



A REVIEW OF THE CURRENT SELF-REPORT MEASURES FOR ASSESSING CHILDREN'S DENTAL ANXIETY

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Abstract: Dental practitioners should be able to evaluate the anxiety in their young patients, as the quality of dental care is negatively affected by this condition. The aim of this review is to present the most used self-report scales available to assess the children's dental fear or anxiety. We analysed the subjective and objective measures commonly used in the evaluation of children's anxiety in clinical settings, in order to present the way in which dental anxiety is developed, knowing that these behavioural disturbances are maintained over time and could intensify during adulthood. Based on the evidence that established a correlation between dental anxiety and poor oral health, the early identification of dental anxiety and its prevalence was considered important, in order to reduce its impact and to develop better preventive measures. Furthermore, our findings could inform dentists and epidemiologists about the choice of self-report dental anxiety measures applicable in children.

INTRODUCTION

Dental anxiety, fear and phobia are often used as synonyms in the literature and therefore their differentiation by dental practitioners is difficult; phobia is a clinical diagnosis which refers to an intense fear that disturbs one's normal routine, compared to fear, which is not always extreme.(1) In order to describe this emotional experience, many other terms were used (such as stress, angst, tension) each having a slightly different meaning. This determined researchers to propose four different perspectives for the concept of anxiety, knowing that the term “dental anxiety” is frequently used in the literature to describe all forms of dental fears and phobias.(2,3) According to Guinot et al (4) anxiety is a nonspecific feeling of fright regarding a certain situation, which neither involves a previous experience, nor is proportional to the reaction of the patient. Dental anxiety is a common problem which develops mostly in childhood and adolescence, as studies report that approximately 50% of children experienced low to moderate dental anxiety and between 10% to 20% high levels of dental anxiety. This latter situation is often accompanied by increased decay-missing-filled (DMF) index. Clinicians often consider that the treatment of an anxious patient is time consuming and demanding, therefore they often refer these children to secondary dental care services.(3,4)

According to the age and intellectual development of the child, there are numerous methods for the evaluation of the degree of anxiety of the patient, using measures that can be objective or subjective, depending on how the degree of anxiety is quantified. The evaluation methods can be grouped as follows: the direct observation of physiological state or behavioural response of the child in the dental setting, the completion of a questionnaire by the parent in order to quantify the child's anxiety, while the third is represented by self-report scales completed by the child.(4) Clinical observation alone was

found to be unreliable, as many studies reported a poor to moderate agreement between the dentists' and child's own ratings of dental anxiety. Anxious children may be more prone to experience negative reactions in dental settings, while others try to hide the signs of anxiety and therefore, their reactions are sometimes interpreted as manifestations of behavioural management problems. Critics argued that the results of these methods should be questioned in terms of validity and also, using salivary biomarkers such as cortisol or IgA is costly to analyze and not suitable for routine anxiety evaluation in the clinic.

The second group of measures have also limitations, as previous studies showed moderate agreement between the parental and child's anxiety ratings; the conclusions were that parents are unable to evaluate the level of anxiety experienced by their children and they often reflect their own anxiety and not the negative emotions of the young patients. The third group of measures is considered the most reliable methods of evaluating anxiety with important advantages for the dental treatment providers, therefore we focused our review on describing some of these scales.(5,6)

Dental anxiety measures can be used for determining the prevalence of dental anxiety in a population and the factors that might help to reduce its level, alongside with the evaluation of anxiety in time. In order to accurately complete self-report measures, the children have to demonstrate that they are able to understand the questions and answer options, which is influenced by the language level and terminology used. The measures for state anxiety can only be applied in the clinical environment (waiting room/ dental chair) as they assess how the patient feels at that moment, compared to methods used for trait anxiety, which can be used outside the clinic, and express the dental anxiety induced by multiple dental contexts or treatment procedures.(7-9)

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The aim of our review was to evaluate the objective and subjective measures of the dental anxiety scales currently used for the assessment of dental anxiety in children, in order to assist practitioners in finding the best method to identify anxious patients at an early stage. A special attention was given to the way in which these methods have been developed or modified, for becoming applicable to children of different ages. During the process of literature selection, we based our search on including a set of specific objectives: providing a descriptive account of the measure (number of questions, scoring), giving information about the validity and reliability of each method and also, to specify the aspects of dental anxiety they assess (trait or state anxiety).

Assessment of dental anxiety

Dental anxiety leading to avoidance of dental treatment has been considered an important source of oral health problems in both children and adults, preventing them from fully cooperating with the dentist; its negative consequences are a less efficient and time consuming treatment visits, but most important, the lack of preventive measures or early detection of dental or oral lesions.(10)

It was reported that children with high levels of anxiety had more unrestored dental caries and for dental professionals, the treatment of these patients is considered to be one of the most stressful parts of their activity.(11-12) Therefore, it is important to be aware of the psychological needs of a young patient, in order to have good cooperation during treatment. In children, there is a strong connection between dental anxiety and uncooperative behaviour and therefore, clinical success in pediatric dentistry is influenced greatly by behaviour management and reduction of preoperative anxiety of the child.(13) In the assessment of dental anxiety level, it is important for the health care professionals to be aware of the multidimensional character of the patient's emotions and to identify those factors that contribute to the maintenance of their anxiety state.

Objective measures for dental anxiety

The physiological responses induced by anxiety are associated with an increased sympathetic drive, inducing changes in the cardiovascular system (increased heart beat rate, high blood pressure), sweat glands (intense perspiration), muscles (high tonus, spasmodic movements), respiratory (sighs, dyspnea) and digestive (dry mouth, constipation) systems.(14) Measurements of these clinical manifestations in pediatric patients during treatment sessions showed a general pattern of sympathetic stimulation, with high secretion of catecholamines, these physiological parameters being useful in the assessment of the stress level in a patient, prior to dental treatment. The values of heart rate and blood pressure are considered by many researchers as reliable indicators of dental anxiety, even though their changes can be influenced also by skeletal muscular activity or breathing.(15-17) A measure frequently used is the electrodermal activity (EDA), which depends on the activation of the sweat glands, which have exclusively sympathetic innervation.(14) EDA was used as a clinical index for various psychophysiological disorders induced by stress, proved to have a high sensitivity and its variations reflect the changes of the cognitive/emotional state of the child; furthermore, this index is relatively independent of any somatic influences, which makes it preferable for researchers whose interest is focused only on the sympathetic activation. The presence of pain and stress can induce disturbances in the activity of the hypothalamic-pituitary-adrenal axis, resulting in increased secretion of cortisol.(18) The possible relationship between the need of emergency treatment due to dental pain, the level of dental anxiety and the concentration of cortisol in saliva have been investigated by Kanegane et al.(19) The authors reported that

dental anxiety alone was not able to induce a reaction of the hypothalamic-pituitary-adrenal axis, but the pain caused a significant increase of the levels of cortisol in the saliva. The most important objective measures used for the assessment of dental anxiety are presented in table no. 1, including their advantages and disadvantages. The use of these physiological parameters requires a monitoring team, financial support and a lot of time, which makes them not commonly used in the clinic.

Table no. 1. Objective measures used for the evaluation of dental anxiety in children undergoing dental treatment

Objective measure	Characteristics
Heart rate	This index is reliable, safe and might be increased by clinical settings, due to anxiety and stress. The patient's movements during treatment could alter the measurements.
Blood pressure	This is a good indicator for the level of anxiety and stress; it might also be elevated by patient's emotional discomfort in the dental room, due to stress and anxiety.
Cortisol concentration in saliva	Measurement of this biomarker is indicated in nonclinical settings; in dental rooms, the salivary levels of cortisol were found influenced not only by anxiety but also the presence of pain.
Ectodermal activity	This is a highly sensitive index, relatively independent of somatic influence. It gives direct information regarding the sympathetic activity.

(Adapted from Guinot et al. 2011)

Subjective (self-report) measures for dental anxiety

Subjective measures are used as an alternative to recording of physiologic parameters. Last review on self-report measures of children dental anxiety was published more than ten years ago by Klinberg (20), who considered that dentists should have an overview of the methods of evaluation available and they need to assess children's dental anxiety. Similar conclusions were expressed also by Schuurs and Hoogstraten, in a review on dental anxiety measures in adult patients.(21) In the following section, we present in chronological order, nine of the most used self-report scales for evaluation of dental anxiety in children, which had been extensively used over the last decade.

The Corah Dental Anxiety Scale (DAS) was developed by Corah in 1969 (22) and is a commonly used scale for the measurement of trait anxiety in adults, but it was modified (Modified Dental Anxiety Scale) and this second version was applied in pediatric patients.(23) The test is reliable, has predictive value, can be resolved in only 5 minutes and the scores range between 5 (nonanxious) and 25 (extremely anxious).(24)

The State-Trait Anxiety Inventory for Children (STAIC) scale was introduced in 1973 Spielberg et al. (25) in order to measure the two dimensions of the anxiety (state and trait anxiety), aiming to evaluate the transitory state of anxiety; compared to other scales, its psychometric properties are better, the scale has validity and is also highly reliable, being widely used to assess anxiety in young patients.(8) STAIC includes: The State Scale - measures the current feelings of anxiety, and the Trait Scale - assesses a more stable and long-lasting predisposition to exhibit anxiety. The scale is considered to have a high reliability and validity, but due to the great number of questions, its completion takes a lot of time and is applicable only in clinical settings.

One of the most frequently used instrument is the Venham Picture Scale (VPS), introduced by Venham et al. in 1977, which is a self-report measure developed for the assessment of the anxiety levels of children during their dental treatment appointment.(26) This scale is suitable for children as young as three years old, without language skills, as they can

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answer nonverbally. The test can be performed in 1-2 minutes, is considered easy and is one of the methods of choice for pediatric patients.(27) The critics of VPS consider that some of the pictures display ambiguous emotions and it is not exploring situations that might induce dental anxiety.(28)

The Children's Fear Survey Schedule – Dental Subscale (CFSS-DS) was introduced by Cuthbert and Melamed in 1982.(29) Developed from the Fear Survey Schedule for Children (which has 80 items), CFSS-DS comprises only 15 items related to the dental setting and treatment, allowing the assessment of the trait anxiety experienced by the patient.(30) The CFSS-DS is considered a highly reliable scale, with well-established cut-off points, which is applicable to children of different ages. It has been argued that it does not measure the physical reactions, behaviours and thoughts which might influence the children's dental anxiety and some researchers have reduced several items, in order to have a shorter version of the questionnaire.

The Short version of the Dental Anxiety Inventory (S-DAI) was introduced by Aartmann in 1998 (30) and includes nine items, requiring patients to indicate their degree of agreement with statements related to dental procedures. This measure takes into consideration situations or treatments that might induce anxiety, by evaluating physical reactions, thoughts and behavioural aspects specific for dental anxiety. Initially, the scale was assigned for adult patient evaluation and until now we found no data regarding its reliability and validity when used for pediatric patients.(31,32)

The Facial Image Scale (FIS) was introduced by Buchanan and Niven in 2002 as a measure for state anxiety; it contains one item with a set of five responding options, represented by faces ranging from a very sad to a very smiley one.(28) Children have to indicate which face expresses most accurately how they feel at that moment. The FIS is suitable for younger children, who have limited cognitive and linguistic skills. Regarding validity, it was argued that the measure might assess the children's mood at that moment, rather than their state dental anxiety. Furthermore, the reliability of FIS has not been estimated, but it was found to be significantly correlated with the Venham Picture Scale.

The Smiley Faces Programme (SFP) and Revised SFP (33,34) are fully computerized measures containing seven items facial image scale, with children having to indicate how they would feel in response to different dental scenarios. Both have an interactive nature and were appreciated by researchers and participants; furthermore, based on the children's suggestions the measures had been revised. Due to the fact that these tests rely on computer access, they cannot assess behaviours, thoughts or physical reactions, which might influence the child's dental anxiety.

In 2007, Howard and Freeman (35) introduced the Modified Child Dental Anxiety Scale (faces) (MCDASf) which has 8 items regarding emotions induced at the dentist. The original scale had 5 faces ranging from "not worried" to "very worried" (1-not worried, 2-very slightly worried, 3-fairly worried, 4-worried a lot, 5-very worried) therefore, teachers considered it was difficult for the children to make a proper selection; as a consequence, a 3-face-scale was used, with the same total score, ranging between 8-40 (1-not worried, 3-fairly worried, 5-very worried). MCDASf has some disadvantages such as: no assessment of unhelpful behaviours or physical reactions that might contribute to children's dental anxiety and the questions about sedation/anesthesia may put the child in unfamiliar situations, if the young patient had not experience this type of procedures before.(36)

In the attempt to overcome all the shortcomings of previously used scales, Al-Namankany et al. introduced in 2012

a new dental anxiety scale that was suitable for children and adolescents, known as Abeer Children Dental Anxiety Scale (ACDAS).(37) It has three parts and gave us the possibility to investigate the children, their parents and the dentist on the same questionnaire. The first part is a 13-question with 3 possible answers based on a Likert scale using faces: 1-relaxed, not scared, 2-neutral, feeling OK, 3-Scared, feeling anxious. Each participant was asked to indicate the face that best represented her/his response to the questions. Part two was also completed by the child and contained 3 questions and part three was addressed to the parents or legal representatives of the children with 2 items and a final question for the dentist who performed the treatment. The third part has 3 questions for future assessment of the child, as stated by the parent or legal guardian (to report if the child had a previous experience and how the guardian expected his/her child to behave before the start of the treatment).

The last question was for the dentist to report with Yes/No. ACDAS is correlating for the first time the dental anxiety with cognitive status in children, which makes it different from other existing methodologies; the scores may range between 13-36 and a value higher than 26 indicates that the child experiences dental anxiety. This scale identifies the stimuli for this behavioural disturbance in a rational order, has questions regarding the expectation of the child's parents concerning the child's attitude prior to treatment, previous dental treatment experience and the doctor's rating for the patient's behaviour at the end of the dental procedure. Furthermore, it was shown that ACDAS is a generalizable scale, which can be applied in different locations with different children, confirming its value as a gold standard anxiety scale for children.(38)

CONCLUSIONS

Dental anxiety is a challenge for dental health care providers and over the years, this raised a need for a better understanding of the complexity of behavioural disturbances in children. Therefore, systematic reviews could help dentists, epidemiologists and psychologists to use the most suitable measure of dental anxiety in their young patients. As a communication tool, doctors could use for each new patient, the administration of a trait measure, which might help to identify those with high levels of dental anxiety or other dental fears. Such a questionnaire should have a small number of items about specific dental procedures that the child can complete while sitting in the waiting room, could be used for children of different ages, the language is clear and the items are valid. Such methods are MCDASf or SFP, with a recognized validity and reliability, so that they were extensively used in experimental and longitudinal studies.

The CFSS-DS was also found valid and reliable in children over 8 years of age and it evaluates many aspects of the child's anxiety. When the medical team aim at an immediate evaluation of the child's feelings, a state dental anxiety measure, such as the FIS could be used, being easy to administer and appropriate even for young children. In order to treat dental anxiety, all factors that contribute to this disturbance should be identified and understood; in this respect, only DFS and S-DAI assessed various facets of children's dental anxiety, such as behaviours, unhelpful thoughts and physical symptoms. Some of the early measures used to evaluate anxiety in pediatric patients were adapted from adult questionnaires which led to concerns related to validity, due to the terminology, above the child's level of understanding. Using cognitive interviews in which children are asked to express their thoughts, as part of their responses to a questionnaire, could be used to test children of different ages.

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