

How to evaluate adolescents' dental anxiety? A review of instruments

Como avaliar a ansiedade de adolescentes ao tratamento odontológico? Uma revisão dos instrumentos
¿Cómo evaluar la ansiedad dental de los adolescentes? Una revisión de instrumentos

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Abstract

Introduction: The prevalence of dental anxiety appears to be relatively consistent throughout the world, but some studies reports higher levels than others. This may be related to different instruments used. **Objective:** to identify and describe the main instruments used in the assessment of dental anxiety in adolescents. **Material and Methods:** Literature review. Original studies involving adolescents, in which the methodology comprised the application of some instrument to identify and / or quantify the phenomenon, were included. The search was limited to English, Portuguese and Spanish publications in the period between 2012 and 2016. Reviews, Meta-analyzes and case reports were excluded. The selected databases were MEDLINE (via PubMed) and LILACS (via BVS); and the search was developed with the following descriptors: 'dental anxiety', 'adolescents', 'Surveys and Questionnaires' (MeSH), combined by the Boolean operator AND. **Results:** Ten psychometric instruments are available to assess dental anxiety. The most frequently used instrument is the Dental Anxiety Scale (DAS), presented in nine studies. Less frequently used is the Facial Image Scale (FIS), presented in only one investigation. Most of the instruments affords translations into other languages, including Portuguese. **Conclusion:** The most used instrument is the DAS, followed by its modified version, the MDAS. Usually, more than one instrument has been used to correlate the findings and to provide the measured construct a greater consistency.

Descriptors: Dental Anxiety; Adolescent; Surveys and Questionnaires.

Resumo

Introdução: A prevalência de ansiedade ao tratamento parece ser relativamente consistente em todo o mundo, mas alguns estudos relatam níveis mais elevados do que outros. Isso pode estar relacionado a diferentes instrumentos utilizados. **Objetivo:** identificar e descrever os principais instrumentos utilizados na avaliação da ansiedade dentária em adolescentes. **Fontes de dados:** Revisão da literatura. Foram incluídos estudos originais envolvendo adolescentes, que em sua metodologia tenha sido utilizado algum instrumento para identificar e/ou quantificar o fenômeno. A busca foi limitada a publicações nos idiomas inglês, português e espanhol, no período compreendido entre 2012 e 2016. Revisões, metanálises e relatos de caso foram excluídos. As bases selecionadas foram a MEDLINE (via PubMed) e LILACS (via BVS); com os descritores: 'dental anxiety', 'adolescents', 'Surveys and Questionnaires' (MeSH), combinados pelo operador booleano AND. **Síntese dos dados:** Foram identificados 10 instrumentos psicométricos disponíveis para avaliação da ansiedade ao tratamento odontológico. O instrumento com maior frequência de utilização foi a escala *Dental Anxiety Scale* (DAS), presente em nove estudos. Em menor frequência, a escala *Facial Image Scale* (FIS), presente em apenas uma investigação. A maioria dos instrumentos apresenta tradução para outros idiomas, incluindo o português. **Conclusão:** O instrumento mais utilizado foi o DAS, seguido por sua versão modificada, o MDAS. Apenas quatro instrumentos são adaptados para uso no Brasil. Todos referem propriedades psicométricas satisfatórias e, em geral, são utilizados mais de um instrumento para correlacionar os achados e fornecer maior consistência ao constructo medido.

Descritores: Ansiedade ao Tratamento Odontológico; Adolescente; Inquéritos e Questionários.

Resumen

Introducción: La prevalencia de la ansiedad al tratamiento odontológico parece ser relativamente constante en todo el mundo, pero algunos estudios reportan niveles más altos que otros. Esto puede estar relacionado con diferentes instrumentos utilizados. **Objetivo:** identificar y describir los principales instrumentos utilizados en la evaluación de la ansiedad dental en adolescentes. **Material y Métodos:** Revisión de la literatura. Se incluyeron estudios originales con adolescentes, en los cuales la metodología comprendía la aplicación de algún instrumento para identificar y / o cuantificar el fenómeno. La búsqueda se limitó a publicaciones en inglés, portugués y español en el período comprendido entre 2012 y 2016. Se excluyeron las revisiones, los metanálisis y los informes de casos. Las bases de datos seleccionadas fueron MEDLINE (a través de PubMed) y LILACS (a través de BVS); y la búsqueda se desarrolló con los siguientes descriptores: 'ansiedad dental', 'adolescentes', 'Encuestas y cuestionarios' (MeSH), combinados por el operador booleano AND. **Resultados:** Diez instrumentos psicométricos están disponibles para evaluar la ansiedad dental. El instrumento más utilizado es la Escala de Ansiedad Dental (DAS), presentada en nueve estudios. El uso menos frecuente es la Escala de imagen facial (FIS), presentada en una sola investigación. La mayoría de los instrumentos permiten la traducción a otros idiomas, incluido el portugués. **Conclusión:** el instrumento más utilizado es el DAS, seguido de su versión modificada, el MDAS. Por lo general, se ha utilizado más de un instrumento para correlacionar los hallazgos y para proporcionar una mayor consistencia al constructo medido.

Descriptorios: Ansiedad al Tratamiento Odontológico; Adolescente; Encuestas y Cuestionarios.

INTRODUCTION

Dental anxiety is defined as a feeling of apprehension that precedes dental treatment¹, not necessarily related to any specific external stimulus^{2,3}. A slight perception of anxiety and/or fear are reactions considered acceptable, but may act as a barrier to developing adequate attendance, by reducing the (patient's) initial motivation to seek treatment and leading to not showing up for appointments. This occurs more frequently in children and adolescents, in many cases contributing to continuous aggravation of oral health problems⁴.

The interaction between adolescents with high levels of dental anxiety and dental professionals is harmed, and this makes them more insecure and vulnerable, leading to worsening of the disturbance⁵.

Dental anxiety is a multidimensional construct that may trigger physical, cognitive, emotional and behavioral responses in individuals. Due to the considerable implications of this feeling in patients and professionals, and negative repercussions on public health, it is important to identify which individuals have dental anxiety, so

that it would be possible to select a better approach to each case⁶.

For this purpose, diverse scales and questionnaires have been developed over several decades. These scales provide a basis for broader understanding of dental anxiety. However, the large number of scales and continuous development of new instruments or modified versions, reveal a need to systematically identify the most adequate instruments for approaching the problem. The aim of the present review was to identify and describe the main instruments used for evaluating dental anxiety in adolescents.

MATERIAL AND METHOD

○ Eligibility criteria of the articles

Original studies involving adolescents were included, in the methodology of which some instrument had been used to identify/and or quantify dental anxiety. The search was limited to publications in the English, Portuguese and Spanish languages; and of the scientific article type. Reviews, meta-analyses and case reports were excluded.

○ Search strategy

The databases selected were MEDLINE (via PubMed) and LILACS (via BVS); the search was developed with the following descriptors: ‘dental anxiety’, ‘adolescents’, ‘Surveys and Questionnaires’ (MeSH), combined by the Boolean operator AND. ((dental anxiety [MeSH Terms]) AND adolescents [MeSH Terms]) AND (surveys and questionnaires [MeSH Terms]) AND ("last 5 years"[Pdat]).

The search was conducted by two researchers and the publications were inserted into the *Mendeley* software for management of the references. The last consultation of publications was made in April 2017.

○ Selection of publications and data extraction

Thus, selection of publications was performed in three stages: (1) selection of titles by reading twice; (2) selection of abstracts, and qualitative analysis of complete texts. To complement the original search, the references of the publications were manually searched. The process of analysis for evaluating and selecting the articles was performed by two researches, independently, with later comparison of the results to obtain texts selected by consensus. In cases of divergence or doubts relative to inclusion of the articles, a third researcher evaluator participated (Figure 1).

RESULTS

On conclusion of the article selection process, 29 eligible studies were identified, which used instruments for evaluating dental anxiety in adolescents. As regards the study designs, the sample was composed of two case control studies^{7,8}, one randomized controlled clinical trial⁹, and the others were cross-sectional studies. The countries that

most investigated dental anxiety in adolescents were Sweden (5), Spain (5) and India (4). Only one study was retrieved about the topic in Brazil, conducted with adolescents in the last five years¹⁰.

Ten (10) instruments available for evaluation of dental anxiety were identified. Of these six were scales and four were questionnaires. The instrument most frequently used was the *Dental Anxiety Scale* (DAS), present in nine studies. The lowest frequency was found for the *Facial Image Scale* (FIS), present in only one investigation. The categorization of frequency of us and data with reference to the studies may be observed in Table 1.

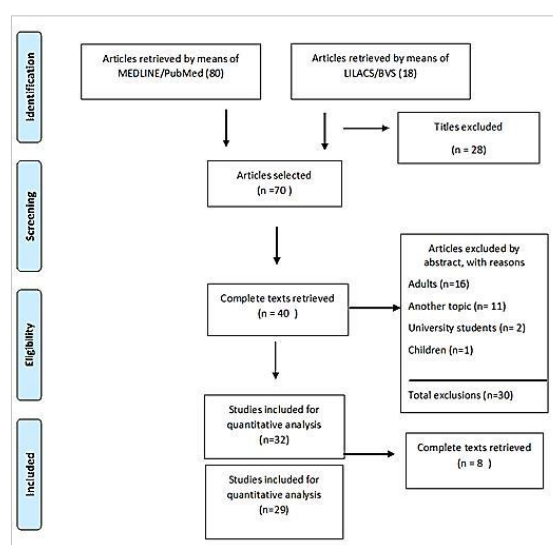


Figure 1: Study Design (PRISMA¹¹).

Table 1. Scales for evaluating anxiety related to dental treatment in decreasing order of utilization

Ranking	Scales and Questionnaires	Author/Year
1	Dental Anxiety Scale (DAS)	Costa et al.2014 ¹² Crego et al.2015 ¹³ Houtem et al.2015 ¹⁴ Muppa et al.2013 ¹⁵ Östberg e Abrahamsson, 2013 ¹⁶ Patel et al.2015 ¹⁷ Taskinen et al.2014 ¹⁸ Viinikangas et al.2007 ¹⁹
2	Modified Dental Anxiety Scale (MDAS)	Jaakkola et al.2014 ⁵ Crego et al.2013 ²⁰ Carrillo-Diaz et al.2013 ²¹ Marya et al.2012 ²²
3	Dental Fear Survey (DAS),	Stenebrand et al.2013 ¹ Wiener et al.2015 ²³ Esa et al.2014 ²⁴ Stenebrand et al.2013 ²⁵
4	Dental Anxiety Question; DFS	Murthy et al.2014 ⁶ Soares et al.2015 ¹⁰ Worsley et al.2016 ²⁶
5	Children's Fear Survey Schedule Subscale (CFSS-DS)	Lundgren et al.2015 ⁷ Majstorovic et al.2014 ²⁷ Rantavuori et al.2012 ²⁸
6	Index of Dental Anxiety and Fear	Carrillo-Diaz et al.2013 ²¹ Armfield, 2013 ²⁹ Carrillo-Diaz et al.2015 ³⁰
7	Fear of Dental Pain Questionnaire (FDPQ)	Ferreira e Colares, 2011 ³¹
8	Facial Image Scale (FIS)	Toscano et al.2012 ³²

All the instruments have a psychometric focus, for the purpose of quantitative measurement of a mental phenomenon. The majority of the instruments have been translated into other languages, including Portuguese. The instruments that have been validated for Brazil are the: *Dental*

Anxiety Scale (DAS), Modified Dental Anxiety Scale (MDAS), Dental Fear Survey (DFS) and Fear of Dental Pain Questionnaire (FDPQ). The number of items in the questionnaires and scales ranged between 1 (DAQ) and 20 (DFS), with the larger portion of these grade in a Likert type scale of 4 or 5 items.

In relation to the year of publication, greater predominance was observed in the year 2015, contributing with 10 studies. Ranked secondly was the year 2013 comprising nine publications. The majority of the instruments were applied in samples that comprised children and adolescents, but a smaller portion of instruments was applied in adult individuals. To broaden understanding of the questionnaires and scales, the authors opted describe these, following the order from the highest to the lowest frequency used.

Description of Instruments

○ *Dental Anxiety Scale (DAS)*

The DAS was developed by Corah in 1969³³, and is a widely used psychometric instrument. It is available in over 20 languages (<http://www.st-andrews.ac.uk/dental-anxiety/scale-translations/>), including Portuguese. The DAS has four questions that ask respondents to grade their level of anxiety associated with four possible scenarios: expectation of a visit to the dentist the next day; sitting in the dentist's waiting room; receive polishing/dental scaling, and receiving a restoration. The scale comprises four items, containing five alternatives in each, and was developed specifically to measure dental anxiety, with scores varying from 4 to 20. The total score is calculated by adding up the points - from 1 to 5 - scored in all the items. Scores of up to 5 indicated not anxious; from 6 to 10, slightly anxious; from 11 to 15, fairly anxious; and from 16 to 20, extremely anxious¹⁵. In her study, Corah³³ identified that mean score of 8 were considered normal anxiety; scores between 17 and 20 were observed in individuals previously identified as phobic.

○ *Modified Dental Anxiety Scale (MDAS)*

The MDAS is an instrument based on the DAS (*Dental Anxiety Scale*), composed of five items, to which an item relative to an injection of anesthesia was related. Each question has five response alternatives, ranging from "not anxious" through to "very anxious", producing a variation of 5 to 25 for the total score, with more elevated score representing an elevated level of dental anxiety. The MDAS scores, in general, are classified into two categories: without anxiety up to moderate dental anxiety (scores 5-18) and high dental anxiety (scores between 19-25)³⁴. The cut-off point of 19 could be determined to indicate the need of intervention to control anxiety. It has good psychometric properties; is relatively quick to apply and calculating the scores is simple. The MDAS has been translated into various languages, such as Spanish, Greek and Chinese. The

scale may be applied in children and adolescents (8 to 15 years), and is considered adequate for identifying dental anxiety in children. Studies have demonstrated good internal consistency and validity of criteria^{34,35}.

○ *Dental Fear Survey (DAS)*

The DFS was published by Kleinknecht et al. in 1973 and its original version contained 27 items³⁶. Two items focus on avoidance; five, on self-perception of physiological activation of fear; 12 items, on fear of situations and specific dental procedures; and one item, on dental fear in general. Each question contains five alternatives with ordinal measurements. The sum of scores can vary between 20 "without fear" to 100 "frightened", but the DFS was mainly developed to detect fear induced by separate items. The present-day version of DFS is composed of 20 items on a scale of 5 points, comprising three dimensions: avoidance (8 items), physiological activation (5 items) and specific fear (7 items). The response options follow a classification that ranges from "never" or "no way" (Score 1) to "almost all the time" or "excessively" (Score 5). The avoidance scores may vary between 8 to 40; physiological activation, between 5 and 25; and specific fear between 7 and 35. The total DFS score may vary between 20 and 100, with higher scores indicating high dental anxiety. The DFS was transculturally adapted and validated in Brazil among university students in the 1990s. Factorial analysis of the Brazilian version has demonstrated 3 consistent factors, explaining 66.3% of the variance of the scale^{37,38}.

○ *DAQ*

The DAQ is an anxiety evaluation instrument made up of the following question: "Are you afraid of going to the dentist?" The respondents opt for one among four possible responses: "No", "A little", "Yes, quite", and "Yes, very". The level of anxiety is categorized according to the responses into: a) without anxiety; b) low; c) moderate and d) high. Its score varies from 1 to 4, with the maximum score that characterizes an individual with a high degree of dental anxiety. The DAQ is considered a short form, simple to use, and has been validated for use in Brazilian children. The population-based validation study of DAQ was published in 1990, in which it could be observed that this instrument presented good internal consistency ($\alpha=0.91$) and high correlation with the items of the DAS ($r=0.71$). A single question was observed to faithfully represent the four situations that constitute the base instrument that originated the DAS³⁹.

The psychometric properties of the DAQ, evaluated in population-based studies are considered adequate. It presents specificity of 0.95 and sensitivity of 0.80, using dichotomic classification (yes/no). It is considered an instrument with good validity and can be used with confidence to evaluate

dental anxiety in epidemiological studies or clinical practice when use of a longer questionnaire is not feasible⁴⁰.

○ *Children's Fear Survey Schedule Subscale (CFSS-DS)*

The CFSS-DS, developed by Cuthbert and Melamed in 1982⁴¹, was drawn up from an instrument for measuring the presence of fear in younger children, denominated *Fear Survey Schedule for Children* (FSS-FC). The CFSS-DS has been translated from English into 20 languages, including Japanese, Chinese, Greek, and Swedish⁴². The questionnaire consists of 15 items related to different aspects of dental treatment. The constructs of the scale are related to very invasive (local anesthesia), moderately (use of drill) procedures, and victimization (being incapable of breathing). Each item is graded on a 5-point Likert scale, from 1 "not afraid at all" to 5 "very afraid". The scores of the 15 items are added for categorization of the total fear score that ranges between 15 and 75. As a self-reported measurement of dental anxiety, it has been suggested that the CFSS-DS is preferred in comparison with the VPT and the *Dental Anxiety Scale*. It has better psychometric properties, evaluating dental anxiety with greater precision, and covers more aspects of the dental context^{7,43}. The CFSS-DS provides a consistent factorial structure over the course of time in children of different ages and reflects the changes in the manifestations of dental anxiety during the period of growth. Therefore, it is considered a questionnaire applicable for clinical and research purposes.

○ *Index of Dental Anxiety and Fear (IDAF-4C)*

In its structure, the IDAF- 4C+ presents three modules that may be used, depending on the intentions and requirements of whoever applies it. In particular the base module that identifies dental anxiety (IDAF-4C) may be useful as a triage tool⁴⁴. The IDAF-4C identifies the four components (emotional, behavioral, physiological and cognitive) of anxiety symptoms. This instrument contains three modules that measure anxiety and dental fear, dental phobia and fear of dental stimuli. The items of the IDAF-4C present good internal consistency (Cronbach 0.94) test and retest reliability in four months ($r = 0.82$), strong association with other scales that evaluate fear and dental anxiety, as well as patterns of future visits to the dentist and perceptions of the visit. Studies have pointed out that, in general, the scale would be a useful tool for evaluating DAF in an adult population⁴⁵.

○ *Fear of Dental Pain Questionnaire (FDPQ)*

The S-FDPQ is a self-applicable instrument, made up of 5 items selected and based on the psychometric properties and face's validation of the original instrument, which comprises 18 items that describes dental procedures that may cause pain. It

evaluates the individual's fear of pain by means of association with each situation. Each item is responded to on a scale of 1 (without fear) to 5 (severe fear), resulting in a possible total score between 18 to 90. The Cronbach Alpha coefficient obtained was 0.82; and the intra-evaluator Kappa correlation coefficient varied from 0.56 to 0.84 ; and the inter-evaluator, from 0.47 to 0.84; showing high internal consistency and satisfactory reproducibility. The short Brazilian version of the S-FDPQ presented high reliability and validity for use with Brazilian adolescents. It is easy to interpret and apply. However, new researches are necessary to confirm these properties in other studies³¹.

○ *Facial Image Scale (FIS)*

This scale comprises a set of five faces, representing expressions ranging from "very happy" to "very unhappy". For the happiest face, a score of value 1 is attributed, and a score of 5 to the unhappiest face. The interviewer asks children to point out the face that most represents their state at that moment. The scores are recorded and categorized for analysis as follows: 0 = without anxiety (FIS score = 1), 1 = little or moderate anxiety (FIS score = 2 and 3), and 2 high or very high anxiety (FIS score = 4 and 5). The instrument presented strong correlation with the *Venham Picture Test* (VPT)⁴⁶, indicating good validity of the competitor criterion; that is, the instrument measures that which it intends to measure. Furthermore, the FIS can be used in younger children, between 3 and 6 years of age, where poor cognitive development may compromise the self-reporting ability or respond to questionnaires. This instrument is considered easy and quick to apply (less than 1 minute) and is useful to apply in dental office waiting rooms to predict the behavior^{47,48}.

DISCUSSION

Most of the instruments identified in this review are composed of questionnaires indexes and self-applicable psychometric styles scales. This type of instrument is widely used by clinicians and researchers because of some advantages, such as being easy to administer, low cost, not requiring too much time during the application. Due to the possibility of obtaining information from the respondent's point of view, it eliminates the subjectivity of the perception of third parties.

The instrument most frequently used in literature was the *Dental Anxiety Scale* (DAS)^{8,13,16}, as well as its modified version, the *Modified Dental Anxiety Scale* (MDAS)^{5,20-22}. The scales were developed some years ago, and are available in several languages, allowing dental anxiety to be categorized in a gradual form or in levels. It is noteworthy that both instruments mentioned were used in samples of adolescents and young adults.

However, it could be stated that the DAQ^{6,10,26} was promising in the evaluation of dental anxiety, considering it was easy to use, took less time to apply, and had high correlation with a more elaborate scale, the DAS.

It was observed that the evaluation of dental anxiety might involve two approaches. The first refers to the measurement of a person's emotional content in relation to his/her perceptions, such as, for example, how the person feels about going to the dentist. The second approach evaluates the predictable reactions of persons to a variety of specific stimuli, events or conflicts. Occasionally, these two approaches are combined into a single scale to a greater or less extension, as in the case of the *Index of Dental Anxiety and Fear (IDAF-4C)*^{20,29,30}.

The literature does not present standardization of instruments' scores. A variability of categorizations is therefore observed, ranging from a dichotomous interpretation to a broader graduation. The question remains: "after all, from which point must the evaluator consider that the respondent presents dental anxiety?" Studies using the DAQ^{6,10,27}, for example, mentioned different categorizations, which makes it difficult to compare the results.

It was verified that the time taken to apply the instruments was not informed, as well as certain psychometric criteria, and the validities of content and construct could be cited. Moreover, it is recommended to distinguish the concepts of fear and anxiety, in order to obtain specific scores for each situation.

Dental anxiety shares many characteristics with other anxiety disorders, and is a specific form of phobia. The recommendation, therefore, would be the use of an additional instrument, whenever possible. This measurement would not only enable the instruments to be correlated to elevate the psychometric properties, but also identify the extent to which trace anxiety conditions contributed to the dental anxiety scores⁴⁹.

The instruments identified are measurements of self-reported anxiety. Thus, they are easy to apply, including a shorter task time and could evaluate the reaction to different aspects of the dental situation. Like any study that involves the application of a self-reported instrument, it is difficult to discriminate between adolescents who do not express the feeling of anxiety because of social adjustment. Low prevalences of anxiety in this age-range may be related to this fact³⁷.

It must be emphasized that every questionnaire described has its own restrictions and because they did not completely cover the concept of anxiety, the use of more than one questionnaire and/or other measurement is recommended.

CONCLUSION

The present review pointed out a variety of instruments proposed to identify the presence of symptoms of dental anxiety in adolescents. The most used is the DAS and its modified version MDAS. Only four instruments have been adapted for use in Brazil. All had satisfactory psychometric properties, and in general, more than one instrument is used for correlating the findings and providing the construct measure with greater consistency. However, the continuous process of validation and better definition of theoretical concepts and cut-off points continues to be necessary for adequate comparison of the results.

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CONFLICTS OF INTERESTS

The authors declare no conflicts of interests.

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