

Validation of a Facial Image Scale to assess child dental anxiety

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Summary. *Objective.* To examine the validity of a scale that uses faces as an indicator of children's dental anxiety.

Setting. Department of Child Dental Health waiting room, Newcastle Dental Hospital.

Subjects and methods. 100 children (aged 3–18 years) completed the Facial Image Scale (FIS) and the Venham Picture Test (VPT) in the dental hospital waiting room.

Results. A strong correlation (0.7) was found between the two scales, indicating good validity for the FIS. Findings also showed that a small, but significant, number of children are anxious in the dental context.

Conclusion. The findings suggest that the FIS is a valid means of assessing child dental anxiety status in a clinical context.

Introduction

Dental anxiety in children has been recognized as a problem in patient management for many years. Furthermore, the effects of this anxiety have been shown to persist into adulthood, which can often lead to dental avoidance [1] and the subsequent deterioration of oral health [2]. It is important that dentists are able to assess dental anxiety in child patients as early as possible so that they may identify patients who are in special need with regards to their fear. For this purpose, formal assessment measures are essential. Upon reviewing the literature, it is clear that there are many different assessment methods available for this purpose (see Aartman and colleagues [3,4] for comprehensive reviews). When considering the usefulness of an assessment measure, however, there are essentially three important factors to take into account:

1 The validity of the instrument used must be considered. This can be problematic, especially when the measure is indirect. For example, the use of

physiological methods has been criticised on the grounds that anxiety may be evoked due to the nature of the equipment used, and not because the child is dentally anxious [5]. In addition, projective techniques suffer from questionable reliability and validity due to difficulties in the interpretation of stories and the standardization of scoring;

2 The assessment measure must be appropriate for use with children. Indirect measures overcome this to a certain degree as they mostly rely on observations and reactions of the child by others. Techniques that rely on some form of verbal-cognitive self-report (e.g. questionnaires) can be problematic, however. Questioning children directly about their dental anxiety is reasonably straightforward, but verbal methods employed with young children can have limitations due to comprehension and intellectual ability [4];

3 It is important to consider whether an assessment measure is of practical use to the dental practitioner, an issue that is rarely addressed in the literature. Techniques such as projective tests and behavioural observation are not designed for everyday use by the clinician. Projective techniques, such as the Children's Dental Fear Picture Test [6], require expertise in carrying out interviews and administering (and scoring) tests. Similarly, physiological methods often require

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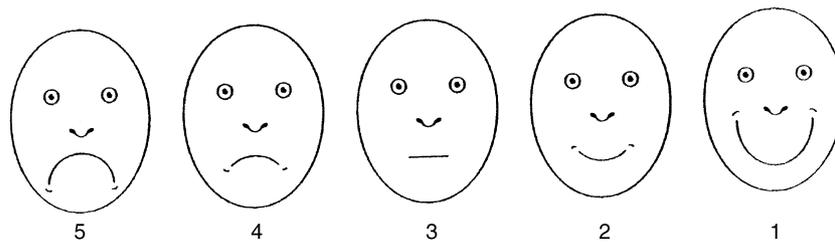


Fig. 1. Facial Image Scale with image scores, 1–5.

experience in using and interpreting results from specialized equipment not used in the normal remit of a dental practitioner. In addition, these methods are time-consuming and involve some interruption to the normal running of the dental clinic. Self-report questionnaires, conversely, are easier to employ in the clinical setting; potential problems may still exist, however, as measures differ significantly in terms of administration, scoring and interpretation [4].

The ideal measure should be valid, allow for limited cognitive and linguistic skills, and be easy to administer and score in a clinical context. In order to cover all of these criteria, the most obvious choice would be to employ a picture scale. One of the few picture scales available is the Venham Picture Test (VPT) [7] which has been used in a number of studies [5,8,9] to assess anxiety before treatment. In this test, children are presented with eight pairs of pictures, each depicting cartoon boys in contrasting moods. They are asked to choose the picture from each pair that they most feel like at that time. The advantage of this measure is that it is relatively easy to administer and score. Validity has been demonstrated by showing that the VPT distinguishes well between children referred to a dental hospital for specific anxiety/cooperation problems, and those referred for other reasons [5,8]. The VPT does have some limitations. The figures on the cards are all male, this may present problems when the young patient is a girl. In addition, some of the figures are ambiguous in what they are portraying. Finally, the scale still takes some time to complete, this is a salient issue when considering very young patients.

The aim of this study is to validate an alternative picture scale using faces as an indicator of anxiety. Faces have been used when assessing children (e.g. Williams *et al.* [10]), though little information is available on the validity of this approach. Work has been carried out involving the assessment of children's pain, for example the Varni-Thompson Paediatric Pain Questionnaire (PPQ) [11]. This involves a visual analogue scale with a very happy face at one end

and a very unhappy face at the other end, indicating no pain and severe pain, respectively. The present Facial Image Scale has a fixed number of faces (not a continuous line) for the children to choose from, thus making it easier to score in a clinical situation, and easier for very young children to understand.

Methods

Sample

103 children (3–18 years of age) and their parents/guardians were approached in the waiting area of the Department of Child Dental Health, Newcastle Dental Hospital. They were asked if they would agree to take part in a study investigating how children emotionally feel at the dentist. Two children declined to participate as their mothers claimed they were shy, and one child claimed that she was too upset to participate.

Scales

The Facial Image Scale (FIS: Fig. 1) comprises a row of five faces ranging from very happy to very unhappy. The children were asked to point at which face they felt most like at that moment. The scale is scored by giving a value of one to the most positive affect face and five to the most negative affect face.

The Venham Picture Test (VPT: Fig. 2) comprises eight cards, with two figures on each card, one 'anxious' figure and one 'nonanxious' figure. The children were asked to point at the figure they felt most like at that moment. All cards were shown in their numbered order. If the child pointed at the 'anxious' figure a score of one was recorded, if the child pointed at the 'nonanxious' figure a score of zero was recorded. The number of times the 'anxious' figure was chosen was totalled to give a final score (minimum score, zero; maximum score, eight). The VPT was administered first, with every second participant to control for order effects. Both scales were shown to the children held at an angle such that the parent

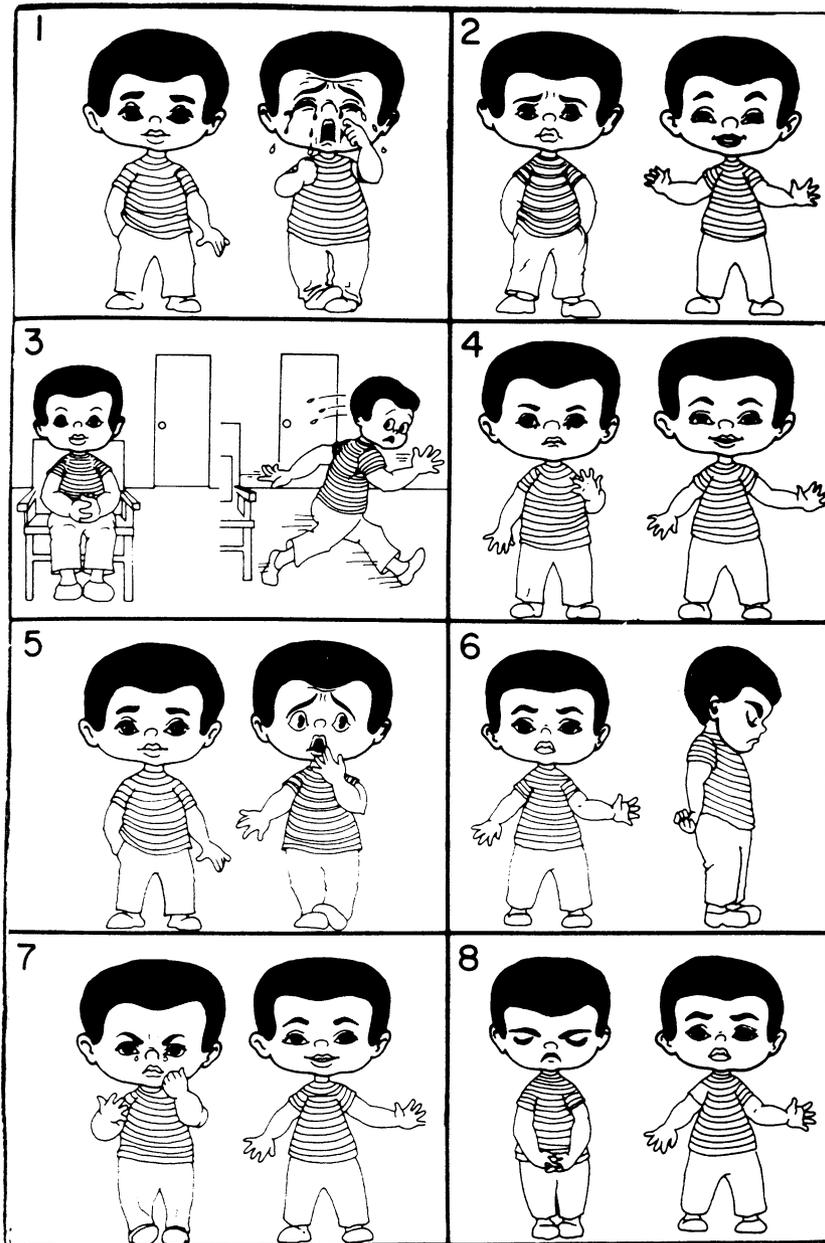


Fig. 2. Venham Picture Test

could not see the choice their child was making, each parent was also asked not to contribute to their child's choice.

Critical assessments of dental anxiety instruments, for both children [4] and adults [12], have reported specific criteria for measuring validity. It is reported that validity, whether the instrument measures what it intends to, can be assessed by correlating the instrument with another instrument designed to measure the same phenomenon. The VPT was selected for this study as, with the FIS, it is a picture

scale that is intended for young children, it measures state anxiety, and is administered before treatment starts.

Results

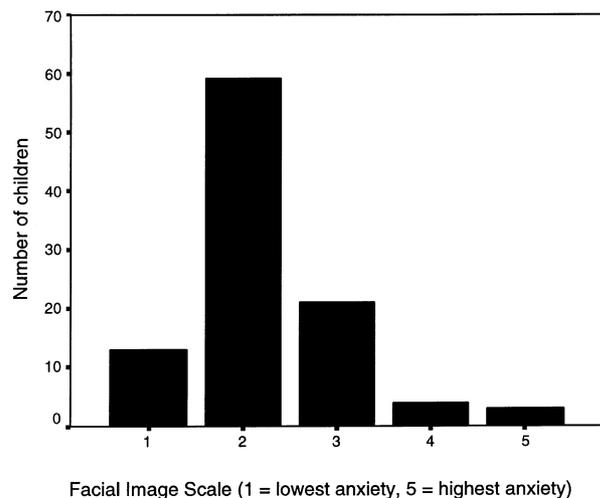
The sample

The mean age of the participants was 11.6 years, SD 3.7 years. There were 50 boys (mean age 11.1 years, SD 3.7 years) and 50 girls (mean age

Table 1. Mean (SD) Venham Picture Scale (VPS) and Facial Image Scale (FIS) scores for boys and girls and overall.

Participants	n	VPS score		FIS score	
		Mean	SD	Mean	SD
Male	50	1.4	1.7	2.2	0.8
Female	50	1.4	2.3	2.3	0.9
Overall	100	1.4	2.0	2.2	0.8

n, number of participants; SD, standard deviation.

**Fig. 3.** Frequency of each face chosen on the Facial Image Scale.

12.2 years, SD 3.1 years). There was no significant difference between boys and girls with regard to age ($t = -1.712$, d.f. = 68, $P > 0.05$).

As can be seen in Table 1, mean anxiety ratings were low for both the VPT (1.4) and the FIS (2.2).

Figure 3 shows the number of children that chose each face on the FIS. There were a small number of participants who chose the negative affect faces, seven children chose faces four and five. 72, however, chose positive affect faces (one and two). Analysis of variance was employed to investigate the effect of age and gender on FIS scores. For this purpose, age was transformed into a grouping variable (3–6 years, 7–10 years, 11–14 years and 15–18 years). Neither the main effects of age ($F_{3,99} = 0.323$, $P > 0.05$) nor gender ($F_{1,99} = 0.045$, $P > 0.05$) were significant; the two way interaction was also not significant.

Correlation of the FIS with the VPT

A measure of the applicability of a psychometric instrument may be evaluated by its degree of correlation with another psychometric instrument designed

to measure basically the same phenomenon. There was a strong correlation between the VPT and the FIS scores ($r = 0.7$, $n = 100$, $P < 0.001$).

Discussion

Given the significance of anxiety in the practice of dentistry, it is crucial that the practitioner is able to detect and assess the severity of anxiety among child patients with a valid method of measurement. There has been a wide range of inventories proposed to identify and quantify dental anxiety in children. We have, however, argued that no measure met all of the criteria identified as necessary for a child's dental anxiety instrument. There was no measure that provided satisfactory evidence of validity, was appropriate for use with very young children, or could be used by both clinicians and researchers. It is proposed, based on the findings of this study, that the FIS in some way encompasses all three criteria, this is summarised as follows:

1 The strong correlation between the FIS and VPT scores supports the validity of the FIS in the dental setting, i.e. the FIS measures what it intends to measure, state dental anxiety. Researchers have also proposed that gender differences in anxiety scores further validate children's dental anxiety assessment measures [13]. Some research, however, reports no gender differences [14,15], while others have shown that girls report higher anxiety [16–18]. Previous work has failed to show significant differences between girls and boys, although studies on adults have produced more clear-cut findings [19]; the absence of significant gender differences does not lessen the validity of the FIS;

2 The FIS can be employed with very young children, this is not the case with other methods of verbal self-report for children, e.g. Children's Fear Survey Schedule – Dental Subscale [15]. It has been argued that a stalemate situation arises with very young children where their lack of cognitive ability means they cannot complete questionnaires; indirect behavioural measures are the only real alternative [3]. The FIS shows that this is not always the case as the youngest age group in this study was 3–6 years and the effect of age differences was not significant;

3 The FIS is quick and easy to administer in the dental waiting room. It took a very short time (less than 1 min) to administer and the score is simply a reflection of the face chosen. The importance of any measure of child dental anxiety is to provide the clinician with

a means by which he or she may judge the child's ability to respond to dental treatment. The FIS gives immediate 'state' feedback to the clinician in the dental waiting room and could allow the clinician to design appropriate treatment plans for their child patient.

The FIS also provided interesting results regarding prevalence of child dental anxiety. The results reflected previous research: the majority of children have low levels of fear, however, a small but significant number show higher levels. Only 7% of children chose either face four or five on the scale, this supports figures found in previous studies [e.g. 20]. This study has shown that not only are the majority of the children not anxious, but most are actually happy to be in the dental waiting room. This result is particularly encouraging as the study was carried out in a dental hospital where some of the children are referred specifically because of dental anxiety problems. In addition, previous researchers [10] have suggested that anticipatory anxiety, i.e. anxiety in the period building up to the dental treatment itself, is indicative of whether the child wants to attend the dental clinic next time. There may be several reasons for this finding. It may be an indication of technological advances such as improved local anaesthesia and treatment techniques. It may also be because the FIS has scope to gauge the degree of feeling positive rather than just assessing how negative the child feels. Many other assessment measures have only one option to assess not feeling anxious [7,13].

Conclusion

The findings of this work indicate that the FIS is a valid measure of dental anxiety for employment with young children in the clinical context. Results show a small but significant number of children are anxious in the anticipatory period (in the waiting room) which reflects previous research. The FIS has the advantage of unobtrusively measuring state anxiety in a dental setting. Clinical implications of this work are that practitioners, dental nurses or receptionists could administer the FIS when the patient arrives for treatment and inform the dental team of any anxiety the child may be suffering. It may be worth considering administering the FIS at different points throughout the dental session. A reflection of the child's anxiety could then be relayed back to the dental team providing a more focused view of what the child is fearful of, this would be helpful when considering patient management techniques. An

accurate assessment of dental anxiety is necessary; not only to determine its prevalence, but also to overcome the problems related to individual diagnosis and treatment [21]. The FIS produced similar results to the VPT but the simplicity and practical advantages of the former highlights its salience as a measure for assessing young children in the dental clinic.

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Résumé. *Objectif.* Evaluer la validité d'une échelle utilisant les visages comme indicateur de l'anxiété dentaire du patient.

Mise en place. Salle d'attente du Département de Santé Dentaire de l'Enfant, Hôpital Dentaire de Newcastle.

Sujets et méthodes. 100 enfants (3 à 18 ans) ont rempli l'Echelle d'image de visage (FIS) et le test d'image de Venham (VPT) dans la salle d'attente de l'hôpital dentaire.

Résultats. Une forte corrélation (0,7) a été trouvée entre les deux échelles, indiquant la bonne validité du FIS. Un nombre réduit mais significatif d'enfants sont anxieux dans le contexte dentaire.

Conclusions. Ces données suggèrent que le FIS est un moyen valable d'évaluation de l'anxiété dentaire de l'enfant dans le contexte clinique.

Zusammenfassung. *Ziele.* Untersuchung der Validität einer Gesichtsausdruckskala als ein Indikator von Zahnbehandlungsangst bei Kindern.

Untersuchungsumgebung. Wartebereich der Abteilung für Kinderzahnheilkunde des Newcastle Dental Hospital.

Probanden und Methoden. 100 Kinder (Alter 3–18 Jahre) füllten im Wartezimmer eine Gesichtsausdruckskala und den Venham Bildertest aus.

Ergebnisse. Eine starke Korrelation (0.7) zwischen beiden Skalen wurde ermittelt, dies spricht für eine gute Validität der Gesichtsausdruckskala. Die Ergebnisse zeigen weiterhin, daß eine kleinere (aber dennoch bedeutende) Gruppe an Kindern Angst in zahnärztlicher Umgebung entwickelt.

Schlussfolgerung. Die Ergebnisse zeigen, dass die Gesichtsausdruckskala eine valide Methode zur Bestimmung von Zahnbehandlungsangst bei Kindern in einem klinischen Kontext darstellt.

Resumen. Objetivo. Examinar la validez de una escala que usa caras como un indicador de la ansiedad dental en niños.

Escenario. Sala de espera del Departamento de Salud Dental Infantil, Newcastle Dental Hospital.

Sujetos y métodos. 100 niños (con edades entre 3 y 18 años) completaron la Escala de Imagen Facial (FIS) y el Test de dibujos de Venham (VPT) en la sala de espera del Hospital Dental.

Resultados. Se encontró una fuerte correlación (0,7) entre las dos escalas, indicando buena validez para la FIS. Los hallazgos también mostraron que un pequeño, pero significativo número de niños están ansiosos en el contexto dental.

Conclusión. Los hallazgos sugieren que la FIS es un medio válido para evaluar el grado de ansiedad dental en el contexto clínico.

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