

A self-report measure of situational anxiety for young children

Larry L. Venham, D.D.S., Ph.D.*
Elise Gaulin-Kremer, Ph.D.

Abstract

In this series of five studies, a self-report measure of situational anxiety for young children was developed and evaluated. Stylized cartoon figures representing various emotional states were paired and presented in a picture selection task. A total of 236 children participated in studies evaluating test items and comparing the picture test with other measures of children's response to the stress of dental visits. The final test developed was a rapidly administered task, which was readily understood and accepted by children as young as three years old. Internal consistency and test-retest reliabilities were assessed and shown to be adequate. The picture test was significantly correlated with anxiety indices which included human figure drawings, ratings of anxiety and cooperative behavior, heart rate, and basal skin response. The results indicate that the picture test is a simple yet valid and reliable index of the young child's response to situational stress.

Introduction

Self-report instruments have occupied a prominent and well-founded position in anxiety research. Since anxiety is an internal state based on unobservable cognitive processes, the individual's self-description of these internal events can provide valuable data inaccessible to more objective measurement techniques. Indeed, previous research has clearly demonstrated the value of self-report measures of anxiety. Using factor analysis, Cattell and Scheier¹ compared 13 studies involving a variety of anxiety indices. The only measures with consistently high loadings on the anxiety factor were those based on self-report. Rosenthal² reported similar results in her factor analysis of anxiety measures.

A survey of current literature revealed no self-report measures of transient anxiety appropriate for young children in a stressful situation. Measures designed for use with adults require cognitive and communication

skills beyond those possessed by young children. Therefore, the present study series was undertaken to develop a self-report measure of situational anxiety suitable for use with children as young as three years old.

The validity of a self-report measure relies heavily on the subject's ability to observe and label affective experiences and his/her willingness to respond honestly. These considerations suggested the usefulness of a projective technique which would permit the child to respond nonverbally and on a more directly experiential level. This approach would presumably minimize the tendency to deny ego-threatening material and would reduce the distortion produced by the subject's attempt to give socially desirable responses.

A projective picture selection task was designed using a male cartoon figure as a stimulus (Fig. 1). A large head was drawn with broad lines to attract attention to the face. The rest of the body was drawn proportionally smaller and with thin lines. The hair and facial features were stylized to avoid any obviously identifiable racial characteristics. Clothing was also stylized to minimize socioeconomic class identification. The cartoon figure was portrayed in the varying states of emotional arousal seen in the clinical setting, including happiness, fear, sadness, and anger. A progression of seven stages from neutral through the extremes of each emotion was drawn.

Test items were created by pairing cartoon figures differing in type and intensity of emotional arousal. The subject was presented with a series of items and asked to choose the member of each pair which best represented his/her current emotional state. The frequency of choosing the more anxious pair member from successive paired presentations defined the anxiety score.

Three initial studies were conducted to evaluate and to refine preliminary forms of the picture test. Two later studies provided reliability and validity data for the final version of the picture selection task.

*Recipient of N.I.H. postdoctoral fellowship.

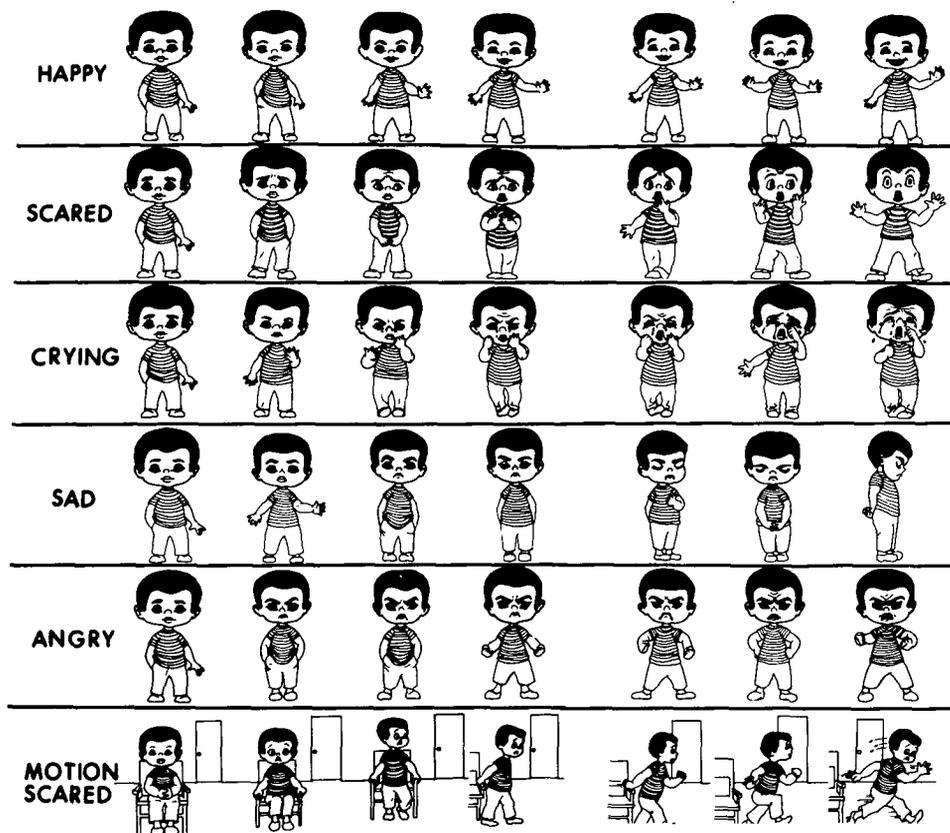


Fig. 1. Stylized cartoon figure portrayed in seven-stage emotional progressions.

Picture test construction

Version 1

Twenty-seven test items were created by arbitrarily pairing pictures from the Happy, Scared, and Crying series (Table 1). No attempt was made to exhaust all possible combinations of emotional states.

These items were administered to a sample of children representative of the young dental population. The subjects were 23 dentally experienced children brought to a university pedodontic clinic for a diagnostic visit. The children ranged in age from 3–9 years, with a mean age of 6.

Each child completed the picture selection test immediately after being seated in the dental chair and again just before leaving the dental chair at the end of the appointment. The instructions were, "I have some pictures. I want you to pick the boy who feels the most like you feel right now. Look carefully at their faces to see how they feel."

Informal observations of the children's test behavior indicated that children in this age group were able to comprehend the instructions and to grasp the emotional meaning of the stimuli. It was not necessary to eliminate any children from the sample because of an inability to understand and perform the task. Further-

more, the children's spontaneous comments and behavior appeared consistent with their test responses, suggesting strong face validity of their test results.

An item analysis was performed to provide a basis for selecting appropriate items for future test versions. Using the pre-visit picture selection data, item-total test correlations were computed by the point-biserial formula. The item-total test correlations ranged from 0.0–1.0 (Table 1). Ten pairs had item-test correlations of 0.88 or better, supporting the potential for constructing a highly homogeneous test.

Pre- and post-visit scores were compared in a preliminary attempt to validate the picture test as an index of situational anxiety. It was expected that anxiety would be greater immediately prior to the visit than following completion of the visit, and that this pattern would be reflected in higher pre-visit than post-visit scores. The findings tentatively supported the validity of the picture test. The mean pre-visit score was 12.13 (S.D. = 8.97); the mean post-visit score was 4.22 (S.D. = 5.44); paired t test (22) = 3.42; $p < 0.005$.

To determine whether children of varying ages showed consistently different responses, the pre-visit picture test scores were correlated with age, r (21) = -0.17, not significant (n.s.). Thus, the preliminary

Table 1. Cartoon figure pairs selected for preliminary & final picture test versions

Version 1	Version 2	Version 3	Final Version
2Sc -6H* (1.0)†	2Sc -6H (0.71)	2Sc -6H (0.50)	2Sc -6H
1 -3Sc (1.0)	1 -3Sc (0.86)	1 -3Sc (0.75)	
2Sc -4Sc (1.0)	2Sc -4Sc (0.57)	2Sc -4Sc (0.67)	
1 -7C (0.88)	1 -7C (0.85)	1 -7C (0.67)	1 -7C
2C -4H (0.88)	2C -4H (0.57)	2C -4H (0.50)	2C -4H
1 -5Sc (0.88)	1 -5Sc (0.71)	1 -5Sc (0.42)	1 -5Sc
3C -4H (0.88)	3C -4H (0.57)	3C -4H (0.67)	3C -4H
4Sc -1 (0.88)	4Sc -1 (0.57)	4Sc -1 (0.75)	
6Sc -7H (0.88)	6Sc -7H (0.43)	6Sc -7H (0.58)	
3Sc -2Sc (0.88)	3Sc -2Sc (0.43)	3Sc -2Sc (0.67)	
2Sc -3H (0.75)	1SM -7SM (0.86)	1SM -7SM (0.50)	1SM -7SM
4C -2C (0.75)	2Sa -7Sa (0.71)	2Sa -7Sa (0.58)	2Sa -7Sa
2H -2Sc (0.75)	6Sa -2Sa (0.88)	6Sa -2Sa (0.58)	6Sa -2Sa
2C -5H (0.75)	2SM -1SM (0.71)	2SM -1SM (0.67)	
3C -1 (0.75)	7SM -5SM (1.0)	7SM -5SM (0.50)	
3C -5C (0.75)	2A -4A (0.71)	2A -4A (0.83)	
2Sc -1 (0.75)	2SM -6SM (0.71)	2SM -6SM (0.50)	
7C -3C (0.75)	6A -2A (0.43)		
6Sc -1 (0.63)	4A -3A (0.43)		
1 -5H (0.63)	2SM -3SM (0.43)		
7H -1 (0.63)			
7C -7H (0.63)			
1 -2C (0.63)			
3Sc -6H (0.63)			
7H -5H (0.38)			
4H -2H (0.38)			
4Sc -7Sc (0.00)			

* The abbreviations used are Sc, scared; H, happy; 1, neutral; C, crying; SM, scared motion; Sa, sad; A, angry.

† Numbers in parentheses, item-total test correlations.

data provided no indication of a differential effectiveness of the picture task across the age range tested.

Version 2

The 10 items from Version 1 with item-test correlations of at least 0.88 were retained for further evaluation. Ten new items were developed by incorporating figures from the Sadness, Anger, and Motion Scared series. These 20 items were administered to an independent sample of 22 young, dentally experienced patients brought to the same pedodontic clinic. The children ranged in age from 4-11, with mean age of 7. The test was administered pre- and post-visit in the manner previously described.

Item analysis yielded item-total test correlations ranging from 0.43-1.0 (Table 1). Again in a comparison of pre- and post-visit scores, the mean score was 12.0 (S.D. = 5.77) pre-visit and 4.14 (S.D. = 3.85) post-visit; paired *t* test (21) = 11.96; *p* < 0.001. These results confirmed the previous validation data.

The correlation between age and picture test scores was computed, *r* (20) = 0.07, n.s. The consistently low correlation again supported the absence of an age-related response bias.

Version 3

Three of the newly developed items with item-total test correlations of 0.43 were eliminated. The remaining 17 items were retained for further evaluation. The 17-item test was administered to an independent sample of 38 dentally experienced children. These subjects ranged in age from 4-7, with an average age of 5.2 years. The children were tested in a nonstressful situation, the living room of a local parish home. Each child was seated at a table with the experimenter and, after a short social phase, was instructed, "I am interested in how boys and girls feel when they come to see the dentist. I have some pictures. I want you to pick the boy who is waiting to see the dentist. Think about how you feel when you visit the dentist to help you pick which boy is waiting to see the dentist. Look carefully at their faces to see how they feel."

The mean score was 10.89 with a S.D. of 4.59. The correlation between the test scores and the age was computed, *r* (36) = 0.25, n.s. The item-total test correlations were computed and are shown in Table 1.

For clinical purposes, a short test which could be quickly administered was considered essential. Therefore, eight items were selected to comprise a final

picture test version. Item selection was based on the item-test correlations and clinical impressions of the children's response to the various items. The final picture test is illustrated in Fig. 2. The anxious member of each pair occupies the left and right position with equal frequency to control for a possible position set.

Picture test validity and reliability

Further data were needed to establish the reliability and validity of the final picture test. Therefore, two studies were conducted in which children were administered the picture test in stressful dental situations. Assessments were made of test-retest reliability, internal consistency reliability, and construct validity.

Restorative treatment study

In the first study, the subjects were 24 children aged 3-8 years, with an average age of 5½ years. Subjects were selected from a population of children presenting

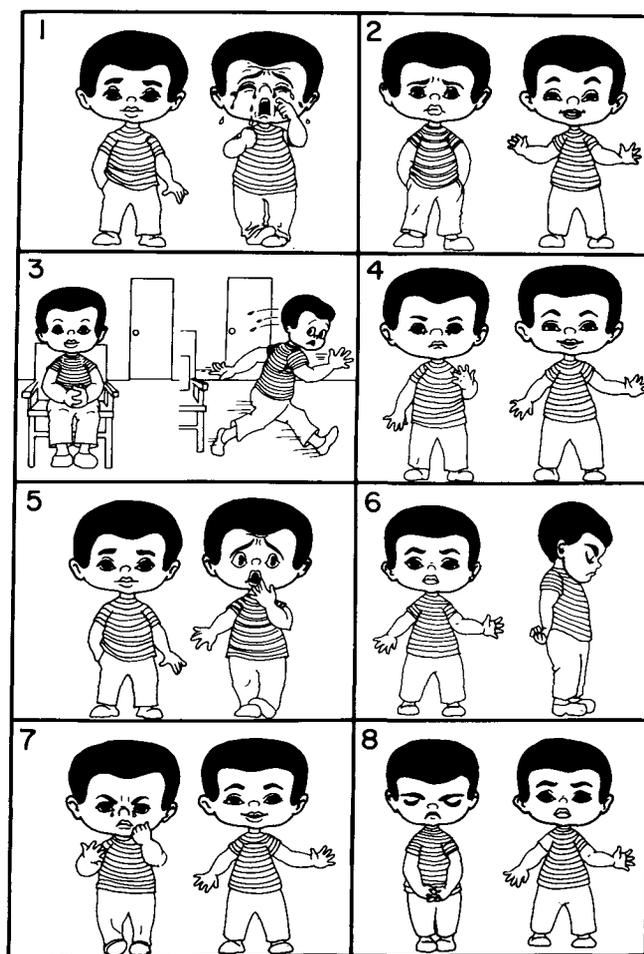


Fig. 2. Final eight item picture test.

for treatment at a public health dental clinic. Each child's initial clinic visit consisted of an oral examination and prophylaxis. Children requiring at least two restorative treatment visits were then selected as subjects.

The two treatment visits were scheduled one week apart. The picture test was administered at Treatment Visit 1 and Treatment Visit 2. After the child was seated in the dental chair and a brief oral exam completed, he/she was informed of the need for local anesthesia. Picture selection responses were then obtained immediately prior to the actual injection procedure. Test instructions were as described previously. Test administration required two minutes or less to complete.

The restorative treatment completed during Visit 1 intervened between the two test administrations. It was impossible to standardize totally the children's experience during this treatment visit. This variability in intervening experience would be expected to reduce the correlation between Visit 1 and Visit 2 scores. Nonetheless, a moderately high test-retest reliability of 0.70 was achieved.

Internal consistency of the picture test was estimated by the Kuder-Richardson formula 20,³ calculated using the data from Treatment Visit 1. A coefficient α of 0.838 indicated a high degree of internal consistency for the final picture test.

Picture test scores were inversely related to age, $r(22) = -0.47$; $p < 0.05$. The previous data had uncovered no consistent relationship between children's ages and their picture selection responses at a dental diagnostic visit. With the current data, it seemed plausible that the more stressful dental treatment visit elicited greater anxiety in the younger subjects. However, further research was needed to evaluate this possibility and ascertain that no age-related response bias was occurring.

Sequential dental visit study

The subjects of our second study were 64 children aged 2-5 years, with an average age of 4. The subjects participated in a longitudinal study of children's responses to dental stress. The children were observed during a total of 207 dental visits. Each child was seen at an initial examination and prophylaxis visit, one or more restorative visits, and a final polish visit.

The child's response to dental stress was assessed using the picture test score and five additional measures: human figure drawing (HFD) score, heart rate (HR), basal skin response (BSR), an anxiety rating, and a cooperative behavior rating. The picture selection and HFD tasks were performed at the beginning of the visit. The HFD was scored for anxiety using a modification⁴ of the scoring system of Engle and

Suppes.⁵ HR and BSR were sampled at standard intervals throughout each visit, and average values were obtained for the visit. A judge, naive to the study purposes, viewed a video tape of each visit and assigned overall ratings of the child's anxiety and cooperative behavior during the visit. Further details of the methodology and dental stress indices are reported elsewhere.⁶

A correlation matrix, which included the child's age and the six response measures, was computed; this matrix appears in Table 2. The picture test scores were significantly correlated with each of the other five indices of dental stress.

The correlations among measures were generally low. However, their magnitude is consistent with that of previously reported correlations between different measures of stress response.^{7,8} The self-report measures were obtained at the outset of the visit and reflected the child's initial response to the situation, whereas the ratings and physiologic measures represented an average response to procedures occurring throughout the dental visit. This methodology should in itself tend to reduce the correlations between the self-report indices and the remaining measures. Nonetheless, the picture test was as strongly correlated with the physiologic measures as the two physiologic measures were with each other. Although the picture test was significantly related to all the measures of situational stress, it correlated most highly with the HFD, another projective self-report index. The correlation between the HFD and picture selection scores is comparable to that reported between the HFD and a test anxiety measure.⁵

The child's age bore a highly significant, inverse relationship to the self-report and rating measures. The consistency of this relationship across four measures suggests a genuine developmental process in stress response rather than an age-related response bias on the picture test. An age effect was not observed in the first three studies conducted in relatively less

stressful settings. However, in the final two studies conducted during a restorative treatment series, younger children consistently tended to receive higher picture test scores than did older children. When undergoing treatment, younger children might be expected to experience greater anxiety than do older children, since they would presumably have fewer resources for coping with stress.

Discussion

A self-report measure of situational anxiety appropriate for the young child has been developed. Anxiety is measured using a picture selection task which can be rapidly administered and is readily understood and accepted by the child. Adequate levels of test-retest and internal consistency reliability were established for the final picture selection test. Test scores showed the predicted correlations with other indices of situational distress; these findings supported the construct validity of the test.

Research from another laboratory has recently provided additional support for the construct validity of the picture selection test. Klorman *et al.*⁹ reported observations on 105 pedodontic patients, ranging in age from 3-14, who were undergoing a variety of dental experiences. Venham's picture selection test and the Melamed Scale of Dental Anxiety¹⁰ were administered prior to the dental visit. The latter scale requires the children to rate on a 5-point scale their nervousness in eight hypothetical dental situations. Their cooperation during the dental visit was rated on a 4-point scale by the practitioner. Picture test scores yielded significant correlations in the predicted direction with both the children's self-reported dental anxiety and the practitioner's cooperativeness ratings. Thus, consistent findings from two laboratories support the validity of the picture test in measuring children's situational anxiety.

Results using the picture selection test confirm ear-

Table 2. Intercorrelations of dental stress measures and age

	Sequential dental visit study						
	Picture test	HFD	Clinical anxiety	Cooperative behavior	HR	BSR	Age
Picture test	1.0	0.31*	0.21*	0.14†	-0.11†	0.21†	-0.42*
HFD		1.0	0.16‡	0.08	-0.19‡	0.18†	-0.47*
Clinical anxiety			1.0	0.80*	0.14†	-0.04	-0.27*
Cooperative behavior				1.0	0.10	-0.06	-0.24*
HR					1.0	-0.21†	0.02
BSR						1.0	-0.13†

† $p < 0.05$.

‡ $p < 0.01$.

* $p < 0.001$.

lier suggestions that children's dental anxiety declines with age. Hawley *et al.*¹¹ studied 47 children aged 2-7 years during their first dental visit. The children's responses to dental procedures were rated on a 4-point scale. Fearful and disruptive responses were most common among the younger children and diminished in frequency as the child's age at the first visit increased. Comparable results were reported by Frankl *et al.*¹³ who studied children's responses at both examination and treatment visits. The present studies documented a similar developmental change in young children's dental stress responses.

The data collected to date indicate the picture selection test is a useful tool for those interested in measuring young children's responses to stressful situations. The routine use of this instrument should enhance the practitioner's understanding of the psychological impact which treatment procedures have on the young patient. Likewise, this tool should provide the researcher greater access to the largely unexplored, experiential world of the stressed child.

References

1. Cattell, R. and Scheier, I.: "The Nature of Anxiety; A Review of Thirteen Multivariate Analyses Comprising 814 Variables," *Psychol Rep.*, 4:351-388, 1958.
2. Rosenthal, I.: "A Factor Analysis of Anxiety Variables," Unpublished Doctoral Dissertation, University of Illinois, 1955.
3. Nunally, J.: *Introduction to Psychological Measurement*, New York: McGraw-Hill Book Company, 1970.
4. Sonnenberg, E. and Venham, L.: "Human Figure Drawings as a Measure of the Child's Response to Dental Visits," *J Dent Child*, 44:438-442, 1977.
5. Engle, P. and Suppes, J.: "The Relation between Human Drawing and Test Anxiety in Children," *J Project Techniques Pers Assess*, 43:223-231, 1970.
6. Venham, L., Bengston, D., and Cipes, M.: "Children's Response to Sequential Dental Visits," *J Dent Res*, 56:454-459, 1977.
7. Mandler, G., Mandler, J., Kremer, I., and Sholiton, R.: "The Response to Threat: Relations among Verbal and Physiological Indices," *Psychol Monographs: Gen Appl*, 75:1-22, 1961.
8. Martin, B.: "The Assessment of Anxiety by Physiological and Behavioral Measures," *Psychol Bullett*, 58:234-255, 1961.
9. Klorman, R., Ratner, J., Arata, C., King, J., and Sveen, O.: "Predicting the Child's Uncooperativeness in Dental Treatment from Maternal Trait, State, and Dental Anxiety," *J Dent Child*, 45:62-67, 1978.
10. Melamed, B., Weinstein, D., Hawes, R., and Borland, M.: "Reduction of Fear-Related Dental Management Problems with Use of Filmed Modeling," *J Am Dent Assoc*, 90:822-826, 1975.
11. Hawley, B., McCorckle, A., Whittemann, J., and Van Ostenberg, P.: "The First Dental Visit for Children from Low Socioeconomic Families," *J Dent Child*, 41:376-380, 1974.
12. Frankl, S., Shiere, F., and Fogels, H.: "Should the Parent Remain with the Child in the Dental Operatory," *J Dent Child*, 29:150-163, 1962.



Dr. Larry L. Venham is Associate Professor at the University of Connecticut Health Center. Requests for reprints should be addressed to Dr. Larry L. Venham, Department of Pediatric Dentistry, School of Dental Medicine, University of Connecticut Health Center, Farmington, Connecticut 06032.



Dr. Elise Gaulin-Kremer is Research Associate, at the University of Connecticut Health Center.