Objective and subjective measures for assessing anxiety in paediatric dental patients

ABSTRACT

**Aim** Anxiety has been defined as a nonspecific feeling of apprehension towards a concrete situation that does not necessarily involve a previous experience. Dental anxiety can prevent patients from cooperating fully during dental treatment. Given that there is a connection between dental anxiety and uncooperative behaviour, it is important for dentists to be able to assess anxiety in their patients. There are many methods for such assessment, and in children they depend on age and intellectual development. These measures can be objective or subjective, depending on the method used to quantify the degree of anxiety. The aim of this literature review was to analyse the objective and subjective scales that are most commonly used to assess the degree of dental anxiety in children, so that anxious patients can be detected at an early stage and helped through their dental experience.

**Conclusion** Knowing the degree of anxiety of dental children is important in order to guide them through their dental experience. Their level of cooperation will also improve and anxiety will be reduced as well.

**Keywords:** Physiological and behavioural measures; Emotional distress; Behaviour observation; Psychologically upset.

Introduction

Successful treatment of children in clinical practice relies on the ability of the dental practitioner to guide them through their dental experiences [Alwin et al., 1994; Jiménez, 1995; Goumans et al., 2004].

According to Wright [1983], every dental health team should keep two main objectives in mind:

- They should carry out dental treatment effectively and efficiently.
- They should instil a positive attitude in the child.

Fulfilling these objectives is often hampered by patient anxiety, from which many children suffer when undergoing certain dental treatments [Jiménez, 1995; Aartman et al., 1998]. Given the connection between dental anxiety and uncooperative behaviour, it is important for dentists to be able to evaluate anxiety in order to identify those patients who need special care with regard to their fear [Boj, 1988; Li and López, 2005; Rayen et al., 2006].

Numerous measures for evaluating the degree of anxiety in a patient have been reported in the literature, in children the choice is based on age and intellectual development. These measures can be objective or subjective, depending on the method used to quantify the degree of anxiety [Vieson and Silvestro, 1983; Alwin et al., 1991; Johnsen, 1998]. Moreover, anxiety has a double dimension, namely state and trait anxiety.

The aim of this literature review was to analyse the objective and subjective scales that are most commonly used to assess the degree of dental anxiety in children, so that anxious patients can be detected at an early stage and helped through their dental experience.

Anxiety

The term anxiety entered the field of psychology as a translation of the German word “Angst”, which was used by Freud in 1936 [1936]. Currently, anxiety is defined as a nonspecific feeling of apprehension towards a concrete situation that does not necessarily require previous experience, and is not proportional to the response that is triggered in the individual [Alwin et al., 1991; Milgrom et al., 1995; Rayen et al., 2006]. Many other terms are commonly used as equivalents to describe the same phenomenon: angst, stress, fear, tension, etc. [Miguel, 1987; Carrobles and Díez-Chamizo, 1991]. Each one of these terms can have a slightly different meaning when used in the literature, depending on the psychological approaches, schools, theories, and even authors [Miguel, 1987]. Given these different interpretations, Carrobles and Díez-Chamizo [1991] proposed four different perspectives for the concept of anxiety.

- Applied clinical science perspective: Freud is the most representative author of this school. Anxiety is understood to be an internal response that serves as a warning signal for the individual when danger is imminent.
- Experimental perspective: this is based on the supposition that anxiety is an instinctive reaction to certain objects or situations, which might or might not represent a real danger [Mowrer, 1936], or a specific state of the human organism that motivates and propels someone to behave in a certain way [Spence and Taylor, 1953].
- Personality research perspective: the key representatives of this approach are Cattell, Lazarus, and Spielberger. The interest in these authors lies in the objective differentiation they make between state and trait anxiety [Miguel, 1987]. Trait anxiety is a proneness or tendency of an individual to react in an anxious way, regardless of the situation. State anxiety is defined as a transitory emotion that fluctuates over time, and is a response to a stimulus. It is portrayed as causing tense feelings as a result of an increase in the activity of the autonomic nervous system [Corah, 1969; Ayer et al., 1983; Alwin et al., 1991].
- Behavioural model of anxiety: in this model, anxiety is conceived as a construct that encompasses a group of motor, psychophysiological, and cognitive responses.
This concept is known as the Three-dimensional Theory of Anxiety [Lang, 1968; Méndez and Macià, 1994].

Dental anxiety and its implications for paediatric dentists

With regard to paediatric dentistry, it is important to keep in mind that anxious patients manifest their anxiety in different ways. Some can respond with disruptive or interruptive behaviour. Others can respond by sweating and an increased heart rate, whereas others do not show any external sign of anxiety [Ayer et al., 1983].

Dental anxiety, and the avoidance of situations that involve dental treatment and care, have frequently been considered to be the source of serious oral health problems in children and adults [Rivera and Fernández, 2005; Humphris et al., 2009]. High levels of anxiety prevent a patient from cooperating fully with their dentist, which can result in lost time for the practitioner and unnecessary difficulties when carrying out the treatment, and, most importantly, can limit the effectiveness of the dental treatment and prevent the early detection of pathological processes [Davila and Menendez, 1986; Boj, 1988]. It was specifically established that children with higher levels of dental anxiety have a greater number of untreated caries. Thus, the quality of dental care that a patient receives might be affected by dental anxiety. For dentists, the treatment of anxious patients is one of the most stressful aspects of their work [Ingersoll et al., 1984; Shinohara et al., 2005; Oliveira and Colares, 2009].

In the light of these issues, a dentist who does not pay attention to the psychological needs of a child will soon be faced with an uncooperative patient [Johnsen, 1998]. Many professionals consider children who show uncooperative behaviour to be one of the greatest problems in dental practice [Ingersoll et al., 1984]. As pointed out by Pinkham [1990], for clinical success in paediatric dentistry, behaviour management is as fundamental as dexterity and knowledge of the material to be used. Owing to the known connection between dental anxiety and uncooperative behaviour, the minimisation of preoperative anxiety is vital for the child to cooperate fully [Li and López, 2005] and enables a better treatment [Rayen et al., 2006].

Methods of assessing dental anxiety

Objective measures

One of the main roles of psychology is to supply objective measures to evaluate a psychological response. Given this, the measurement of physiological function plays an important role in the field of behavioural assessment [Jiménez, 1995].

The psychophysiological responses produced by anxiety are associated in general with an increase in the activity of the sympathetic branch of the autonomic nervous system. Changes occur in the cardiovascular system (increased blood pressure and pulse rate), in the sweat glands (increased sweat production and electrical conductivity of the skin), in the muscles (increased muscle tone, spasmodic movements, etc.), in the respiratory system (sighs, feeling breathless, etc.), and in the digestive system (dry mouth, constipation, etc.) [Méndez and Macià, 1994]. Measurements of psychophysiological responses in children during dental procedures have demonstrated a general pattern of sympathetic arousal with increased secretion of catecholamines, increased heart rate, and decreased galvanic skin resistance [Rosenberg and Katcher, 1976]. Different studies have demonstrated that these physiological measurements are very useful for measuring the degree of stress in a patient before dental treatment [Myers et al., 1972; Messer, 1977; Beck and Weaver, 1981]. Studies carried out by Messer [1977] and Myers et al. [1972] confirmed that the physiological changes occur in the body as a result of the stress and anxiety suffered by patients during dental procedures. The authors of these studies concluded that heart rate and blood pressure can be used as reliable indicators of anxiety. Laufer and Chosack [1964] and McCarthy [1957] obtained similar results. However, although a change in heart rate is used frequently as an index of autonomic arousal, other factors such as skeletal muscular activity, blood pressure, and breathing also influence heart rate [Rosenberg and Katcher, 1976].

Another measure that is commonly used to evaluate the degree of anxiety in a patient is electrodermal activity (EDA) [Bradley et al., 2008]. EDA depends on the activation of eccrine sweat glands that are only innervated by the sympathetic autonomic nervous system. Measurements of EDA are based on the measurement of psychologically induced sweating [Jiménez, 1995]. EDA is one of the psychophysiological indexes used most commonly to correlate different psychological processes because, from the beginning, it has been related to emotion, physiological arousal, and attention. In addition, this variable has been used as a clinical index for various psychophysiological disorders that are related to stress [Wieland and Meffered, 1970; Hugdahl et al., 1995; Bradley et al., 2008]. EDA has a high degree of sensitivity [Wieland and Meffered, 1970], since its variations provide evidence of changes in the cognitive or emotional state of the patient [Hugdahl et al., 1995]. In addition, the main advantage of EDA is that it is relatively free of somatic influences. In contrast, changes in heart rate can be due to sympathetic or parasympathetic activity, or to a combination of both [Jiménez, 1995]. For this reason, measurement of EDA is the preferred method for an investigator who seeks only to measure sympathetic activation, whereas an investigator who wishes to conduct a wider investigation will prefer heart rate (if only one of the two measurements is possible) [Jiménez, 1995].

In addition to all the physiological measures of anxiety mentioned above, disturbances to the hypothalamic-pituitary-adrenal axis can also occur during episodes of dental anxiety. Situations of pain and stress lead to an increase in the activity of this system, which results in increased secretion of cortisol [Kanegane et al., 2009]. Kanegane et al. [2009] investigated the possible relationship between dental pain, dental anxiety, and the concentration of cortisol in the saliva of patients who required urgent dental care. The results showed that dental anxiety on its own is not sufficient to cause a response in the hypothalamic-pituitary-adrenal axis, but rather it is pain that causes a significant alteration in the concentration of cortisol in the saliva.

Table 1 describes the validity and reliability of the most
important objective scales for the measurement of dental anxiety, including their advantages and disadvantages. All the physiological parameters described can be used to measure anxiety in a patient, but they all require a monitoring team, financial expenditure, and extra time in the dental clinic. For this reason, these types of measure are not commonly used in dental clinics [Klingberg et al., 1995].

**Subjective measures**

Subjective measures can be used as an alternative to objective physiological scales.

One of the visual scales most commonly used is the Venham Picture Scale (VPS). It is a self-report measure that permits measurement of the state of anxiety of children when visiting a dentist. Children are presented with eight pairs of images that show various emotions and they are asked to select the ones that reflect their emotional state best. The scores range from 0 (no anxiety) to 8 (very anxious). The test is easy to perform and only takes one or two minutes, which makes it one of the scales of choice for children [Ingersoll et al., 1984; Alwin et al., 1991; Alwin et al., 1994; Aartman et al., 1998; Newton and Buck, 2000; Buchanan and Niven, 2002; Pizano and Bermúdez, 2004; Rivera and Fernández, 2005].

The Children’s Fear Survey Schedule – Dental Subscale (CFSS-DS) is a particularly useful questionnaire for children. It comprises 15 items that are related to treatment and the dental setting, and it permits measurement of the trait anxiety suffered by a patient. The scores obtained are within a range of 15 to 75 points. Scores equal to or over 45 points indicate higher levels of anxiety [Raadal et al., 1995; Aartman et al., 1998; Newton and Buck, 2000; Klaassen et al., 2003; Goumans et al., 2004; Pizano and Bermúdez, 2004; Rivera and Fernández, 2005].

Together with the CFSS-DS, the Corah Dental Anxiety Scale (DAS) is another of the scales used most commonly to measure trait anxiety in paediatric patients. It is useful in adult patients and it can be modified and used in children [Corah, 1969; Alwin et al., 1991; Pizano and Bermúdez, 2004; Jääkola et al., 2009]. There are currently two versions of this scale: the first has four items whereas the second includes a fifth item that assesses fear of oral anaesthetic injections. The second version is called the Modified Dental Anxiety Scale. The five basic questions can be answered by parents if the child is very small, or by the patient themselves if they are able to understand them. On adding up the total score for the scale, a range of points is obtained from 5 (nonanxious) to 25 (extremely anxious). This measure is the most commonly used in the assessment of dental trait anxiety [Townend et al., 2000] because it takes only five minutes to answer, is very reliable, and has a predictive value [Corah et al., 1978; Aartman et al., 1998; Newton and Buck, 2000; Rivera and Fernández, 2005].

On some occasions, it is important to assess the response of the patient to a therapeutic procedure more thoroughly than by means of a simple verbal description of the response. With this in mind, the Interval Scale of Anxiety Response (ISAR) was designed as an instrument to measure the anxiety of a person reliably in any dental situation [Mendola et al., 1987], and it has shown great reliability and validity. It enables patients to report on their anxiety before, during, and immediately after dental treatment [Mendola et al., 1987; Corah et al., 1986].

Given the double dimension of anxiety (state and trait anxiety), a scale is needed that measures the two different dimensions. The State–Trait Anxiety Inventory for Children (STAIC) fulfils this purpose; it has greater psychometric properties than other scales, and high reliability and validity [Alwin et al., 1991; Newton and Buck, 2000]. It comprises a questionnaire for the assessment of anxiety in children aged 6 to 12 years that has two scales: the first measures state anxiety (20 items) and the second measures trait anxiety (20 items). The aim of the inventory is to observe the transitory state of anxiety in the child. Despite its high reliability and validity, its use is limited to hospital surroundings because the scale is very long, and its completion requires a considerable amount of time [Del Gaudio and Nevid, 1991; Newton and Buck, 2000; Li and López, 2005].

Two scales have been devised that enable the dentist and the auxiliary to assess the level of cooperation and anxiety of the child, respectively [Stark et al., 1989]. In the Cooperation Behaviour Scale (CBS) the child is classified from 1 (extremely cooperative) to 6 (extremely uncooperative), whereas in the Anxiety Behaviour Scale (ABS) the child is classified from 1 (extremely relaxed) to 6 (extremely anxious) [Stark et al., 1989]. With both scales, the children are evaluated independently by the dentist and auxiliary four times during the treatment: 10 seconds after entering the consultation room, after the injection, on opening the mouth, and when finishing the restoration. In addition, each professional conducts a global assessment of the child immediately after their visit [Stark et al., 1989].

The Children’s Most Anxious Scale (CMS) is also used. It was developed to evaluate the nature and degree of general anxiety in children and adolescents. The score on this scale ranges from 0 (fearless) to 43 (very fearful) [Alwin et al., 1991; Alwin et al., 1994]. Another scale frequently used in clinics is the Children’s Emotional Manifestation Scale (CEMS). It was developed to provide a simple and coherent method for nurses to record children’s behaviour during stressful medical procedures. It is made up of five categories that include: “vocalisation”, “activity”, “interaction”, and “level of cooperation”. These behaviour types are valid indicators of the emotional state of a child.

<table>
<thead>
<tr>
<th>ANXIETY</th>
<th>COMMENTS</th>
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<tbody>
<tr>
<td>Heart rate</td>
<td>Reliable and safe indicator of stress and anxiety. Increases simultaneously with stress and anxiety in the dental room. May alter as a result of the physical movements of a patient during dental treatment.</td>
</tr>
<tr>
<td>Blood pressure</td>
<td>Reliable and safe indicator of stress and anxiety. Increases simultaneously with stress and anxiety in the dental room.</td>
</tr>
<tr>
<td>Cortisol concentrations in saliva</td>
<td>Satisfactory results have not been obtained because anxiety on its own does not produce disturbances in salivary cortisol concentrations. Not used in dental rooms.</td>
</tr>
</tbody>
</table>

**Table 1 - Objective measures for measuring anxiety in children undergoing dental treatment.**
behaviour of the child. Each category has five levels of intensity. Thus, when the numbers obtained in each category are added together, the total score ranges from 5 (positive emotional behaviour) to 25 (negative emotional behaviour) [Ramsay, 1972; Becher, 1997; Li and López, 2005].

Another scale that is used commonly to measure dental anxiety was developed by Melamed et al. [1975] and is called the Melamed Children's Behaviour Profile. It permits the frequency of disruptive behaviour to be recorded, and is made up of a list of 27 types of behaviour that are considered to be reactions induced by a fear of dental settings. Each type of behaviour has a factor assigned to it that indicates the degree of disruption. Behaviours are registered on this scale at three-minute intervals for the duration of the 30-minute appointment. The overall result is obtained by multiplying the frequency with which each of the behaviour types arises by its factor [Alwin et al., 1991; Jiménez, 1995].

Table 2 describes the validity and reliability of the most important subjective scales for the measurement of dental anxiety, together with their advantages and disadvantages.

Discussion

Medical and dental procedures are often invasive and generate a certain degree of anxiety in children. The need to help children face up to their anxiety has been recognized for more than 30 years [Weinstein et al., 2003], because on many occasions anxiety prevents them from receiving the necessary dental treatment that will enable them to maintain proper oral health. Dentists need to be aware of their patients' anxiety in order to help them. For this reason, many measures have been developed to assess the level of dental anxiety suffered by patients when they undergo dental treatment. Anxiety is a form of emotion that is associated with a physiological change in arterial pressure and heart rate. As a consequence, the presence of anxiety can be seen from two different viewpoints, either from a psychoanalytical or a physiological angle [Rayen et al., 2006]. Various authors have studied both aspects over the years, and have shown how stress produces anxiety, and how this leads to a chain reaction that affects blood pressure and heart rate [Gang, 1975; Messer, 1977; McNeil et al., 1993]. Studies carried out by Messer [1977] and Myers et al. [1972] on anxiety during dental treatment confirmed that significant changes occur in systolic and diastolic blood pressure and heart rate during treatment, whereas the level of oxygen saturation remains the same. Authors such as Laufer and Chosack [1964] and McCarthy [1957] obtained similar results, and reached the conclusion that heart rate and blood pressure were two reliable and safe indicators of anxiety. McNeil et al. [1993], Pinkham [1983], Simpson et al. [1974], and Howitt and Stricker [1965] also established that heart rate is an appropriate physiological measurement for assessing anxiety during dental treatment. A study carried out by Rayen et al. [2006] concluded that heart rate and blood pressure increase simultaneously as a result of stress and anxiety in the dental clinic.

Another indicator that is used to measure anxiety and stress in the dental clinic is EDA [Rice, 2000]. According to different authors, anxiety seems to be one of the fundamental factors that regulate EDA [Geer, 1966; Corah and Pantera, 1968; West et al., 1983]. Therefore, EDA appears to represent a suitable index of anxiety [Richardson and Kleinnekht, 1984; Lundgren et al., 2001]. In fact, for many authors, EDA is the response system of choice for the assessment of anxiety because, unlike most of the responses of the autonomic nervous system (heart rate, blood pressure, etc.), it is a direct measure of sympathetic activity that is relatively free of any influence of somatic symptoms (respiratory cycles or muscle tone) [Geer, 1966; Corah and Pantera, 1968; West et al., 1983; Jiménez, 1995; Lundgren et al., 2001].

Despite the respective advantages and disadvantages of EDA and heart rate as physiological measures, these two indicators continue to be the most reliable objective measures for the detection of anxiety and stress in the dental clinic [Hubert and Dejong, 1991]. However, the ideal situation

<table>
<thead>
<tr>
<th>Subjective anxiety measures</th>
<th>Items</th>
<th>Comments</th>
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<tbody>
<tr>
<td>Venham Picture Scale</td>
<td>2</td>
<td>Easy to apply. Requires 1-2 minutes to carry out. Comprehensible for a wide age range. Difficult for teenagers, because identifying with the images is difficult. The correlation with other measures is low-moderate.</td>
</tr>
<tr>
<td>Children's Fear Survey Schedule-Dental Subscale</td>
<td>15</td>
<td>Useful for a dental clinic. Precise. Permits measurement of trait anxiety. The data provided are very useful.</td>
</tr>
<tr>
<td>Corah's Dental Anxiety Scale</td>
<td>4</td>
<td>Most commonly used measure across the world. High level of reliability and predictive value. Requires less than 5 minutes to complete. Yields a narrow total score range that can be used efficiently in clinical settings.</td>
</tr>
<tr>
<td>Modified Dental Anxiety Scale</td>
<td>5</td>
<td>Useful for planning interventions aimed at reducing anxiety. Measures trait anxiety.</td>
</tr>
<tr>
<td>State-Trait Anxiety Inventory for Children</td>
<td>40</td>
<td>Measures state-trait anxiety. Good psychometric properties. High reliability and validity. Only used in hospitals, because it is very long and requires a lot of time to complete (8-12 min). Crying, agitation, verbal protests, disruptive behaviour, and cooperation levels cannot be registered.</td>
</tr>
<tr>
<td>Children's Emotional Manifestation Scale</td>
<td>5</td>
<td>Assesses the emotional behaviour of the child. Excellent validity for use in clinical settings. Suitable tool for assessing the effectiveness of interventions aimed at minimising preoperative anxiety.</td>
</tr>
<tr>
<td>Mclamed Children's Behaviour Profile</td>
<td>27</td>
<td>High validity. Permits differentiation of children who require specific behaviour management. Registers the frequency of disruptive behaviour. Requires observers to be suitably trained. Cumbersome to apply.</td>
</tr>
<tr>
<td>Interval Scale of Anxiety Response</td>
<td>7</td>
<td>Measures anxiety in any situation (before, during, and after treatment). High reliability and validity. Useful for evaluating the effectiveness of pharmacological and nonpharmacological interventions for reducing anxiety.</td>
</tr>
<tr>
<td>Children's Manifest Anxiety Scale</td>
<td>43</td>
<td>Assesses the nature and degree of general anxiety in children and teenagers.</td>
</tr>
</tbody>
</table>

**Table 2** - Subjective measures for measuring anxiety in children undergoing dental treatment.
would be for investigators to obtain information from various psychophysiological registries simultaneously (heart rate, blood pressure, EDA, etc.) [Benjamins, 1995; Jiménez, 1995].

Given that children may not have a fully developed capacity to recognize and interpret the physiological and cognitive manifestations of anxiety, subjective measures of dental anxiety in children have had to concentrate on the behavioural components of fear, or on the use of nonverbal tools such as pictures [Newton and Buck, 2000]. Pictorial measures such as the VPS can be performed quickly and reliably, and they can be understood by a wide age group [Alwin et al., 1991; Newton and Buck, 2000; Pizano and Bermúdez, 2004; Rivera and Fernández, 2005]. However, authors such as Aartman et al. [1998] have concluded that this scale is difficult for teenagers to use because they find it difficult to identify with the images.

The VPS is useful for differentiating between fearful and fearless children, but its correlation with other measures of dental anxiety tends to be low or moderate. Aartman et al. [1998] assessed the validity of the VPS by examining its correlation with another scale that is used commonly in paediatric dentistry, the CFSS-DS, and found that the correlation was decreased because the VPS measures state anxiety, whereas the CFSS-DS measures trait anxiety, and these basic types of anxiety differ. Consequently, a better assessment of the validity of the VPS requires correlation with other measures of state anxiety [Aartman et al., 1998]. Although pictorial scales represent a potentially useful means to measure anxiety in children, more studies are needed to determine their reliability and validity [Newton and Buck, 2000].

One of the anxiety measures used most commonly is the above-mentioned CFSS-DS [Aartman et al., 1998; Newton and Buck, 2000; Klaassen et al., 2003; Pizano and Bermúdez, 2004; Rivera and Fernández, 2005]. This scale covers many of the possible scenarios that may arise in the dental clinic and, in addition, it is very precise [Newton and Buck, 2000; Rivera and Fernández, 2005]. In light of this, in clinical practice, this scale is preferable to the VPS or DAS for the evaluation of dental anxiety in children [Aartman et al., 1998].

The DAS is one of the anxiety scales that is used most frequently worldwide [Aartman et al., 1998; Aaakkola et al., 2009]. It has good reliability and validity and it is easy to carry out [Del Gaudio and Nexpert, 1991; Newton and Buck, 2000; Pizano and Bermúdez, 2004; Rivera and Fernández, 2005]. Despite being a widely used scale, the DAS has been criticised for having a range of score totals that is too narrow to be used efficiently in clinical studies. For this reason, the modification of the original scale was proposed with the aim of increasing the number of possible answers by introducing an additional item [Schuurs and Hoogstraten, 1993]. As a consequence, the scale has been modified by the addition of a fifth item, which measures anxiety concerned with the administration of local anaesthesia [Humphris et al., 1995].

The Modified DAS has been applied in children and adults. Given that it has only five questions, it is considered to be a short instrument that is easy to apply, but it still has high levels of reliability and validity [Firat et al., 2006]. In addition, it is useful in the assessment of certain dental situations and for planning interventions that are aimed at alleviating dental anxiety in children, such as systematic desensitisation [Newton and Buck, 2000]. Doerr et al. [1998] reported that this scale is currently one of the most extensively used tools for the measurement of dental anxiety.

The validity of the Children's Emotional Manifestation Scale (CEMS) was investigated by comparing the preoperative state anxiety of children with their emotional behaviour score during the induction of anaesthesia [Li and López, 2005]. Previous studies [Lynch, 1994; Zahr, 1998; Li and Lam, 2003] had shown that high preoperative levels of anxiety were associated with more negative behaviour responses during medical procedures than low levels. As a consequence, a high score for anxiety before an intervention was associated with a higher score in the CEMS [Lynch, 1994; Zahr, 1998; Li and Lam, 2003].

As mentioned previously, evidence suggests that an increase in emotional activation and anxiety leads to an increase in heart rate and blood pressure [Ramsay, 1972]. The results of a study carried out by Ramsay [1972] revealed a positive correlation between the score on the CEMS and physiological indicators of stress, which provided further validation for this scale. Similarly, there is a good correlation between the CEMS and the STAIC, which indicates that the CEMS has very good internal consistency and validity. It can be used in clinical surroundings and to assess the effectiveness of interventions designed to minimise preoperative anxiety [Li and López, 2005].

Despite the existence of a large number of measures for the assessment of dental anxiety and their general use in research, many questions about them remain unsolved. Lindsay and Jackson [1993] alleged that the existing measures for dental anxiety fail to incorporate new knowledge regarding the factors that contribute to this type of anxiety. Currently, there is much debate as to whether the perfect technique for use in paediatric dentistry exists among all the different methods for assessing anxiety (self-report measures, techniques for behavioural observation, physiological techniques, and projective techniques). The low level of correlation among the different methods seems understandable given the multidimensional nature of anxiety, because it has physiological, cognitive and motor responses that manifest in different ways in each individual. Further studies are needed to determine the reliability and validity of the measurement of dental anxiety in children.

Conclusion

There is a wide variety of measures available to assess the level of dental anxiety. Most of these measures display suitable levels of internal consistency, validity, and reliability. Although all the physiological measures mentioned can be used to measure anxiety in a patient, they all require a monitoring team, financial expenditure, and extra time in the dental clinic. As a result, these types of measure are not commonly used in dental clinics. More studies are needed to determine the reliability and validity of the measures used to assess dental anxiety in children, given their multidimensional nature.

References