Measuring Anxiety in Children: A Methodological Review of the Literature

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This paper provides a comprehensive methodological review of the literature concerning anxiety measurement in children. Initially, a conceptual basis for anxiety measures is introduced, followed by specific approaches to measuring childhood anxiety based on 14 original articles. In particular, a variety of strategies that have been used in previous research are discussed in detail with theoretical underpinnings. Common approaches to measure anxiety such as self-reported instruments, observational ratings, and behavioral checklists are reviewed one by one with a critical look at the strengths and weaknesses of each of these approaches. While multiple measures of anxiety are available to assess the level of anxiety in children, selection of measurement approach should be an iterative process based on rigorous evaluation of evidence of reliability and cross-validation of the tool across different age groups of children.

Key Words anxiety, child, epidemiologic measurement

INTRODUCTION

The importance of psychological adjustment of children with chronic diseases has been emphasized (Stam, Grootenhuis, Caron, & Last, 2006). In particular, anxiety has been increasingly discussed and recognized by a number of researchers as one of the most significant indicators of psychological adjustment to chronic disease in children (Lähteenmäki, Sjöblom, Korhonen, & Salmi, 2004; Moore & Mosher, 1997). For example, anxiety was used as an indicator of coping in adolescents with chronic pain (Claar, Baber, Simons, Logan, & Walker, 2008), children and adolescents with sickle cell disease (Benton, Ifeagwu, & Smith-Whitley, 2007), inflammatory bowel disease (Mackner, Crandall, & Szigethy, 2006), juvenile arthritis (Mullick, Nahar, & Haq, 2005), cancer, (Schultz, et al., 2007; Stam, Grootenhuis, & Last, 2001), and children with asthma (Akçakaya, Aydogan, Hassanzadeh, Camcioglu, & Cokugraş, 2003). While numerous forms of anxiety measurements are available, discussions regarding strengths and weaknesses of each measurement approach have been scarce. The purpose of this paper is to discuss a variety of approaches used by researchers to measure anxiety in children. Such information would help researchers to adequately identify and select relevant anxiety measures for the purpose of their future studies.

CONCEPTUAL BASIS OF ANXIETY MEASURES

Since Freud’s conceptualization of anxiety-neurosis in 1894 as a discrete clinical syndrome, anxiety has been measured within the context of psychological...
theory (Spielberger, 1966). Even though there is a lack of agreement regarding the nature of anxiety, most researchers have developed their measures based on Freudian theory, though recently there has been an increasing discussion of physiological theories.

**Psychological and physiological theories of anxiety**

Freud first attempted to explicate the concept of anxiety in the context of science (Spielberger, 1966). According to Freud (1936), anxiety is regarded as an unpleasant affective state or condition, which is characterized by all that is covered by the word, ‘nervousness’. Freud conceived of anxiety as a signal indicating the presence of a dangerous situation and differentiated between objective anxiety and neurotic anxiety largely on the basis of whether the source of the danger was from the external world or from internal impulses. Based on Freudian theory, objective anxiety involves a complex internal reaction to anticipated injury or harm from some external danger. With objective anxiety, the intensity of the anxiety reaction is proportional to the magnitude of the external danger that evokes it, the greater the external danger, the stronger the perceived threat, the more intense the resulting reaction. Neurotic anxiety is characterized by feelings of apprehension and physiological arousal (Freud). However, the source of danger is internal, and this source is not consciously perceived because it has been repressed.

As an extension of the Freudian theory, May (1950) described anxiety as the apprehension cued off by a threat to some value which the individual holds essential to one’s existence as a personality. According to May, the particular events or stimuli which evoked anxiety are largely determined by learning rather than impulses. An anxiety reaction is normal if it is proportionate to the objective danger and does not involve repression or other defense mechanism. Neurotic anxiety reactions are disproportionate to the objective danger and involve repression and neurotic defenses.

Anxiety is also viewed as an intensely unpleasant state of tension arising from experiencing disapproval in interpersonal relations. For example, through an empathic linkage between an infant and its mother, the tension of anxiety, when present in the mothering one, induces anxiety in the infant (Sullivan, 1953). Once aroused, anxiety distorts the individual’s perception of reality and limits the ranges of stimuli that are perceived. Today, anxiety is viewed as an unpleasant emotional state, which is characterized by subjective feelings of tension, apprehension, and worry, and by activation or arousal of the autonomic nervous system (Bourne, 2006; Watson & Kendall, 1989; Wesley, 1988), mostly consistent with Freud’s conceptualization.

Recently, there has been increasing discussion of physiological theories behind anxiety. These theories explain that individuals with anxiety disorder experience heightened physiological arousal when they encounter stressors or social situations, which they interpret as an indication of danger or anxiety (Gerlach, Mourlane, & Rist, 2004). Anderson and Hope (2009) also noted that such an interpretation of physiological arousal leads to increased symptoms of anxiety (e.g. racing heart or blushing) among individuals with anxiety disorder. Furthermore, perceptions about the dangerousness of such physiological arousal may maintain anxiety symptoms as individuals learn to avoid threatening or stressful situations in order to evade such physiological arousal (Anderson & Hope).

**State versus trait anxiety**

Since the 1950s, empirical evidence of different types of anxiety has emerged. Cattell and Scheier (1958) identified two distinct anxiety factors, which they labeled state anxiety and trait anxiety. In a factor analytic study, Cattell and Scheier found that the state anxiety factor was based on a pattern of variables, defining a transitory state or condition of the organism which fluctuated over time. However, trait anxiety was interpreted as measuring stable individual differences in a relatively permanent personality characteristic. Physiological variables (e.g. respiration rate, and systolic blood pressure) markedly loaded on the state anxiety factor, but had only slight loadings on trait anxiety. According to Spielberger (1966), state anxiety refers to an empirical process or reaction
which is taking place now at a given level of intensity. It is characterized by subjective, consciously perceived feelings of apprehension and tension, accompanied by or associated with activation of the autonomic nervous system. In contrast, trait anxiety indicates a latent disposition for a reaction of a certain type to occur if it is triggered by appropriate or sufficiently stressful stimuli (Spielberger). Anxiety as a personality trait implies a motive or acquired behavioral disposition that predisposes an individual to perceive a wide range of objectively non-dangerous circumstances as threatening, and to respond to these with anxiety state reactions disproportionate in intensity to the magnitude of the objective danger. Trait anxiety measures, therefore, reflect anxiety-proneness, i.e. differences between individuals in the probability that anxiety states will be manifested under circumstances involving varying degrees of stress (Spielberger, 1972).

The state-trait distinction introduced by Cattell and Scheier (1958) subsequently received much attention from researchers. Lazarus and Averill (1972) regarded anxiety as a complex emotional syndrome which consists of unpleasant cognitive and affective states and physical arousal as basic components. Cattell (1972) and Izard (1972) described the unique and distinctive pattern of responses that is associated with anxiety states. For Cattell, the response pattern in state anxiety defines a fundamental emotion as a unitary source state. Izard contended that anxiety is a complex but unstable reaction which consists of variable combinations of other more basic emotions such as fear, distress, and shame. The development of comprehensive theory to account for anxiety phenomena has been paralleled with that of measurement of the concept, as discussed in the following section.

METHODS

Relevant studies for this review were identified by electronic searches of one of the most comprehensive and widely used databases, PubMed. The literature search was limited to articles published in the English language up to December, 2008. The key words “measurement,” “anxiety,” and “children” were used to narrow the literature search. The electronic searches generated a combined total of 224 titles and abstracts for assessment. Of these 224 articles, 75 without links to full-text were excluded. A total of 149 full-text articles were then reviewed systematically to confirm inclusion in this study. Of the 149 articles examined, 80 were not original measurement articles. Rather, they looked at anxiety as part of its measure in relation to other relevant concepts such as pain, trauma symptoms, hardness, quality of life, depression or sense of coherence. In addition, 18 did not target children and were more concerned about anxiety in young adults (18–22 years) or parents of children with a certain physical condition (e.g. cancer, cystic fibrosis, attention deficit, or type 1 diabetes), 13 were conceptual in nature discussing general anxiety research, theories or treatment, eight were simple validation studies of translated version of anxiety instruments, seven investigated genetic or hormonal influences on childhood anxiety, seven discussed somewhat remotely relevant topics (e.g. recall bias in measuring cognitive functioning of children), and two were qualitative. As a result, a total of 14 studies were included in this systematic review (Figure 1).
RESULTS

Many approaches have been used to measure anxiety in children. Those approaches include self-report measures and behavioral/observational methods (see Table 1).

Self-reports

The Diagnostic and Statistical Manual of mental disorder (DSM-IV; American Psychiatric Association, 2000) lists a number of anxiety disorders, including panic disorder, agoraphobia, social phobia, simple phobia, obsessive-compulsive disorder, post-traumatic stress disorder, and generalized anxiety. The vast majority of self-report measures attempt to assess generalized anxiety. The prominent feature of generalized anxiety is trait anxiety in the form of motor tension, autonomic hyperactivity, vigilance, or scanning (American Psychiatric Association).

S-R Inventory of Anxiousness

The S-R Inventory measures trait anxiety in adolescents (Endler, Hunt, & Rosenstein, 1962). The inventory includes 14 modes of anxiety responses and 11 anxiety-provoking situations, yielding a total of 154 (5-point) items. It was administered to 136 undergraduate students (Endler et al.) with alpha coefficients ranging from .55 to .90. The lowest alpha coefficient was obtained for starting off on a long automobile trip and the highest for being alone in the woods at night. Although evidence of criterion validity exists, the developers did not specify the age range of the participants. Further, no other study was found to utilize the inventory for adolescents. Time to complete the instrument was about 20–30 minutes (Endler et al.), which may be too much of a burden for children with chronic conditions.

Multifactorial Scale of Anxiety

This scale also assesses anxiety in adolescents (Fenz & Epstein, 1965). The scale consists of 53 items (1–5 point) in three subscales: Muscle tension (18 items); autonomic arousal (16 items); and feelings of insecurity (19 items). Psychometric properties of the scale were tested in 98 undergraduate students (52 females and 46 males). The split-half reliability coefficients were .70 for the total scale, .73 for the muscle tension scale, .62 for the autonomic arousal scale, and .74 for the feelings of insecurity scale. In a later study with 188 undergraduate students, Fenz (1967) reported that test-retest reliability coefficients at the 6-week interval were .70 for the total scale, .63 for the muscle tension scale, .70 for the autonomic arousal scale, and .62 for the feelings of insecurity scale. No validity evidence of the instrument is provided.

State-Trait Anxiety Inventory (STAI) Form Y-1 and Y-2

The STAI Form Y-1 and Y-2, developed by Spielberger (1973), is a self-report measure of childhood anxiety. This inventory contains two subscales: Form Y-1 assesses temporary symptoms (e.g. I feel upset), while Form Y-2 measures chronic or trait anxiety symptoms (e.g. I have disturbing thoughts). Both forms consist of 20 items each and the child is instructed to choose one of four answers that best describes how he or she generally feels or how he or she is feeling at present. A score of 1–4 is obtained on each item, and these are summed to yield total anxiety state and total anxiety trait scores. Scores can range from 20 to 80 on each form, with higher scores indicating higher anxiety.

The STAI for children has been validated across different age groups in children. In an instrument validation study, the internal consistency coefficients for Form Y-1 (state anxiety scale) were .82 for boys and .87 for girls and the coefficients for Form Y-2 (trait anxiety scale) were .78 for boys and .81 for girls (Spielberger, 1973). The 2-week test-retest reliability coefficients for anxiety state were .31 for boys and .47 for girls and the coefficients for anxiety trait were .65 for boys and .71 for girls. The low anxiety state test-retest coefficients may have been an index of the transitory nature of anxiety states. Finch, Kendall, Dannenburg, and Morgan (1978) found that the anxiety trait scale correlated well with the Children’s Manifest Anxiety Scale (Castaneda, McCandless, & Palermo, 1956), and that anxiety state scores increased when the children were exposed to stressful situations, which supports the construct validity of the measure.
The instrument has been used for more than 2,000 healthy children (Blumberg & Izard, 1986; Hazzard, Webb, Kleemeier, Angert, & Pohl, 1991; Heiney et al., 1997; Kleinman & Russ, 1988) and for clinical samples with a variety of conditions such as liver disease or diabetes (Windsorova, Stewart, Lovitt, Waller, & Andrews, 1991), chronic fatigue (van de Putte, Engelbert, Kuis, Kimpen, & Uiterwaal, 2007), and cancer (Moore & Mosher, 1997; Servitizoglou, Papadatou, Tsiantis, & Vasilatou-Kosmidis, 2008). Moore and Mosher found that the reliability coefficient alpha was .89 for Form Y-1 and .87 for Form Y-2 in 74 children with cancer. The STAI Form Y-1 and Y-2 can be easily administered to children within 10 minutes for most children aged 9 to 18 years (Spielberger, 1973). In addition, the instrument is noteworthy in that it measures both state and trait anxiety.

**Junior Manifest Anxiety Scale**

The Junior Manifest Anxiety Scale (Joshi, 1974) consists of 40 dichotomous items, including six lie items. This self-rating scale is designed to measure trait anxiety in children aged 9 to 16 years. A “yes” answer for each anxiety item counts toward the anxiety score, and the maximum possible score on the scale is 34. The test can be administered individually as well as in groups. In order to overcome any reading disability, the tester is instructed to read the test loudly. The scale was administered to 200 school children (Joshi). The test-retest reliability after a 2-week interval was .86. A content validity index of .88 was obtained on the basis of agreement between two professionals. However, no other types of validity have been established.

**Revised Children’s Manifest Anxiety Scale (RCMAS)**

This inventory of 37 dichotomous items was devised by Reynolds and Richmond (1978) as a revision of the earlier, Children’s Manifest Anxiety Scale (CMAS; Castaneda et al., 1956). The CMAS consisted of 42 anxiety items and 11 additional items designed to provide an index of the child’s tendency to falsify one’s response to the anxiety items. However, the difficulty in wording, limited items to poll enough areas of anxiety in children, and inefficiency of the administration in terms of time to complete the scale were pointed out as problems of the CMAS (Reynolds & Richmond).

Reynolds and Richmond (1978) revised the CMAS based on the 53 items from the CMAS and added 20 items as suggested by a panel of experienced teachers and clinicians. The 73-item revised draft of the CMAS was then administered to 329 healthy children from grades 1 to 12. Grades 1 and 2 students took 45 minutes to complete the tool with the teacher reading the items. For grades 6 or above, it took approximately 20 minutes. Based on item analysis, 28 anxiety items were retained along with nine of the original 11 lie scale items. Lie items that correlated .30 or higher with the anxiety scale or failed to correlate significantly with any other lie scale items were eliminated. Reliability estimate by KR20 yielded .83.

Each item of the revised scale is a statement pertaining to a symptom of anxiety (e.g. I worry a lot of the time). Children were instructed to answer “yes” or “no” for the items. In addition to the total anxiety score, three factor scores can be assessed; these reflect physiological anxiety (10 items), worry and oversensitivity (11 items), and social concerns and concentration (7 items). Finally, nine items for lie factor are designed to detect a social desirability response bias. A high score for lie scale (6 or higher) invalidates the anxiety score (Reynolds & Richmond, 1978). The factor structure of the instrument was obtained from the original sample data of 1978 (Reynolds & Richmond). In the study, the concurrent validity was established by the relationship of RCMAS with the STAI for children (Reynolds, 1980). Specifically, the correlation between the STAI Form Y-2 (trait anxiety scale) and RCMAS instrument was .85 ($p < .001$), whereas there was a low, non-significant correlation between the STAI Form Y-1 (state anxiety scale) and the RCMAS ($r = .24$, $p > .05$).

The RCMAS has been used for about 300 community samples aged 6 to 18 years (Chorpita, Tracey, Brown, Collica, & Barlow, 1997; Codori, Petersen, Boyd, Brandt, & Giardello, 1996; Compas et al., 1994; Welch, Wadsworth, & Compas, 1996) and for more
<table>
<thead>
<tr>
<th>Type</th>
<th>Title (1st author, year)</th>
<th>Target population</th>
<th>Reliability and validity</th>
<th>Strengths</th>
<th>Weaknesses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Self-report</td>
<td>S-R Inventory of Anxiousness (Endler et al., 1962)</td>
<td>Not specified</td>
<td>Cronbach alpha coefficients ranged from .55 to .90 in college students</td>
<td>Comprehensive (including 14 modes of anxiety responses and 11 anxiety-provoking situations)</td>
<td>Target age range was not specified, Too burdensome (154 items taking 20–30 minutes to complete)</td>
</tr>
<tr>
<td>Self-report</td>
<td>Multifactorial Scale of Anxiety (Fenz &amp; Epstein, 1965)</td>
<td>Adolescents</td>
<td>Split-half reliability of .70 for the total scale, .73 for the muscle tension scale, .62 for the autonomic arousal scale, and .74 for the feelings of insecurity scale</td>
<td>Maybe not appropriate for use in younger-aged children No validity information available</td>
<td>Relatively simple with 53 items Includes age-relevant content related to anxiety (e.g. feelings of insecurity)</td>
</tr>
<tr>
<td>Self-report</td>
<td>State-Trait Anxiety Inventory (Spielberger, 1973)</td>
<td>Children (9–18 years)</td>
<td>Internal consistency coefficients of .82 for boys and .87 for girls for state anxiety and .78 and .81 for boys and girls, respectively, for trait anxiety Test-rest reliability coefficients of .65 and .71 for boys and girls, respectively, for trait anxiety</td>
<td>Measures both state and trait anxiety Validated across different age groups of children in clinical (including cancer) and non-clinical settings</td>
<td>Requires some pre-knowledge about the situation so researcher can make a judgment to apply appropriate anxiety subscales (i.e. state vs. trait)</td>
</tr>
<tr>
<td>Self-report</td>
<td>Junior Manifest Anxiety Scale (Joshi, 1974)</td>
<td>Children aged 9–16 years</td>
<td>Test-retest reliability coefficient of .86 Content validity index of .88</td>
<td>Measures both state and trait anxiety Validated across different age groups of children in clinical (including cancer) and non-clinical settings</td>
<td>Requires some pre-knowledge about the situation so researcher can make a judgment to apply appropriate anxiety subscales (i.e. state vs. trait)</td>
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<td>Type</td>
<td>Description</td>
<td>Children aged</td>
<td>Notes</td>
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<tr>
<td>Self-report</td>
<td>Revised Children's Manifest Anxiety Scale (Reynolds &amp; Richmond, 1978)</td>
<td>6–18 years</td>
<td>Reflects both physiological and psychological aspects of anxiety and convergent validity testing approaches. Validated across different age groups of children. More validation studies needed for children below the age of 12 years. Instrument use limited among children with chronic diseases such as cancer.</td>
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<tr>
<td>Self-report</td>
<td>Penn State Worry Questionnaire-Children (Chorpita et al., 1997)</td>
<td>6–18 years</td>
<td>Measures only part of anxiety feature (i.e. worry)</td>
<td></td>
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<tr>
<td>Behavioral</td>
<td>Physical indicators measuring heart rates (Kaufman et al., 1990), palmar sweating (Lore, 1965), electromyogram or eye blinks (Brandt &amp; Fenz, 1969)</td>
<td>age not specified</td>
<td>Offers more comprehensive feature of anxiety. Difficult to operate (often requiring equipment and other resources)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Behavioral</td>
<td>Drawings (Clatworthy et al., 1999; Prytula &amp; Hiland, 1975)</td>
<td>age not specified</td>
<td>Very limited evidence of reliability and validity. Scoring processes are not often standardized. Utility is limited to children in normal settings.</td>
<td></td>
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</tr>
<tr>
<td>Behavioral</td>
<td>Behar Preschool Behavior Questionnaire (Behar, 1977)</td>
<td>3–6 years</td>
<td>Utility is limited to children in normal settings.</td>
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<tr>
<td>Behavioral</td>
<td>Behavioral Rating Scale for Blood Sampling (Rebesco et al., 1984)</td>
<td>less than 10 years</td>
<td>Utility is limited to children in one situation (i.e. blood sampling)</td>
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</tbody>
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(Contd.)
Table 1 (Continued)

Comparison of Anxiety Measures Included in the Study

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<thead>
<tr>
<th>Type</th>
<th>Title (1st author, year)</th>
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<th>Weaknesses</th>
</tr>
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<tbody>
<tr>
<td>Behavioral</td>
<td>Child Behavior Checklist</td>
<td>Children aged 4–18 years</td>
<td>Cronbach’s alpha coefficients of .90 for internalizing emotional problems, .94 for externalizing emotional problems, and .97 for the total problem scale</td>
<td>Covers both behavioral and emotional problems, and has been used and validated in children with cancer</td>
<td>Need more information on inter-rater and intra-rater reliabilities for the measure.</td>
</tr>
<tr>
<td></td>
<td>Behavior Checklist (Achenbach, 1991)</td>
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</table>

The RCMAS is one of the most widely used instruments for assessing childhood anxiety due to its simplicity (Chorpita et al., 1997). The RCMAS also includes various aspects of anxiety and controls for social desirability factor by including lie items in the measure. However, there is a lack of evidence of reliability except for internal consistency. In addition, the developers did not cross-validate the instrument across ages. Based on evidence suggesting that children below the age of 12 years demonstrate substantive cognitive difference (Piaget, 1950), more validation studies with split samples (i.e. aged 6–11 years for younger children and 12–18 years for older children) are warranted to allow the estimates of reliability and validity for different developmental groups. Another issue is that the instrument was not specifically designed for chronically ill children (e.g. cancer). The use of the RCMAS for children with chronic diseases might be questioned because the validity of the instrument with chronically ill pediatric patients is yet to be determined (von Essen, Enskär, Kreuger, Larsson, & Sjödén, 2000).

**Penn State Worry Questionnaire-Children (PSWQ-C)**

The questionnaire was designed to measure self-reported worry of children and adolescents (Chorpita et al., 1997). Because of the favorable properties of the Penn State Worry Questionnaire (PSWQ) observed in adult samples (Meyer, Miller, Metzger, & Borkovec, 1990), as well as the simplicity of its items, Chorpita et al. revised the instrument for children use by performing grammar analysis and rewording items at approximately the second grade level.
Nine items were reworded and the remaining items were left unchanged, yielding a 16-item instrument. Items are scored from 0 to 3, resulting in a possible range of total scores of 0 to 48, with higher scores reflecting a greater degree of anxiety. It can be completed less than 10 minutes for most children. Researchers are allowed to answer questions in the event that any children have difficulty with reading.

Using 199 children aged 6 to 18 years from community schools, Chorpita et al. (1997) performed exploratory factor analysis. Two items were deleted during the process. About 36.3% of the item variance was explained by the one-factor solution. Chorpita et al. also tested the factor structure of the instrument with 14 retained items across gender and age groups, which resulted in invariant factor structure and good model fit. Convergent validity and discriminant validity were established by correlations with RCMAS-worry and oversensitivity scale \( r = .71, p < .05 \); Reynolds & Richmond, 1978) and Children's Depression Inventory \( r = .52, p < .05 \); Kovacs, 1981). Internal consistency coefficient for the 14 items was .89. A 1-week test-retest reliability with 35 children aged 7 to 18 years yielded .92 \( p < .001 \). The PSWQ-C is simple to administer and shows favorable reliability and validity. But the instrument tests only part of anxiety feature (i.e. worry), which limits the utility of the measure.

**Behavioral or observational methods**

Various measures of autonomic nervous system activity have been employed in an attempt to assess the physiological component of anxiety state. Common behavioral methods include heart rate monitoring (Kaufman, Eller, & Applegate, 1990), palmar sweating (Lore, 1965), drawings (Sheskin, Klein, & Lowental, 1982; Sonnenberg & Venham, 1977), and behavioral ratings (Behar, 1977; Rebesco, Cotler, & Jason, 1984).

**Physical indicators**

Various types of physical indicators have been used to measure anxiety. For example, Kaufman et al. (1990) measured state anxiety during intelligence testing for 43 children aged 5 to 11 years. Kaufman et al. monitored heart rates at the end of each minute during the test. The monitoring was accomplished by a painless clip attached to the child’s earlobe. Lore (1965) measured the amount of palmar sweating as a practical means of measuring autonomic nervous system activity, which presumably is related to anxiety in children. The average age of the 26 subjects was 7½ years. Brandt and Fenz (1969) used heart rate, electromyogram, and the number of eye blinks as measures of anxiety for 24 undergraduate students. These physiological measures, however, assess only one part of anxiety (i.e. state anxiety) and hence, utilization of them has been minimal.

**Drawings**

A number of researchers have attempted to assess children’s anxiety level by means of drawing. The central hypothesis upon which interpretations of human figure drawings are based is the body-image hypothesis (Clatworthy, Simon, & Tiedeman, 1999; Prytula & Hiland, 1975). The human figure drawn by an individual who is directed to draw a person relates intimately to the impulses, anxieties, and conflicts corresponding to the environment. However, no published research was found to measure anxiety using drawing in children with serious chronic conditions. Rather, this method has been used to test state anxiety, especially before or after dental treatment for children aged 5 to 17 years (Kantaputra, Chiewcharnvalkiat, Wairatpanich, Malikaw, & Aramratana, 2007; Sheskin et al., 1982; Sonnenberg & Venham, 1977). Children are given a standard sheet of white paper sized 28 cm x 22 cm and are asked to draw a person. The level of anxiety is determined by the sum of certain criteria for the drawing (e.g. person’s size, space from the margin, or head to body ratio). These criteria, however, are not often standardized. Furthermore, no evidence of intra-rater or inter-rater reliability of a measure of this kind is readily available, adding barriers to utilizing this approach.

**Child behavior checklist**

The level of anxiety has been frequently rated by teachers, parents or by clinicians, especially for young
children. Behar Preschool Behavior Questionnaire (Behar, 1977) and Behavior Rating Scale for Blood Sampling (Rebesco et al., 1984) were designed to assess anxiety in children aged less than 10 years based on their behaviors observed by teachers, parents, or clinicians. The Child Behavior Checklist (CBCL) measures the frequency and intensity of behavioral and emotional problems of a child aged 4 to 18 years in the past 6 months (Achenbach, 1991). The CBCL has 11 scales including anxiety/depression, delinquency, aggression, withdrawal, somatic complaints, social problems, thought problems, attention problems, externalizing problems (includes delinquent and aggressive behavior), internalizing problems (including withdrawal, somatic complaints, and anxiety/depression), and total problems (including externalizing, internalizing, social, thought, and attention problems). The parents of the children and adolescents report about specified problems in a response format of “0–2” with 0 indicating “not true” and 2 “true”. The total behavioral problem scale score is the sum of all the responses to all the items. The CBCL is one of the most widely used instruments in research and clinical work in children (Achenbach, 1991; Kim et al., 2008) and has evidence of validity and reliability (Mohammadi, Taylor, & Fombonne, 2006). In the literature of children with chronic diseases, the CBCL is becoming increasingly popular as a comprehensive measure of behavioral and emotional problems including anxiety (Conklin, Li, Xiong, Ogg, & Merchant, 2008; Sands et al., 2005; Yeh & Wang, 2004), though the inter-rater and intra-rater reliability of the instrument is overdue.

**DISCUSSION**

As the nature of previously life-threatening conditions (e.g. cancer) has shifted from acute disease to chronic, life-threatening disease, psychological adjustment of children with chronic conditions is becoming a critical issue that needs to be addressed for their successful survival beyond the treatment period. This paper discusses a variety of approaches used by researchers to measure anxiety in children, one of the key indicators of psychological adjustment of children with chronic diseases, as one of the first critical steps to developing appropriate nursing intervention and evaluating its effect. While competing conceptualizations about anxiety exist, most anxiety measures seem to be based on the theoretical conception proposed by Freud (1936), who viewed anxiety as an unpleasant emotional state or condition characterized by subjective feelings of tension, apprehension, and worry.

Methods to assess anxiety in children included self-reports and behavioral/observational methods, though the review revealed that there has been little uniformity in the choice of tools. The result is not surprising since it is not easy to develop a single tool that can sufficiently capture multifaceted nature of anxiety because of the complexity of anxiety itself and children (Watson & Kendall, 1989; Wesley, 1988). Of the multiple self-report instruments reviewed, earlier versions (e.g. S-R Inventory of Anxiousness) were too burdensome as they would take at least 20–30 minutes to complete, limiting its utility in chronically ill children, most of whom are undergoing intense treatment and emotional responses. Of other self-report measures, the STAI and the RCMAS have been validated and are commonly used in pediatric patient research. However, the lack of more rigorous evaluation of the psychometric properties and cross-validation of these instruments across different age groups was noted.

Various types of physical indicators of anxiety were also reviewed. The biggest disadvantage of behavioral methods was the nature of these methods measuring state anxiety only. This has implications in childhood chronic disease research in that, such tools may not be useful to examine the anxiety-proneness of children with chronic disease manifested under circumstances involving varying degrees of stress. A recent development of the CBCL offers some promise in measuring anxiety, however, in that the instrument offers an opportunity to assess both behavioral and emotional problems among children who undergo stressful events such as cancer. Currently lacking is that this tool also involves subjective
judgment; it would be critical to establish inter-rater as well as intra-rater reliabilities to support the consistency of the judgment before fully utilizing the instrument in children.

The results of this review indicate several avenues for future research. The review results support a critical need for further exploring the concept of anxiety in children, particularly those with highly stressful chronic conditions such as cancer, and for identifying attributes that can contribute to its development. Given the complicated nature of chronic disease experience, it would be important to evaluate and develop measurement that can capture the multifaceted dimensions of anxiety in chronically ill children. In addition, further systematic psychometric validation research is needed in children. Most previous studies of childhood anxiety have focused on children with psychological problems (Moore & Mosher, 1997; Lähteenmäki et al., 2004), instead of exploring the interplay of physical conditions (e.g. cancer) and their psychological impact in the experience of anxiety. Finally, future studies need to address cross-validation of childhood anxiety instruments across different age groups and samples, while trying to reduce the completion time so as to increase the likelihood of an instrument’s completion. Such information would be essential for relevant intervention studies to adequately capture intervention effects at the level of the target children population.

This review only included papers published in English. These may have resulted in some relevant work published in other languages or unpublished documents (e.g. dissertations, government documents) being omitted. Nevertheless, the paper lays important groundwork for additional research in the field of anxiety in children, particularly those with highly stressful conditions such as cancer.

CONCLUSION

While different forms and approaches of anxiety measures are available, most anxiety measurements reviewed in this paper had their own purpose, specified target ages, as well as unique strengths and weaknesses. Selection of appropriate anxiety measures should be based on rigorous evaluation of evidence as offered in the paper so that careful comparison and contrast of competing approaches can be made before the researcher makes any final decision. This methodological review is only the first step toward more systematic research to address anxiety in children.

REFERENCES

*Indicates studies measuring anxiety in children that were included in the review.


