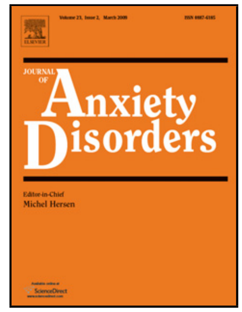
Accepted Manuscript



Title: Psychometric Properties of the Spence Children's Anxiety Scale in a Hong Kong Chinese Community Sample

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PII: S0887-6185(11)00019-3
DOI: doi:10.1016/j.janxdis.2011.01.007
Reference: ANXDIS 1247

To appear in: *Journal of Anxiety Disorders*

Received date: 4-10-2010
Revised date: 22-1-2011
Accepted date: 24-1-2011

Please cite this article as: Li, J. C.-h., Lau, W.-y., & Au, T. K.-f., Psychometric Properties of the Spence Children's Anxiety Scale in a Hong Kong Chinese Community Sample, *Journal of Anxiety Disorders* (2010), doi:10.1016/j.janxdis.2011.01.007

Research highlights

- This study evaluated the psychometric properties of the Spence Children's Anxiety Scale (SCAS) and the associated parent-report version (PSCAS) in a Hong Kong Chinese community sample.
- While good psychometric properties of SCAS and PSCAS had been documented in Western cultural contexts (e.g., Australia), no systematic psychometric evaluation of the Chinese-translated SCAS and PSCAS has been published.
- The psychometric properties were evaluated based on the four criteria: (a) factor structure, (b) descriptive statistics, (c) convergent validity with a negative affect measure, and (d) internal consistency.
- Our results were highly comparable with those published on Australian samples, thus providing a solid conceptual foundation for the use of the Chinese version of SCAS and PSCAS.

Psychometric Properties of the Spence Children's Anxiety Scale in a Hong Kong Chinese Community Sample

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Acknowledgements:

We thank the children and parents for their participation, and Wai Chan, Karen Ravn, and Virginia Tze for their valuable feedback on earlier drafts.

Abstract

This study evaluated the psychometric properties of a widely used self-report anxiety scale—the Spence Children's Anxiety Scale (SCAS) and the associated parent-report version (PSCAS)—in a Hong Kong Chinese community sample. While good psychometric properties of SCAS and PSCAS had been documented in Western cultural contexts (e.g., Australia), no systematic psychometric evaluation of the Chinese-translated SCAS and PSCAS has been published. In this study, psychometric properties of SCAS and PSCAS were examined with respect to four criteria: (a) factor structure, (b) descriptive statistics, (c) convergent validity with an anxiety cognition measure, and (d) internal consistency. Psychometric properties of SCAS and PSCAS for a Chinese community sample were found to be highly comparable with those published on Australian samples, thus providing a solid conceptual foundation for use of the Chinese version of SCAS and PSCAS.

Keywords: Spence Children's Anxiety Scale, psychometric properties, anxiety, self-report scale.

Psychometric Properties of the Spence Children's Anxiety Scale

in a Hong Kong Chinese Community Sample

Anxiety disorders constitute the most commonly diagnosed psychological disorders for children (Merikangas & Avenevoli, 2002), with prevalence estimates ranging from 5.7% to 17.7% of children meeting the diagnostic criteria (Costello & Angold, 1995). If untreated, anxiety disorders tend to persist—even though the specific triggers of anxiety may change over time—and continue to interfere with daily functioning (Anderson, 1994; Saavedra & Silverman, 2002). Moreover, childhood anxiety disorders predict problems later in life, including suicidal thoughts and attempts (Boden, Fergusson, & Horwood, 2007) and poorer quality of life (Olatunji, Cisler, & Tolin, 2007). Even mild cases increase future risk for anxiety, internalizing problems, social incompetence, isolation, and shyness (Hirshfeld-Becker & Biederman, 2002). Early identification and treatment are therefore important.

Anxiety is a subjective cognitive and emotional experience. A self-report scale—if proved to be valid and reliable—can be a very valuable assessment tool, helping children report their "hidden" anxiety problems (Spence, Barrett, & Turner, 2003). A valid self-report scale has the additional advantage of freeing up clinicians' time for more in-depth diagnostic interviews (Stallings & March, 1995). Much effort therefore has been invested in developing valid self-report scales to assess anxiety symptoms as specified in the DSM-IV (American Psychiatric Association, 1994).

A widely and productively used self-report scale is the Spence Children's Anxiety Scale (SCAS; Spence, 1997). It was designed to measure the six anxiety dimensions specified in the DSM-IV, including separation anxiety disorder (sample item: "I would feel afraid of being on my own at home"), social phobia ("I worry what other people think of me"), obsessive-compulsive disorder ("I can't seem to get bad or silly thoughts out of my head"), panic attack and agoraphobia ("My heart suddenly starts to beat too quickly for no reason"), physical injury fears ("I am scared of insects or spiders"), and generalized anxiety disorder ("I worry about things"). SCAS contains 38 anxiety symptom items and six positive filler items to reduce negative response bias. Children are asked to report the frequency of each item on a 4-point scale (never, sometimes, often, and always). As an extension, Nauta et al. (2004) developed a parental version of SCAS (PSCAS) to obtain parents' concurrent ratings on the items. The conceptual and theoretical framework of SCAS and PSCAS has been reported in detail (e.g., Spence, 1997, 1998; Nauta et al., 2004; the *Spence Children's Anxiety Scale* website, 2010).

Good psychometric properties of SCAS and PSCAS (e.g., test-retest and internal reliability, concurrent and discriminant validity) have been documented with the original validation samples in Australia (Spence, 1997, 1998; Nauta et al., 2004). Nonetheless, psychometric properties do seem to vary to some extent across cultures (Whiteside & Brown, 2008). They differed, for example, between Japanese and German samples (Essau, Sakano, Ishikawa, & Sasagawa, 2004), and between Hellenic (i.e., Greek-speaking) and other cultural groups (e.g., Australian, Japanese, German; Mellon & Moutavelis, 2007).

Given the limited mental health resources in populous and developing nations such as China, a cost-effective anxiety assessment tool can be very valuable. While both SCAS (child-report) and PSCAS (parent-report) have been translated into Chinese (Wang & Deng, 2004; Wang, 2005), to our knowledge, no systematic psychometric evaluation of the translated SCAS and PSCAS has been published using a Chinese sample. Given the reported variation in psychometric properties for SCAS in various languages (English, Japanese, German, Greek), it is crucial to examine the psychometric properties of the Chinese translation of this scale, and the associated parent-report PSCAS, before widely adopting the Chinese version in research and clinical practice.

A Chinese translation of SCAS and PSCAS has already been used in at least one published article, an effectiveness study of cognitive-behavioral treatment (CBT) in a community clinical setting for Chinese children with anxiety problems (Lau, Chan, Li, & Au, 2010). Briefly, in that study, clinically-referred Chinese children (age 6 – 11 years) in Hong Kong were randomly assigned to either a cognitive-behavioral treatment program or a waitlist-control condition. Only children in the treatment condition showed significant reduction in anxiety symptoms—both statistically and clinically—as measured by a Chinese version of SCAS and PSCAS translated by Wang and Deng (2004) and Wang (2005) respectively. The waitlist group also received the treatment program afterwards and showed a similar reduction in symptoms. Importantly, effectiveness of the intervention was significant immediately after treatment and also in 3- and 6-month follow-ups. These results offer perhaps the first empirical support for the effectiveness of CBT in treating childhood anxiety problems in a non-Western cultural context. Yet, Lau et al. (2010) only provided a rather limited report of the psychometric properties of the Chinese versions of SCAS and PSCAS. A more comprehensive and systematic report is needed to determine how much weight to put on their results.

To recapitulate, this study will examine psychometric properties of SCAS and PSCAS in a Hong Kong Chinese sample. Psychometric properties to be evaluated include: (a) factor structure, (b) descriptive statistics, (c) convergent validity with another anxiety measure, and (d) internal consistency.

Participants

A sample of 207 1st to 4th grade Chinese children (aged 6 – 11; 103 boys and 104 girls) from two mainstream primary schools in Hong Kong participated along with their parents. Most of the children came from working to middle-class two-parent households, and the median household monthly income was in the range of US$1,250 to US$2,500.

Procedure

The parents filled out a questionnaire about family demographics, gave informed written consent for both themselves and their children to participate, and completed a Chinese version of the PSCAS (Wang, 2005).

The children completed at school the SCAS (the Chinese version translated by Wang & Deng, 2004) and a Chinese version of the anxiety subscale of the Negative Affectivity Self-Statement Questionnaire (NASSQ) translated and back-translated by professional translators bilingual in Chinese and English (Lau et al., 2010).

Measures

Spence Children's Anxiety Scale (SCAS). The SCAS contains 44 items measured on a 4-point scale, and consists of 6 conceptually-based anxiety dimensions, including separation anxiety disorder (6 items), social phobia (6 items), obsessive-compulsive disorder (6 items), panic attack and agoraphobia (9 items), physical injury fears (5 items), and generalized anxiety disorder (6 items). The remaining 6 items are positively-worded filler items. Convergent and divergent validity has been documented with an Australian community sample for this self-report measure (Spence, 1998). Comparable validity was also found with samples in, for instance, Japan (Essau et al., 2004), and North America (Whiteside & Brown, 2008). SCAS also had good test-retest and internal consistency reliability in the Australian community sample (Spence, 1998). In this study, a Chinese translated version of SCAS was used (Wang & Deng, 2004).

Children's Negative Affectivity Self-Statement Questionnaire – Anxiety Subscale (NASSQ – Anxiety). Children indicated how often anxious thoughts occurred during the past week (e.g., I am going to make a fool of myself). Concurrent and construct validity, as well as internal and retest reliability, have been documented for this instrument (Ronan, Kendall, & Rowe, 1994). In the present study, the 11-item scale for 7- to 10-year-olds was used. In Lau et al.'s (2010) effectiveness study of cognitive-behavioral treatment for Chinese children with anxiety problems, this measure was used to assess children's anxiety cognition, which turned out to significantly mediate the treatment status (treatment vs. waitlist control) and the treatment outcome as measured by SCAS.

Spence Children's Anxiety Scale – Parent (PSCAS). This parent-report of child anxiety paralleled the SCAS (Spence, 1998). Nauta et al. (2004) evaluated with 484 parents of anxiety-disordered children and 261 parents of typically developing children in Australia and the Netherlands, finding it had good psychometric properties and was generally comparable with the SCAS. The structure suggests six inter-correlated factors in line with the conceptual model for childhood anxiety disorders specified in DSM-IV. The internal consistency reliability ranged from satisfactory to excellent. Good convergent and divergent validity was revealed by a predicted reasonably strong correlation between SCAS and parent-reported child internalizing symptoms, and a weaker correlation with parent-reported child externalizing symptoms. In the present study, we used a Chinese translated version of PSCAS (Wang, 2005).

Psychometric Properties

Factor Structure

The factor structure of SCAS and PSCAS for our community sample of 207 6- to 11-year-old Hong Kong Chinese children and their parents was compared with the published norms of English-speaking children and parents (Spence, 1998; Nauta et al., 2004) by confirmatory factor analysis (CFA) using EQS (Bentler, 1995). Following Spence (1998), we used elliptical re-estimated least squares (ERLS) with EQS to deal with the problem of positive kurtosis, as typically found in a clinical scale measuring anxiety symptoms in community samples.

For SCAS, DSM-IV offered the conceptual basis for a model with six correlated factors (mapping onto subtypes of childhood anxiety) and one higher-order factor. Spence (1998) evaluated the following models: 1) one factor, 2) six uncorrelated factors, 3) six correlated factors, and 4) six correlated factors loaded onto one general higher-order factor. Model 4—conceptually consistent with DSM-IV—fitted the data best in the confirmatory factor analysis (CFA). Nauta et al. (2004) followed Spence's (1998) procedure to examine these four models for PSCAS. The CFA solutions, however, led them to propose an additional model: 5)—five correlated factors and one higher-order factor. We therefore examined models 1 to 5 (M_1 to M_5) of SCAS and PSCAS here, following these three criteria: i) factor loadings of individual items onto the corresponding factors specified by Spence's (1998) and Nauta et al.'s (2004) factor analyses, ii) fit indices between hypothesized models and empirical data, and iii) difference between the more and less restrictive models according to χ^2 change.

The first criterion examined whether the SCAS items that loaded significantly on a factor in Spence's (1998) CFA also loaded significantly on a factor in our CFA and, if so, whether the average loadings for the corresponding factors in the two CFAs were comparable. Analogous comparisons were made between our and Nauta et al.'s (2004) analyses for PSCAS.

The second criterion evaluated the hypothesized models on the basis of two types of fit indices: (i) χ^2 value (with a significant χ^2 value suggesting a poor fit), and (ii) normed fit index (NFI), non-normed fit index (NNFI), and comparative fit index (CFI), with a value of .90 or above suggesting a good fit for these three indices. In addition, Nauta et al. (2004) used the root mean square error of approximation (RMSEA; with values below .05 considered an adequate fit).

The third criterion compared the more and less restrictive models according to χ^2 change. We considered one factor the most restrictive model (M_1). For each of the less restrictive models (i.e., M_2 to M_5), χ^2 change was used to evaluate whether a significant difference was found with the previous model. If so, the less restrictive one should be selected because that would free some of the restricted parameters in the previous model to produce a better fit model. For comparison, Table 1 presents the fit indices and χ^2 changes for our local sample along with those for Spence's (1998) SCAS normative sample; Table 2 shows the same indices for our sample along with Nauta et al.'s (2004) PSCAS normative sample.

Model 1 (one factor). For SCAS, all of the factor loadings were significant, *p*s < .01, ranging from .44 to .73, with a mean of .56. For the fit indices, M_1 produced a significant χ^2 result, χ^2 (666) = 1190, $p < .001$, meaning that the one factor model did not fit the empirical data well. Because a large sample size tends to produce a significant difference, the goodness-of-fit indices were also evaluated. The NFI, NNFI, and CFI were above .96, indicating a good fit with our local normative data, as in Spence (1998; all three indices above .91). When we compared M_1 with the null model (the most restrictive model that independence of items is assumed), χ^2 change was significant, $\Delta\chi^2(37) = 13452$, $p < .001$, suggesting M_1 fits the data more appropriately than the null model.

Likewise, PSCAS showed significant factor loadings, where all *p*s were less than .01, ranging from .29 to .63, with a mean of .48. As indicated in Table 2, the NFI, NNFI and CFI were above .96, and RMSEA was less than 0.01, even better than those found in Nauta et al.'s study (2004; where the first three were above .83, and the last was .10). The χ^2 test again showed a significant result, perhaps due to large sample size. M_1 differed significantly from the null model, $\Delta\chi^2(37) = 7476$, $p < .001$, indicating the less restrictive M_1 should be selected.

Model 2 (six uncorrelated factors). A key feature of M_2 is that all of the items were loaded onto six uncorrelated factors. Only some of the factor loadings in SCAS were significant, ranging from .27 to .79, with a mean of .60. The NFI, NNFI and CFI were, however, unsatisfactory (less than .32). Spence (1998) also found only reasonable indices, .85, .87 and .88 respectively. Moreover, the χ^2 test showed a significant result. In fact, M_2 produced a significantly larger χ^2 value than M_1, $\Delta\chi^2(1) = 946 < .001$. Hence, M_1 (one factor) fitted the data even better than M_2 (six uncorrelated factors). This is understandable because we restricted the independence (i.e., zero correlation) of the six correlated anxiety symptoms, thereby producing a poor fit model.

Similar results could be found for PSCAS. Some of the factor loadings were significant, ranging from .24 to .73, with a mean of .54. The NFI, NNFI and CFI were above .76, and RMSEA was .10, as in Nauta et al. (2004; where the three indices were above .79, and RMSEA = .10). Similarly, the χ^2 test showed a significant result. A significant χ^2 change from M_1 to M_2 was found, $\Delta\chi^2(1)$ = 513, p < .001, and M_2 produced a larger χ^2 value, meaning that the one-factor M_1 is more desirable.

Model 3 (six correlated factors). M_3 showed a good fit with our local normative data for both SCAS and PSCAS, as in the original normative samples (Spence, 1998; Nauta et al., 2004). M_3 loaded all SCAS/PSCAS symptoms onto six correlated factors, allowing the correlations among factors to vary freely. It fitted the data better than the two nested and more restrictive models M_1 (one factor) and M_2 (six uncorrelated or orthogonal factors).

For SCAS, all the loadings for individual items in our sample on factors corresponding to those in Spence (1998) were significant (ps < .01; loadings ranging from .32 to .78 with a mean of .60, as indicated in Table 3). The NFI, NNFI, and CFI were above .96, suggesting a good fit with our local normative data, as in Spence (1998; where all three indices were above .93). The results were similar for PSCAS. For our local normative sample, all the loadings of individual items—on corresponding factors specified in Nauta et al (2004)—were significant (ps < .01; loadings ranging from .35 to .70 with a mean of .54, as shown in Table 3). The NFI, NNFI, and CFI were above .97, and RMSEA was below .01, suggesting an excellent fit. These fit indices were even better than those observed in Nauta et al. (2004; where NFI, NNFI, and CFI were close to .90, and RMSEA = .08).

For SCAS, M_3 fitted our local normative data better than M_1 (one factor; $\Delta\chi^2(16)$ = 196, p < .001) and M_2 (six uncorrelated or orthogonal factors; $\Delta\chi^2(15)$ = 1142, p < .001), as was the case in Spence (1998). For PSCAS, M_3 fitted our local normative data better than M_1, $\Delta\chi^2(16)$

= 286, $p < .001$, and M_2, $\Delta\chi^2(15) = 799$, $p < .001$, as in Nauta et al. (2004).

Model 4 (six correlated factors loaded onto one general higher-order factor). M_4 loaded SCAS symptoms onto 6 correlated factors with one higher-order factor. This posed no special problem for our local sample for PSCAS, although it did for Nauta et al.'s (2004) sample. For our normative sample, the NFI, NNFI, and CFI were above .96, and RMSEA was below .01, indicating an adequate fit of observed data. All factor loadings were significant (*p*s < .01; ranging from .35 to .70). For SCAS, however, we opted out of interpreting the EQS solution of M_4 because the results seemed too good to be true. Specifically, all items were loaded onto a factor—possibly a general latent anxiety factor—without any unexplained variance. Byrne (2006) described this situation as either "a cause for celebration or a reason for distress" (p. 203) and counseled caution. We therefore considered the alternative M_5 suggested by Nauta et al. (2004) in response to the problems M_4 posed for their PSCAS normative sample.

Model 5 (five correlated factors and one higher-order factor). M_5 loaded SCAS symptoms onto 5 correlated factors with one higher-order factor. Our normative data for SCAS fitted M_5 well (NFI, NNFI, CFI > .96). Factor loadings of individual items on factors corresponding to Spence's (1998) M_4 were all significant, with *p*s < .01, ranging from .32 to .78 with a mean of .59; these values were comparable to the factor loadings in Spence's best model M_4, which ranged from .41 to .76 with a mean of .57. For PSCAS, M_5 also fitted our local normative data well (NFI, NNFI, CFI were above .96, and RMSEA was below .01). Loadings for individual items in our sample on factors corresponding to those in Nauta et al. (2004) were all significant (*p*s < .01), ranging from .29 to .70 with a mean of .54; these values were comparable to those found in Nauta et al. (2004), ranging from .29 to .83 with a mean of .60.

To summarize, M_3 of SCAS and PSCAS seems to be a satisfactory baseline model, where symptoms of correlated anxiety subtypes were loaded onto their corresponding factors uncovered in the original validation samples in Australia. That is, the goodness-of-fit and factor loading results of our Chinese-speaking normative sample were comparable to the original normative English-speaking samples published by Spence (1998) and Nauta et al. (2004), thus demonstrating that M_3 was relatively invariant across studies. Whether a latent factor exists above six correlated factors (i.e., M_4) or five correlated factors (i.e., M_5) needs further scrutiny. Spence (1998) found support for M_4 with SCAS, and Nauta et al. (2004) found support for M_5 with PSCAS. We found support for M_4 with PSCAS, and support for M_5 with both SCAS and PSCAS. Importantly, our confirmatory factor analyses revealed that the Chinese translation of both SCAS and PSCAS has factor structure and factor loadings for individual items on corresponding factors comparable to the original English version.

Factorial Invariance

We follow Nauta et al.'s (2004) criteria for evaluating factorial invariance across the demographic variables considered in this study, including gender, age, and school. The model to be compared is based on the baseline M_3, as it yields reasonable goodness-of-fit indices and is developed on the conceptual basis of DSM-IV. Also, both Spence (1998) and Nauta et al. have provided statistics and indices for M_3. Although the less restrictive models M_4 and M_5 have been proposed by Spence and Nauta et al., neither model is chosen for our evaluation because of improper solutions (i.e., M_4 for SCAS for our sample and PSCAS for Nauta et al.'s) or lack of data (i.e., M_5 not considered in Spence, 1998).

Nauta et al.'s (2004) criteria were based on ten Berge's (1986) percentage of explained variance produced by the principal component analysis (PCA) and average of phi coefficients. Specifically, when the factorial structure is assumed equal, the percentage of variance explained by the six correlated factors should be comparable across different samples. A difference of 10% or less is considered reasonably invariant in general. Phi coefficients refer to the correlations between the pair-wise factors. In this study, we have six correlated factors, thereby producing 15 pair-wise correlations. The average of phi coefficients (i.e., average of the 15 correlations) should be comparable across different samples if they share the same underlying factorial structure. An average of less than .10 is typically considered appropriate.

For SCAS, percentage of variance explained by the six factors was highly comparable between boys (54.5%) and girls (60.1%), school A (56.2%) and school B (57.8%), as well as younger (58.2%) and older children (54.5%). The average of the phi coefficients was also invariant across the samples (.85 for boys and .88 for girls; .87 for school A and .88 for school B; .83 for younger children and .92 for older children). Likewise, for PSCAS, the percentage of explained variance was quite homogeneous across the samples, at least for school A (54.2%) and school B (49.2%) and for younger (51.4%) and older children (51.6%). A sizable difference was detected between boys (55.5%) and girls (71.6%). The average phi coefficient was highly comparable (.75 for boys and .77 for girls; .78 for school A and .74 for school B; .75 for younger children and .75 for older children). To summarize, the six correlated factors structure is generally invariant across the demographic sub-samples in this study.

Descriptive Statistics

Mean and SD. Mean and SD of the six anxiety subscales are reported in Table 4. The mean score of each subscale is substantially less than its maximum score, which is typical when children and parents in a community sample report the children's—relatively few—symptoms on a clinical scale. The mean scores are also comparable with those in Spence (1998) and Nauta et al. (2004).

Inter-correlations of the SCAS and PSCAS Subscales. Table 5 shows the inter-correlations of the SCAS and PSCAS subscales, respectively. For SCAS, the correlations ranged from .53 to .75, with a mean of .66. The highest correlation was found between Panic Attack and OCD. For PSCAS, the correlations ranged from .37 to .67, with a mean of .54. The highest correlation was observed between Panic Attack and GAD.

Inter-correlations of the Parent and Child Versions of the Subscales. Table 6 indicates how well the parent and child versions of SCAS subscales correlate with each other. The diagonal shows the correlations between the parent and child ratings on the same subscales. All the correlations are positively significant at the .05 level, ranging from .24 to .42 with a mean of .32, thereby suggesting a reasonable convergent validity between the child and parent scores on the same subscales. The off-diagonal indicates the correlations between the parent and child ratings on the different subscales. All the correlations are positively significant at the .05 level, except for that between the parent version of Physical Injury and the child version of OCD.

Internal Consistency Reliability

Following Spence (1998) and Nauta et al. (2004), Cronbach's coefficient alpha is used here to evaluate the internal consistency reliability of the items within each subscale. We did examine other types of internal consistency reliability (including Spearman-Brown split half and Guttman split half) but found little difference between them and coefficient alpha, and so only the latter is presented in Table 7. The coefficient alphas were highly comparable between the present study and Spence's (1998) for SCAS, as well as between our sample and Nauta et al.'s (2004) for PSCAS.

Convergent Validity

To evaluate convergent validity, the total scores of SCAS and PSCAS were computed and compared with the anxiety subscale of NASSQ. The total score of SCAS correlated significantly with that of NASSQ, $r = .74$, $p < .01$. Likewise, the total score of PSCAS correlated significantly (but less strongly than SCAS) with that of NASSQ, $r = .35$, $p < .01$. The weaker correlation is understandable because PSCAS was reported by parents, which might lead to a lower degree of convergent validity with children-reported NASSQ. Generally speaking, both SCAS and PSCAS demonstrated appropriate convergent validity with the anxiety subscale of NASSQ.

Discussion and Conclusion

Given the limited resources for mental health assessment in China, it is important to develop a valid and relatively inexpensive tool for assessing Chinese children's anxiety problems. SCAS and PSCAS are two related child-report and parent-report measures based on DSM-IV and commonly used in the West for assessing children's anxiety level. In this study, we have examined their psychometric properties in a Chinese sample. Our investigation revealed that the conceptual basis of anxiety symptoms is quite similar between Chinese and Australian children. For our Chinese sample, both SCAS and PSCAS were found to have good psychometric properties, which importantly were comparable with those documented with Western normative samples as reported in Spence (1997; 1998) and Nauta et al. (2004). This conclusion was based on four main criteria.

The first criterion was the factor structure of SCAS and PSCAS. The DSM-IV motivated six-correlated-factors model yielded reasonable results in our Chinese community sample. In fact, our goodness-of-fit indices were even better than those reported by Spence (1998) and Nauta et al. (2004). Following Spence and Nauta et al., we also evaluated more complex factor structure (six correlated factors with one higher-order factor; five correlated factors with one higher-order factor), and again found reasonable support for these models using our normative sample. In terms of generalization across different demographic sub-samples (i.e., gender, school, and age), we followed Nauta et al.'s evaluation procedure, considering the percentage of variance explained by the factors and the average of phi coefficients. We found these two statistics to be relatively invariant across our demographic sub-samples for SCAS and PSCAS, suggesting factorial invariance of the six-correlated-factors model.

The second criterion focused on the descriptive statistics for the six-correlated-factors model, including mean, SD and inter-correlations. The mean score of each subscale was much lower than its possible maximum value, as would be expected for a community sample using a clinical scale for anxiety symptoms. The anxiety subscales also yielded reasonable inter-correlations, in line with the DSM-IV assumption that the six factors should be correlated.

The third criterion was internal consistency as measured by Cronbach's coefficient alpha. Our sample yielded good reliability indices, and the coefficient alphas were highly comparable to those reported by Spence (1998) and Nauta et al. (2004). The items within a subscale, then, proved to be reasonably consistent for an Asian sample as well as the original validation samples in Australia.

The fourth criterion was converging validity. Both the total score of SCAS and of PSCAS correlated significantly with the anxiety subscale score of a negative affect measure (NASSQ), showing good convergent validity.

To conclude, psychometric properties of the child-report and parent-report of the Spence Children's Anxiety Scale for a Chinese community sample were highly comparable with those published on Australian samples, thereby providing a solid conceptual foundation for the use of SCAS and PSCAS in the Chinese population. However, this study has some limitations and calls for further investigation. First, an analytical problem occurred when we conducted the CFA on SCAS (M_4: improper solution due to zero disturbance of Factor GAD). This meant that no disturbance error variance was left for the Factor GAD to explain. Byrne (2006) described this as "either a cause for celebration [as all of the variance of the factor has been utilized for prediction] or a reason for distress [as it may be too good to be true]" (p. 203). Future research should evaluate this factor structure with another Chinese sample. Second, the current sample is based on a community sample from two mainstream primary schools in Hong Kong. Spence (1998) noted the importance of including a clinical sample to evaluate the usefulness of SCAS (and by extension PSCAS). This needs to be done with a Chinese clinical sample. Finally, this study focused on measuring the anxiety level of children, and divergent validity of SCAS and PSCAS was not examined. Further studies should include other measures as in Spence (e.g., Child Depression Inventory [CDI]; Kovacs, 1992) to evaluate the divergent validity of SCAS and PSCAS for the Chinese population.

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Table 1: SCAS Fit Indices for Hypothesized Models in the Present Study and Spence (1998).

	Study	χ^2	*df*	NFI	NNFI	CFI	Comparison	$\Delta\chi^2$	Δdf
Null Model	Spence	23777*	703						
	Present	14642*	703						
Model 1: 1 factor	Spence	1952*	666	.92	.94	.94	Model 1 vs.	558*	16
	Present	1190*	666	.97	1.00	1.00	Model 3	196*	16
Model 2: 6 uncorrelated factors	Spence	3499*	665	.85	.87	.88	Model 2 vs.	2105*	15
	Present	2136*	665	.30	.27	.31	Model 3	1142*	15
Model 3 (baseline): 6 correlated factors	Spence	1394*	650	.94	.97	.97	Null vs.	22383*	53
	Present	994*	650	.97	1.00	1.00	Model 3	13648*	53
Model 4: 6 correlated & 1 higher-order factor	Spence	1497*	659	.94	.96	.96			
	Present	Improper solution due to zero disturbance of Factor GAD							
Model 5: 5 correlated & 1 higher-order factor	Spence	Spence did not examine Model 5							
	Present	1035*	660	.97	1.00	1.00			

Note: NFI = norm fit index; NNFI = non-normed fit index; CFI = comparative fit index. * $p < .001$.

Table 2: PSCAS Fit Indices for Hypothesized Models in the Present Study and Nauta et al. (2004).

	Study	χ^2	*df*	NFI	NNFI	CFI	RMSEA	Comparison	$\Delta\chi^2$	Δdf
Null Model	Nauta	37757*	703							
	Present	8833*	703							
Model 1: 1 factor	Nauta	5728*	666	.84	.84	.85	.10	Model 1 vs.	2427*	16
	Present	1357*	666	.97	1.00	1.00	<.01	Model 3	286*	16
Model 2: 6 uncorrelated factors	Nauta	5021*	665	.85	.85	.80	.10	Model 2 vs.	1765*	15
	Present	1870*	665	.77	.81	.83	.10	Model 3	799*	15
Model 3 (baseline): 6 correlated factors	Nauta	3269*	650	.89	.90	.91	.08	Null vs.	34588*	53
	Present	1071*	650	.98	1.00	1.00	<.01	Model 3	7762*	53
Model 4: 6 correlated & 1 higher-order factor	Nauta	Improper solution due to non-positive PSI								
	Present	1137*	659	.97	1.00	1.00	<.01			
Model 5: 5 correlated & 1 higher-order factor	Nauta	3392*	660	.89	.90	.90				
	Present	1157*	660	.97	1.00	1.00	<.01			

Note: NFI = norm fit index; NNFI = non-normed fit index; CFI = comparative fit index; RMSEA = root mean square error of approximation. * $p < .001$

Table 3: Confirmatory Factor Analysis: Standardized Factor Loadings for Six Correlated Factors of SCAS and PSCAS (in parentheses).

Anxiety Subscales	Questionnaire items	Factor loadings F1	F2	F3	F4	F5	F6
Pan Att	(13) I suddenly feel as if I can't breathe when there is no reason for this	.67(.62)					
	(21) I suddenly start to tremble or shake when there is no reason for this	.69(.68)					
	(28) I feel scared if I have to travel in the car, or on a bus or a train	.58(.43)					
	(30) I am afraid of being in crowded places (like shopping centres, the movies, buses, busy playgrounds)	.63(.55)					
	(32) All of a sudden I feel really scared for no reason at all	.78(.57)					
	(34) I suddenly become dizzy or faint when there is no reason for this	.66(.51)					
	(36) My heart suddenly starts to beat too quickly for no reason	.64(.62)					
	(37) I worry that I will suddenly get a scared feeling when there is nothing to be afraid of	.70(.70)					
SAD	(5) I would feel afraid of being on my own at home		.47(.44)				
	(8) I worry about being away from my parents		.59(.51)				
	(12) I worry that something awful will happen to someone in my family		.55(.55)				
	(15) I feel scared if I have to sleep on my own		.53(.51)				
	(16) I have trouble going to school in the mornings because I feel nervous or afraid		.66(.42)				
	(44) I would feel scared if I had to stay away from home overnight		.58(.61)				
Soc Pho	(6) I feel scared when I have to take a test			.64(.53)			
	(7) I feel afraid if I have to use public or bathrooms			.49(.42)			
	(9) I feel afraid that I will make a fool of myself in front of people			.59(.56)			
	(10) I worry that I will do badly at my school work			.55(.61)			
	(29) I worry what other people think of me			.67(.55)			
	(35) I feel afraid if I have to talk in front of my class			.48(.39)			
Phy Inj	(2) I am scared of the dark				.51(.63)		
	(18) I am scared of dogs				.32(.35)		
	(23) I am scared of going to the doctors or dentists				.50(.43)		
	(25) I am scared of being in high places or lifts (elevators)				.57(.51)		
	(33) I am scared of insects or spiders				.54(.41)		

Table 3 (continued)

OCD	(14) I have to keep checking that I have done things right (like the switch if off, or the door is locked)	.50(.47)	
	(19) I can't seem to get bad or silly thoughts out of my head	.60(.65)	
	(27) I have to think of special thoughts to stop bad things from happening (like numbers or words)	.67(.61)	
	(40) I have to do some things over and over again (like washing my hands, cleaning or putting things in a certain order)	.60(.44)	
	(41) I get bothered by bad or silly thoughts or pictures in my mind)	.76(.62)	
	(42) I have to do some things in just the right way to stop bad things happening	.67(.43)	
GAD	(1) I worry about things		.56(.58)
	(3) When I have a problem, I get a funny feeling in my stomach		.49(.44)
	(4) I feel afraid		.57(.60)
	(20) When I have a problem, my heart beats really fast		.62(.67)
	(22) I worry that something bad will happen to me		.69(.67)
	(24) When I have a problem, I feel shaky		.69(.67)

Note: Pan Att: panic attack, SAD: separation anxiety disorder, Soc Pho: social phobia, Phy Inj: physical injury. OCD: obsessive compulsive disorder, GAD: general anxiety disorder.

Table 4: Descriptive Statistics of SCAS and PSCAS (in parentheses) Subscales.

	Mean	SD
Pan Att	4.88 (2.97)	5.80 (3.59)
SAD	6.08 (5.33)	4.21 (3.23)
Soc Pho	6.13 (5.29)	4.03 (2.97)
Phy Inj	5.70 (5.57)	3.55 (2.80)
OCD	4.74 (3.17)	4.07 (2.83)
GAD	5.16 (4.30)	3.71 (2.79)

Note: Pan Att: panic attack, SAD: separation anxiety disorder, Soc Pho: social phobia, Phy Inj: physical injury. OCD: obsessive compulsive disorder, GAD: general anxiety disorder.

Table 5: Inter-correlations of SCAS and PSCAS (in parentheses) Subscales.

	Pan Att	SAD	Soc Pho	Phy Inj	OCD	GAD
Pan Att	1					
SAD	.66 (.48)	1				
Soc Pho	.63 (.51)	.69 (.61)	1			
Phy Inj	.61 (.44)	.65 (.53)	.53 (.40)	1		
OCD	.75 (.65)	.65 (.51)	.66 (.57)	.53 (.37)	1	
GAD	.75 (.67)	.72 (.56)	.72 (.62)	.61 (.46)	.69 (.65)	1

Note: All the correlation coefficients were significant at the .01 level. Pan Att: panic attack, SAD: separation anxiety disorder, Soc Pho: social phobia, Phy Inj: physical injury. OCD: obsessive compulsive disorder, GAD: general anxiety disorder.

Table 6: Inter-correlations of the Subscales of Parent (PSCAS) and Child (SCAS) Reports.

		SCAS (child version)					
		Pan Att	SAD	Soc Pho	Phy Inj	OCD	GAD
PSCAS (parent version)	Pan Att	.25**	.21**	.15*	.18**	.17**	.19**
	SAD	.24**	.42**	.28**	.25**	.29**	.30**
	Soc Pho	.22**	.27**	.36**	.15*	.28**	.29**
	Phy Inj	.14*	.25**	.17**	.34**	.12	.20**
	OCD	.25**	.24**	.22**	.18**	.30**	.22**
	GAD	.18**	.25**	.27**	.16*	.21**	.24**

Note: Pan Att: panic attack, SAD: separation anxiety disorder, Soc Pho: social phobia, Phy Inj: physical injury. OCD: obsessive compulsive disorder, GAD: general anxiety disorder.

$^{**}p < .01$, $^{*}p < .05$

Table 7: Internal Consistency Reliability of SCAS and PSCAS Subscales.

	SCAS		PSCAS	
	Spence	Present	Nauta et al.	Present
Pan Att	.82	.88	.81	.83
SAD	.70	.74	.76	.66
Soc Pho	.70	.75	.77	.68
Phy Inj	.60	.63	.61	.57
OCD	.73	.80	.79	.73
GAD	.73	.77	.75	.76

Note: Pan Att: panic attack, SAD: separation anxiety disorder, Soc Pho: social phobia, Phy Inj: physical injury. OCD: obsessive compulsive disorder, GAD: general anxiety disorder.