Development and Validation of a Short Form of the Chinese Version of the State Anxiety Scale for Children

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Abstract

Objectives. The availability of a valid, reliable, and suitable tool that accurately measures and differentiates anxiety levels of children is crucial before designing appropriate interventions to minimize their apprehension and enhance their coping ability. Regrettably, there is a lack of such a simplified instrument for use in busy clinical settings where time constrains makes the use of more comprehensive questionnaires unfeasible. The study aimed at developing a short form of the Chinese version of the State Anxiety Scale for Children (CSAS-C) for use in busy clinical settings and at testing psychometric properties of the new form.

Design. The study was divided into two phases with phases one aimed at developing a short form of the CSAS-C, while phase two aimed at testing psychometric properties of the new form.

Results. Using exploratory factor analysis, a subset of 10 items, which was highly correlated with scores obtained from the full form and, which had acceptable internal consistency was developed. The psychometric properties of this shot form have been empirically tested, showing adequate internal consistency reliability and excellent construct validity.

Conclusion. This study addresses a gap in the literature by developing a 10 items short form of the CSAS-C. Results indicate that this short form is an appropriate and objective assessment tool for measuring anxiety levels of Chinese children in a busy clinical setting where time constraints make unfeasible the use of the full form.

Development and Validation of a Short Form of the Chinese Version of the State Anxiety Scale for Children

Anxiety is the most commonly reported emotion for children when confronted with surgery or stressful medical procedures (Lizassain & Polaino, 1995; Ziegler & Prior, 1994). Although a mild to moderate level of anxiety is crucial for learning and can promote better adjustment (Janis, 1958), excessive anxiety can be detrimental to children's physical and psychological health. Previous studies have shown that excessive anxiety hinders children's ability to cope with medical treatment, encourages negative and uncooperative behaviour, and causes behavioural changes (Becher & Sing, 1977; Li & Lam, 2003; Ziegler & Prior, 1994). Therefore, children need to be well prepared before surgery or stressful medical procedures, and the goal of such preparation should focus on minimizing their level of anxiety. However, the availability of a valid, reliable, and suitable tool that accurately measures and differentiates anxiety levels in children is crucial before designing appropriate interventions to minimise their apprehension and enhance their coping ability.

A review of the literature reveals that instruments frequently used to measure children's anxiety were the Children's Manifest Anxiety Scale (Castaneda, McCandless, & Palermo, 1956), the General Anxiety Scale for Children (Sarason, Davidson, Lighthall, Waite, & Ruebush, 1960), and the State-Trait Anxiety Scales Inventory for Children (STAIC; Spielberger, Edwards, Lushene, Monturoi, & Platzek, 1973). In contrast to the General Anxiety Scale for Children and the Children's Manifest Anxiety Scale, the STAIC consists of separate self-report scales for measuring state anxiety (A-State) and trait anxiety (A-Trait). These concepts were first introduced by Cattell & Scheir (1961, 1963) and further elaborated by Spielberger (1966, 1972). According to Spielberger, et al. (1973), state anxiety refers to a transitory emotional reaction, which is characterised by subjective, perceived feelings of apprehension, tension; and worries that varied in intensity from time to time. Trait anxiety was regarded as a relatively stable personality disposition.

The State Anxiety Scale for Children is frequently used in clinical areas to determine the actual levels of children's anxiety intensity induced by stressful procedures such as invasive medical procedures and surgeries. The scale asks children to indicate the degree to which they are experiencing a particular feeling at the current moment. Each item begins with the stem "I feel", and children respond by placing an "X" next to one of three possible responses that best describes how they feel. The scale consists of 20 items, which are scored from 1 to 3, with total possible scores ranging from 20 to 60. Higher scores indicate greater anxiety. This scale has been used extensively in a number of cross-cultural studies and translated into several languages including Spanish (Bauermeister, Forastieri, & Spielberger, 1976), Japanese (Soga, 1983), Arabic (Day, Knight, El-Nakadi, & Spielberger, 1986), Dutch, Portuguese, German, Greek, Turkish, French (Walker & Kaufman, 1984), Thai (Chaiyawat & Brown, 2000), and Chinese (Li & Lopez, 2004).

The original State Anxiety Scale for Children has been translated into Chinese (CSAS-C;

Li & Lopez, 2004). The term *anxiety* is a general concept and has been frequently used in Chinese culture to describe emotions reported by children, such as feelings of worry, upset, and nervousness, during hospitalization or when confronted with surgery (Becher & Sing, 1997; Fielding & Tam, 1989,1990). Nevertheless, prior to commencing translation and use of the State Anxiety Scale for Children in a new cultural group, it is crucial to ensure cultural congruence of a construct. A bilingual clinical psychologist working with Chinese children was consulted to review the context of the original scale. The items of the State Anxiety Scale for Children were found to reflect behaviors and emotions that are also typical for Chinese children. The instrument was then translated and back-translated following the technique described by Bracken and Barona (1991). The semantic and content equivalence of the translated version was also ensured Content equivalence implies that each item in the instrument has consistent cultural relevance; semantic equivalence implies that each item remains conceptually and idiomatically the same after translation (Flaherty et al., 1988).

The test-retest reliability coefficients for the Chinese version were .79 and .78 for age groups 7 to 8 and 9 to 12, respectively, and the internal consistencies of the scale ranged from .81 to .94 across different age groups. Concurrent validity was supported by correlation of the scale with children’s heart rate and mean arterial blood pressure during pre-operative and post-operative periods. Construct validity of the scale was confirmed by administering the scale to primary school students of different grades under different conditions. The higher mean scores for the scale in the pre-examination condition than in the post-examination condition were statistically significant.

The factorial structure of the State Anxiety Scale for Children has been examined using exploratory factor analysis (Dorr, 1981; Gaudry & Poole, 1975; Hedl & Papay, 1982) and confirmatory factor analysis (Li & Lopez, 2004) previously. These studies consistently provided evidence that there are two factors underlie the scale. Factor I (*State Anxiety Present*) was defined almost exclusively by state anxiety present items, e.g., "*I feel nervous*" and "*I feel worried*". Factor II (*State Anxiety Absent*) was defined exclusively by state anxiety absent items, e.g., "*I feel calm*" and "*I feel happy*". These results also are congruent with Spielberger and coworkers' (1973) conception and expectation that the State Anxiety Scale is composed of anxiety absent, and anxiety present dimensions.

Although the State Anxiety Scale has excellent psychometric properties and has been widely used elsewhere, some limitations are recognized. One limitation is that this instrument contains 20 items. Because children generally require 5 to 8 minutes to complete it, this questionnaire may not be feasible in busy settings, such as an operating room. On the other hand, the timing for measuring children's anxiety level is essential. To gain a thorough understanding of children's responses to stressful medical procedures, it is best to measure their level of anxiety at the time they experience the most distressed. Previous studies found that children who are facing surgery feel most distress and threatened in the holding area of the operating theatre, and just before the procedure of anaesthesia induction (LaMontagne, 1993; Li & Lam, 2003; Wolfer & Visintainer, 1975). Using the state anxiety score, containing 20 items, to measure the anxiety level of children at that moment may not be feasible and appropriate, as it could disrupt the procedure and distract the child and health-care workers. Furthermore, children of young ages may have difficulty completing the longer version, as they may not have either the patience to discern a long list of adjectives with very similar meanings. For example, the terms *jittery, scared*, *frightened,* and *terrified* in the English version of the State Anxiety Score all carry similar meaning when directly translated to the Chinese language. It is therefore essential to develop a short form of the State Anxiety Scale for children for use in busy clinical settings where time constrains make the use of the full form unfeasible. A six-item short form of the State Anxiety Scale for Adolescents and Adults was developed by Marteau and Bekker (1992), which showed acceptable reliability and validity. The use of this six-item short form produced score similar to those obtained using the full form. Currently, there is no short form of the State Anxiety Scale for Children being developed. The present research was designed to develop such a short scale for measuring the anxiety level of children in busy clinical settings and empirically test its psychometric properties.

Method

The study was divided into two phases with phases one aimed at developing a short form of the CSAS-C, while phase two aimed at testing psychometric properties of the new form.

Design and Settings

A test-retest, within-subjects design was used. Children admitted for surgery in a day surgery unit during two consecutive years' summer holiday were invited to participate in the study after the purpose, nature, and design of the study were described to their parents. In Hong Kong, the summer holiday for primary school children is from July to the end of August each year. In phase one (the first summer holiday), selected participants were asked to respond to the CSAS-C when they admitted in a day surgery unit before operation. In phase two (the second summer holiday), selected participants were asked to respond to the short form of the CSAS-C inside the theatre but before the procedure of anaesthesia induction, and 4 hours after their operation in the day surgery unit.

Sample

To test whether the scale was appropriate for 7- to 12-year-olds, children of this age range were invited to participate in the study. According to Piaget's (1963) Theory of Stages Development, children in this age range belong to the same developmental stage, that is, Concrete Operational. In this stage, children can develop logical reasoning about objects, events and relationships. However, thought remains limited to concrete objects and events. This age group was frequently selected in previous children's research studies (Li & Lam, 2003; Li & Lopez, 2004). Additionally, subjects of the study were Cantonese-speaking

Chinese children. The researcher excluded children who had chronic illness that require special medical care and those with identified cognitive and learning problems. There were two parents in phase one and six parents in phase two refused participation without giving any special reasons. The response rate for the study of phase one and two were 98% and 93%, respectively. Ultimately, convenience samples of 112 children in phase one and 82 children in phase two were recruited.

Data Collection Procedures

Approval to conduct the studies was obtained from the Survey and Behavioral Research Ethics Committee of the Chinese University of Hong Kong and the ethical committee of the study's hospital. The unit head of the day surgery unit were fully informed about the study's purpose, nature, design, and duration. Written consent was also obtained from the parents after they were told the purpose of the studies. The children and their parents were also informed that they had the right to withdraw from the studies at any time and were assured of their confidentiality.

Demographic data were collected when children were admitted to the day surgery unit (Table 1). In phase one, children were asked to respond to the CSAS-C when they admitted in a day surgery unit before operation. In phase two, children were asked to respond to the short form of the CSAS-C once they arrived in the induction room but before they underwent anaesthesia induction and 4 hours after their operation in the day surgery unit. Children's heart rates, systolic and diastolic blood pressure were also recorded during these two periods.

INSERT TABLE ONE HERE

Data Analysis

The data obtained in phase one was subjected to exploratory factor analysis using SPSS, version 11. Internal consistency reliability of the short form of the CSAS-C was assessed by calculating Cronbach's alpha. Concurrent validity was estimated by correlating the scores of the short form of the CSAS-C with the children's heart rate and mean arterial blood pressure in the induction room before anaesthesia induction and 4 hours after their operation in the day surgery unit. A paired-samples *t* test was done to compare the state anxiety scores of children, which obtained by the short form of the CSAS –C before and after their operation.

Results

Phase one: Developing a short form of the CSAS-C

The data obtained was subjected to exploratory factor analysis. The suitability of the data for factor analysis was confirmed by using Bartlett's test of Sphericity and the Kaiser-Meyer-Oklin (KMO) measure of sampling adequacy. The results showed that the KMO value was .94, exceeding the recommended value of .6 (Kaiser, 1970, 1974), and Bartlett's (1954) Test of Sphericity reached statistical significance, supporting the factorability of the correlation matrix. Two techniques of factor extraction, Kaiser's criterion and Catell's scree test (1966), were used to assist in the decision regarding the number of factors to be retained for further investigation in this study. Principal components analysis revealed the presence of two components with eigenvalues exceeding 1 and an inspection of the screeplot revealed a clear break after the second component. Therefore, it was decided to retain two components for further investigation. To aid in the interpretation of these two components, Orthogonal rotation was then performed via the Varimax procedure. The rotated solution yielded two interpretable factors, anxiety present and anxiety absent, which were ranked in order of magnitude of their factor loadings (Table 2). Five items of the highest factor loadings of each factor were chosen to form five subsets (two-, four-, six-, eight-, and ten-item) of equal numbers of anxiety-present and anxiety-absent items from the full form of the CSAS-C. Spielberger (1983) argued that equal numbers of anxiety-present and anxiety-absent items constitute a more stable and consistent measure. The correlations between scores from these short-forms and the full form of the CSAS-C were investigated using the Pearson product-moment correlation coefficient. Results showed that the correlations were: r = .92 for 10 items; r = .85 for eight items; r = .83 for six items; r = .81 for four items; and r = .79 for two items. Of all subsets, only the correlations between the subset of 10 items and the full form of the CSAS-C was higher than r = .90. Internal consistency reliability of the full form and the subsets of the CSAS-C were assessed by calculating Cronbach’s alpha. Results showed that the internal consistency reliabilities were: .89 for the full form; .83 for 10 items; .76 for eight items; .73 for six items; .65 for four items; and .35 for two items. After thorough discussion among a panel of experts (three nurse educators and two paediatric clinical nurse specialists), the subset of 10 items was chosen for further empirical testing of its psychometric properties.

INSERT TABLE 2 HERE

Phase two: Testing Psychometric properties of the short form

Reliability

Internal consistency reliability was assessed by calculating Cronbach's alpha. Results showed that the internal consistency of the short-form of the CSAS-C was .86 in the preoperative period and .88 in the post-operative period, indicating a high internal consistency reliability of the short-form of the CSAS-C.

Validity

The relationships between scores on the short-form of the CSAS-C with heart rates and mean arterial blood pressure were investigated using the Pearson product-moment correlation coefficient. Results showed that there was a strong positive correlation between the short form of the CSAS-C and heart rate in the preoperative period (r = .68, n = 82, p < .01) and in the postoperative period (r = .59, n = 82, p < .01). A medium positive correlation between the short form of the CSAS-C and the mean arterial blood pressure was detected in the preoperative period (r = .46, n = 82, p < .01) and in the postoperative period (r = .4.1, n = 82, p < .01). Results indicated that high levels of state anxiety in children were associated with a faster heart rate and higher mean arterial blood pressure.

Construct validity was further supported by comparing the mean scores for the short form of the CSAS-C in the pre- and postoperative periods. The mean scores for the short form of the CSAS-C in the preoperative period was significantly higher than that in the postoperative period (Table 3).

INSERT TABLE 3 HERE

Discussion

The study aimed at developing a short form of the Chinese version of the State Anxiety Scale for Children (CSAS-C) for use in busy clinical settings and at testing psychometric properties of the new form. Based on the result of exploratory factor analysis, a ten items short form was created, which was moderately reliable and strongly correlated with the original version. The psychometric properties of the short form of the CSAS-C have been empirically tested. The results revealed adequate internal consistency, concurrent validity with two physiological indices, heart rates and mean arterial blood pressure, and convergent validity in differentiating pre- and post-operative levels of state anxiety in these children. The short form also took significantly less time to administer than the original full version.

Exploratory factor analysis is most frequently used as a part of the instrument development process. It can be used to reduce the number of items on a scale by eliminating items with low factor loadings or items that load at approximately equal level on two or more factors (Floyed & Widaman, 1995). The decision for selecting five subsets from the full form for further testing was made by the expert panel. First, it was determined that the short form should not more than half items of the full form so that it could be used in busy clinical settings. Second, it was the target to select the smallest subset of both anxiety-present and anxiety-absent items from the full form of the CSAS-C, which should be highly correlated with scores obtained from the full form and, which has acceptable internal consistency. Of all subsets, only the subset of 10 items was shown to have adequate internal consistency and strong correlation with the full form of the CSAS-C. In order to ensure good psychometric properties of the newly developed short-form of the CSAS-C, the subset of 10 items was chosen after thorough discussion in the panel despite the fact that this subset contains more items than the other four subsets. Although the subset of 10 items was shown to have adequate internal consistency and was highly correlated with the full form of the CSAS-C in study one, the psychometric properties of this short form must be further empirically tested before it can be used as an objective assessment tool in measuring children's anxiety level. Additionally, it is crucial to confirm whether this short form is feasible and appropriate to be used in busy operating room settings.

When compared with the full form of the CSAS-C, the newly developed short form contains 10 items, which is half of the full form. Also, there are fewer repetitive items in the short form, which makes children clearer and less confused in completing the form. In phase two, children took an average of two and half minutes to complete the short form. The time was acceptable and appropriate as it caused only minimal disturbance to the nursing and medical procedures in the theatre.

Results showed that the internal consistency of the new form was high under different conditions. These results indicated a reliability of .80 or higher, which is acceptable for the instrument to be used in research (Nunally & Bernstein, 1994). The test-retest reliability of the newly developed scale was not assessed in this study, as it would be unrealistic and not feasible to administer the scale twice in a day surgery unit under similar conditions. Moreover, because of the transitory nature of anxiety states, the state anxiety score of a child may vary in intensity, fluctuating from time to time. Therefore, reporting of internal consistency would be more appropriate, as it seems to provide a more meaningful index of reliability than test-retest correlations (Spielberger et al., 1973).

The validity of the short form of the CSAS-C was supported. The use of heart rate and mean arterial blood pressure as concurrent measures in this study was supported by previous literature (Augustin & Hains, 1996; Panda, Bajaj, Pershad, Yaddanapudi, & Chari, 1996). Anxiety stimulates sympathetic, parasympathetic, and endocrine systems, leading to an increase in heart rate and blood pressure (Rasmsay, 1972); these physiological parameters are considered to be objective and concrete indicators for indirect assessment of anxiety levels (Augustin & Hains, 1996; Carpentio, 2002; Panda et al.). In this study, the results showed that children’s increased mean arterial blood pressure and heart rate measurements were statistically associated with increased anxiety levels, consistent with previous research findings (Augustin & Hains, 1996; Katz, Fogelman, Attias, Baron, & Soundry, 2001; Li & Lopez, 2004; Mahajan et al., 1998; Zahr, 1998).

The construct validity of the short form of the CSAS-C was also supported by comparing children’s pre- and postoperative state anxiety levels. Preoperative anxiety was recorded once children were inside the induction room because of previous studies have revealed that the procedure for anaesthesia induction was most distressing and threatening to children. Children’s postoperative anxiety was measured at 4 hours after their operation. According to an anaesthetist consultant working in the day surgery unit, there should have been no effect of preoperative medication or anaesthesia on the child’s physiological measures 4 hours after surgery. Therefore, there would be no physiological effects that influences children responding to the scale at that moment. It was anticipated that elevation in children’s anxiety scores would be associated with their exposure to a stressful situation. The mean scores were statistically higher in the preoperative period than in the postoperative period. These findings were consistent with those of previous studies (Li & Lam, 2003), showing that the short form of the CSAS-C had the ability to significantly discriminate between the anxiety levels of children in different stressful situations.

Limitation and Recommendation

This study's convenience sampling and the fact that all data were collected in one setting limit the ability to generalize the results. Besides, over 70 percent of the samples consisted of male patients, possibly introducing selection and sampling biases. However, previous research (Dorr, 1981; Gaudry & Poole, 1975; Hedl & Papay, 1982; Li & Lopez, 2004) found that state anxiety under different stress conditions had a similar impact on children of both sexes; thus, the non-equivalence with regard to sex may have had little impact on the findings of this study. Despite possible limitations of this study, preliminary data indicate that the scale possesses good reliability and adequate validity. Continued use of the instrument would allow more sophisticated data analytic techniques. Future study in a variety of settings would provide data for further validation and generalization of this scale.

Conclusion

This study addresses a gap in the literature by developing a 10 items short form of the CSAS-C to be used in a busy clinical setting where time constraints make unfeasible the use of the full form. The results indicate that the short form of the CSAS-C is an objective assessment tool for measuring anxiety levels in Chinese children and an appropriate clinical research tool to use in busy clinical settings, such as an operating theatre.

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Table 1

Demographic characteristics of the participants in the two studies

	Study 1 (*n* = 112)		Study 2 (*n*= 82)	
	Frequency	%	Frequency	%
Age (Yrs)				
7	27	24.1 %	14	17.1 %
8	15	13.4 %	13	15.9 %
9	13	11.6 %	14	17.1 %
10	10	8.9 %	13	15.9%
11	22	19.6%	12	14.6 %
12	25	22.3%	16	19.5 %
Sex				
Male	83	74.1 %	60	73.2 %
Female	29	25.9 %	22	26.8 %
Surgery				
Circumcision	62	55.3 %	46	56.1 %
Herniorrhaphy	16	14.3 %	10	12.2 %
Minor ENT Operation	8	7.2 %	11	13.5 %
Minor Orth. Operation	12	10.7 %	9	10.9 %
Surgical Excision	14	12.5 %	6	7.3 %

Table 2

Two-Factor solution for the Chinese version of the State Anxiety Scale

Item	Component 1 Anxiety Absent	Component 2 Anxiety Present
Cheerful	.797	
Happy	.782	
Pleasant	.775	
Relaxed	.773	
Rested	.743	
Good	.715	
Calm	.654	
Nice	.623	
Sure	.613	
Satisfied	.578	
Frightened		.814
Troubled		.800
Upset		.785
Worried		.784
Nervous		.751
Terrified		.746
Scared	.328	.659
Bothered	.308	.564
Mixed-up		.533
Jittery		.490
% of variance explained	28.29 %	27.63 %

Note: Only loadings above .3 are reported

Table 3. Mean Scores for the Short-form of the CSAS-C from a day surgery unit

	n	Preoperative *Mean, SD*	Postoperative *Mean, SD*	*t*-Value	*P* Value
Children	82	20.96, 4.93	13.35, 2.30	14.17	P < .001