reliable scale for assessing and screening social anxiety in adolescents. Interestingly, the mean SPIN score in this study for adolescents with social anxiety disorder ( $M = 28.86$ ) is similar to that reported in the US population ( $M = 27.33$ ) but lower than the mean found in Finland ( $M = 31.2$ ). Adolescents without social anxiety also produced very similar scores here to those of US and Finnish adolescents without the disorder (12.38 vs. 12.39 and 12.4, respectively). Taken together, these results indicate the stability of social anxiety scores for the general population across Western countries. Further cross-cultural studies are required to underline this aspect.

Table 4  
Youden Index, sensitivity, specificity, PPV, NPV, and likelihood ratios, with corrected 95% confidence intervals of selected SPIN cut-off scores

	Sensitivity	Specificity	PPV	NPV	Youden Index	LR+	LR-
30	48.25 (38.63-57.86)	96.15 (91.25-100)	94.83 (88.27-100)	55.97 (47.19-64.75)	.44	12.54	.54
24	67.54 (58.51-76.58)	89.74 (82.37-97.12)	90.59 (83.79-97.38)	65.42 (55.94-74.90)	.57	6.59	.36
21	71.05 (62.29-79.82)	85.90 (77.53-94.26)	88.04 (80.87-95.22)	67.00 (57.28-76.72)	.59	5.04	.34
19	77.19 (69.05-85.33)	79.49 (69.89-89.09)	84.62 (77.20-92.03)	70.45 (60.35-80.56)	.57	3.76	.29
17	84.21 (77.08-91.34)	74.36 (64.03-84.69)	82.76 (75.45-90.06)	76.32 (66.10-86.53)	.59	3.28	.21
15	86.84 (80.20-93.49)	69.23 (58.35-80.11)	80.49 (73.08-87.90)	78.26 (67.80-88.72)	.56	2.82	.19
13	90.35 (84.49-96.21)	62.82 (51.45-74.19)	78.03 (70.59-85.17)	81.67 (71.04-92.29)	.53	2.43	.15

Note: PPV: positive predictive value; NPV: negative predictive value; LR+ = positive likelihood ratio; LR- = negative likelihood ratio

A one-factor structure was confirmed, as suggested by the scale's original authors (Connor et al., 2000) in adults and by a previous study in adolescents (Ranta, Kaltiala-Heino, Koivisto et al., 2007). Evidence was also found for a three-factor model, as proposed by the latter authors. However, given the similar fit indexes of the two models, the high factor inter-correlations, and in line with the simplicity criterion (Tabachnik & Fidell, 2001), we concur with the suggestion of Ranta, Kaltiala-Heino, Koivisto et al. (2007) as regards maintaining a unidimensional structure for the SPIN with adolescents.

Construct validity was examined by means of the ADIS-IV-C, the results showing that adolescents with social anxiety disorder scored significantly higher than those without this disorder. These findings are consistent with the reports by Johnson et al. (2006) and Ranta, Kaltiala-Heino, Rantanen et al. (2007) in different cultures, languages and countries. The present study also revealed gender and age differences, although these were not statistically significant, or if so, the effect size was low ( $d = .38$ ), this being contrary to the findings of Ranta, Kaltiala-Heino, Koivisto et al. (2007). However, it should be noted that the magnitude of these effects was not reported in the Finnish study. As Garcia-Lopez, Ingles & Garcia-Fernandez (2008) have pointed out, effect sizes need to be computed, given that when doing so the magnitude of age and gender differences seems not to be noteworthy for socially anxious adolescents.

As regards the reliability of the SPIN the results showed high internal consistency (.92), this figure being similar to that reported by Johnson et al. (2006) for a sample of adolescents with SAD and higher than that found by Vilete et al. (2004) and Ranta, Kaltiala-Heino, Koivisto et al. (2007) in the general population (.88, .89, respectively). Sample characteristics might explain these differences.

Support for the concurrent validity of the scale was provided by the high and significant correlations with other social anxiety measures, even though the correlations suggested that the SPIN provided additional information to those measures. In particular, the present results revealed that the SPIN was highly and almost equally correlated with the SPAI, SPAI-B and SAS-A. In contrast, Johnson et al. (2006) found that the SPIN was more strongly correlated with the SPAI-C than with the SAS-A. It should be noted, however, that the SPIN and the SPAI-C were very highly correlated (.91) in the study of Johnson et al. (2006), which could suggest that the social anxiety construct assessed by the two scales was identical and that the new scale did not provide further information. Here, correlations between the SAS-A and the SPIN were identical (.82), but the SPAI rather than the SPAI-C was used, since the former was defined by its original authors as being the version to use with adolescents older than 14 (leaving the SPAI-C for younger children). This could explain the differences in results and may be interpreted as support for using the SPAI with adolescents, in conjunction with the SPIN.

Another strength of the SPIN is its demonstrated capacity to discriminate adolescents with and without social anxiety disorder, thus supporting its diagnostic utility. This finding is consistent with the results of other similar studies conducted in the USA and Finland (Johnson et al., 2006; Ranta, Kaltiala-Heino, Rantanen et al., 2007), as well as with research in adults (Antony et al., 2006; Connors et al., 2000; Sobic, Gieler & Stangier, 2008).

Overall, the scale has demonstrated its utility as a screening measure. The AUC value (.86) revealed good diagnostic performance for the SPIN, this being higher than the .80 suggested by Holmes (1998) for an AUC to be considered an indicator of usefulness. Although the choice of a cut-off score depends on the purpose of the research, the present results suggest a cut-off score of 21 for Spanish-speaking adolescents. This is consistent with the findings of Johnson et al. (2006) in a US adolescent population, but contrasts with the higher cut-off scores (24) found by Ranta, Kaltiala-Heino, Rantanen et al. (2007) in Finnish adolescents. However, the cut-off suggested by the Finnish study is higher than that proposed by the scale's original authors ( $SPIN \geq 19$ ), although it should be noted that the latter was for an adult population. Taken together these contrasting findings highlight the importance of culturally-adapted normative data and cut-off scores.

Finally, and to the best of our knowledge, this is the first study to provide data regarding the treatment sensitivity of the SPIN. The results demonstrate that this scale is a valid tool for use as a treatment outcome measure, although the small size and gender imbalance in the clinical sample should be noted.

One limitation of the present study is that information was collected only from adolescents, and thus they were the sole informants. Some authors have recommended gathering data from a wide range of informants when assessing child anxiety, since parent-child agreement rates range from low to moderate. For example, parent-child agreement has been found to be particularly low for internalized problems (for a review, see De los Reyes & Kazdin, 2005). Given that adolescents with social anxiety disorder often try to make a good impression to mental health providers, the inclusion as informants of parents, teachers or significant others might contribute to the correct identification of subjects. Several studies also show that agreement between parents and children is the exception rather than the rule (Comer & Kendall, 2004; DiBartolo, Albano, Barlow, & Heimberg, 1998; Kramer et al., 2004). In this context, Garcia-Lopez, Espinosa-Fernandez, Muela, & Diaz-Castela. (2007) found that adolescents reported higher levels of feared social situations and symptomatology than their parents did. In sum, there remains controversy regarding who the best informant is.

Another limitation is the lack of additional groups of adolescents with other anxiety or mental disorders



that would enable further examination of the construct validity of the SPIN. Finally, there is a need to examine the test-retest reliability of the SPIN and its properties in a community population.

In conclusion, the SPIN has adequate psychometric properties, with high internal consistency and good construct and external validity. The present findings were very similar to the psychometric properties reported for the SPIN in US and Finnish adolescents. In addition, it is suggested that a cut-off score of 21 be used for screening purposes in the general Spanish-speaking adolescent population. Overall, the SPIN is a quick and easy measure to administer and score, thus making it a good candidate for screening in Spanish-speaking adolescent populations.

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