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A meta-analysis of the cross-cultural psychometric properties of the Social Phobia and Anxiety Inventory for Children (SPAI-C)

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ABSTRACT

Several studies have found that the Social Phobia and Anxiety Inventory for Children (SPAI-C), an empirically derived self-report instrument to assess DSM-IV social phobia in childhood and adolescence, has good psychometric properties. While these findings were replicated across different cultures, the overall strength of the psychometric properties of the SPAI-C remains unknown. We assessed the validity of the SPAI-C by meta-analytic techniques across studies collected from PubMed, PsycInfo and Eric databases, conducted in different countries, among subjects of different age, and sex. A total of 21 articles were retained, predominantly from Europe and North America. We found that the psychometric properties based on Cronbach alpha, mean score differences between sexes, and construct validity, were robust for the SPAI-C scale. Girls scored significantly higher than boys, and geographical differences played a moderating effect on sex-related score differences. These results further support the SPAI-C as an instrument to identify Social Phobia in youth.

1. Introduction

Social phobia (SP, American Psychiatric & Association, 2000) is a debilitating and common mental disorder (Beidel, 1998; Inderbitzen-Nolan & Walters, 2000; Pine, Cohen, Gurley, Brook, & Ma, 1998; Wittchen, Stein, & Kessler, 1999). Often beginning in childhood or adolescence, it results in poor peer relationships and social isolation (Beidel, 1998; Beidel, Turner, & Morris, 1999; La Greca & Lopez, 1998; Schneier, Johnson, Hornig, Liebowitz, & Weissman, 1992). Since SP tends to begin early in life, and is chronic and persistent (Kessler et al., 1994, 2005; Wittchen et al., 1999), early recognition and treatment are especially desirable. This makes the need for reliable and valid screening instruments for SP particularly important.

The Social Phobia and Anxiety Inventory for Children (SPAI-C) (Beidel, Turner, & Morris, 1995; Beidel, Turner, & Fink, 1996) is the only empirically derived self-report instrument to assess DSM-IV SP in childhood and early adolescence. It consists of 26 items on a 3-point scale (*never or hardly ever, sometimes, most of the time or always*) assessing somatic, cognitive, and behavioural symptoms of SP in the developmental years. The maximum score on the SPAI-C is 52, and a score ≥18 has been repeatedly documented as an indication of the probable presence of SP (Beidel et al., 1995; Beidel & Turner, 1998).

The SPAI-C has been the subject of numerous reliability and validity studies conducted around the world. The results of these empirical investigation indicate that the instrument has good internal consistency and reliability in both clinical (Beidel et al., 1995, 1996) and research settings (Aune, Stiles, & Svarva, 2008; Gauer, Picon, Vasconcellos, Turner, & Beidel, 2005; Ogliari et al., in press). Moreover, the SPAI-C yields good convergent validity with both self-report (Beidel et al., 1995) and clinician-administered (Beidel et al., 1996; Beidel, Turner, Hamlin, & Morris, 2000) measures of SP. Furthermore, the scale has the power to discriminate children with SP from children with other anxiety disorders (Beidel, Turner, Hamlin, et al., 2000) and is a valid measure of treatment outcome (Beidel, Turner, & Morris, 2000; Beidel et al., 2007). The next step in the process would be the use of meta-analytic techniques to assess the validity of the measure across studies conducted in different countries, and among children and adolescents of varying age, and sex.

It is generally accepted (Campbell & Stanley, 1966; Hale, Crocetti, Raaijmakers, & Meeus, 2011) that one indication of external validity is the ability of an instrument to have its psychometric properties replicated across different populations, in order to

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determine its stability across different epidemiological features, such as sex differences in prevalence. Similarly, the evaluation of the moderating effects played by age, and national/cultural diversity on scores' differences in the two sexes (Hale et al., 2011) can further characterize the psychometric features of a questionnaire. Inasmuch as the prevalence of anxiety disorders is higher among girls (Merikangas et al., 2010; Roberts, Roberts, & Xing, 2007), and the female-to-male ratio for SP varies between 1.5/2:1 (Schneier et al., 1992; Wittchen et al., 1999), it would be important (Hale et al., 2011) to investigate by meta-analytic approaches the SPAI-C's ability to yield comparable sex ratio figures across different cultures and to investigate the moderating effect played by age. Finally, an additional, classical method to investigate the construct validity of a scale consists of examining its correspondence to another questionnaire that taps the same, or a similar, construct. Several studies have analyzed the relationship between the SPAI-C and the Social Anxiety Scale for Children-Revised/Social Anxiety Scale for Adolescents (SASC-R/SAS-A, La Greca & Stone, 1993; LaGreca, 1998) and found moderate-to-high correlations (Epkins, 2002; Inderbitzen-Nolan, Davies, & McKeon, 2004; Kuusikko et al., 2009; Morris & Masia, 1998; Olivares, Sanchez-Garcia, Lopez-Pina, & Rosa-Alcazar, 2010; Storch, Masia-Warner, Dent, Roberti, & Fisher, 2004). In this investigation, we examined four psychometric features of the SPAI-C: (a) the internal consistency; (b) the score differences between the two sexes; (c) the moderating effect of age and national/cultural diversity upon the score differences in the two sexes; (d) the construct validity of the SPAI-C by estimating its relationship with the SASC-R/SAS-A, using meta-analytic validity approaches.

2. Materials and methods

2.1. Papers selection

A first selection of empirical articles was made by searching in PubMed, PsycInfo and Eric databases by the keywords: "Social Phobia Anxiety Inventory Children". The available articles had publication dates ranging from January 1995 through November 2010, the month of our search. Then, the references of the selected papers were reviewed for other relevant, unpublished papers. The search produced a total of 138 abstracts.

To be included in our database, original articles had to comply with these criteria:

1. English as language of publication.
2. Adoption of the SPAI-C as a measure of social anxiety.
3. Availability of at least one of the following statistics for the SPAI-C.

(a) Mean values specified for boys and girls, or score differences between boys and girls (i.e. *t*-test statistics) with specifications of the number and sex of participants.
(b) Cronbach's alpha values.
(c) Correlation between the SPAI-C and SASC-R/SAS-A.

After the application of these criteria 21 reports remained.

These articles were recorded according to: (1) year of publication; (2) clinical vs. non-clinical population; (3) mean age of the sample; (4) country in which the study was conducted; (5) sample size and percentage of boys and girls; (6) SPAI-C mean scores for boys and girls and SD or *t*-test values; (7) Cronbach's alpha for total scale; (8) correlation indices between SPAI-C and SASC-R/SAS-A.

As possible causes of heterogeneity to explain boys' vs. girls' differential scores, we took into account two variables, namely geographical area, and the mean age of the sample.

2.2. Data analyses

Consistent with Rodriguez and Maeda (2006), we calculated the overall internal consistency of the SPAI-C using a meta-analysis of all alpha (*reliability*) coefficients, including the mean Cronbach's alpha with its 95% confidence interval (CI), and the minimum and maximum values (Rodriguez & Maeda, 2006).

Successively, to compare the sex differences on the SPAI-C scores across different studies, we performed a meta-analysis with the Comprehensive Meta-Analysis (CMA) software (Version 2.2.048) (Borenstein, Hedges, Higgins, & Rothstein, 2008). Using a random effects model, we calculated the effect size (ES), which is reported here as the standardized difference between the means of the two groups (Cohen's *d*), together with its 95% CIs. According to Cohen's criteria (Cohen, 1988), a $d < 0.20$ is considered of small effect, a *d* of about 0.50 of moderate effect, and *d* of about 0.80 of large effect. The possible presence of heterogeneity across studies was evaluated by the T^2 index, which estimates the variance of true effects. The amount of heterogeneity was quantified using the I^2 index, which measures the proportion of total variation due to real differences in the variability of ES among studies (Borenstein, Hedges, Higgins, & Rothstein, 2009). The *Q* statistic was used to test the heterogeneity of the specific set of ESs and the effects of the selected moderators, i.e. geographical area and mean age.

Since the moderators differed in metrics (continuous: age, vs. dichotomous: geographical area), we used two different strategies to evaluate their role in shaping heterogeneity of sex differences. First, we carried out a subgroup analysis for the 'geographical area' moderator, and then we performed a method of moments meta-regression analysis for 'sample mean age'. The subgroup analysis was based on a mixed-effect model, assuming a common among-study variance component across subgroups (pooled within-group estimates of T^2) and a random effect model to combine subgroups. A *Q*-test was used to test for heterogeneity across subgroups.

To evaluate the relation between the score for the SPAI-C and the score for the SASC-R/SAS-A, we performed a second meta-analysis with CMA. We calculated a global correlation coefficient and its 95% CI. A meta-correlation of 0.10 is typically considered of small effect, while 0.25 and $\geq$0.40 correlations are considered of medium and large effect, respectively.

Finally, to estimate the possibility that published studies have larger mean ES than unpublished studies, the results were controlled, by the "Trim and Fill" procedure (Duval & Tweedie, 2000), and the Classic Fail-safe Number method (Rosenthal, 1979). The "Trim and Fill" method is a non-parametric method that evaluates the effect of potential data censoring on the meta-analyses. By this method we built a plot of each study's ES against the meta-sample's ES and standard error. A funnel shape in these plots indicates no publication bias. However, since smaller or non-significant studies are less likely to be published, studies in the bottom left-hand corner of the plot are often omitted (Juffer & van IJzendoorn, 2007). The right-most studies in the meta-analysis that symmetrically unmatched are thus trimmed and replaced, with their missing counterparts imputed or "filled" in as mirror images of the trimmed outcomes. This allows for the computation of an adjusted ES and relative CI. The Classic Fail-safe Number method estimates the number of missing studies that would be needed to produce an ES's *p*-value greater than the alpha value. Meta-analyses with a