Validated psychometric scales to measure dental fear/anxiety among children and adolescents in Italy. A systematic review

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KEYWORDS
- Children’s Fear Survey Schedule-Dental Subscale (CFSS-DS)
- Dental Fear/Anxiety (DFA)
- Italian children and adolescents
- Modified Child Dental Anxiety Scale (MCDAS)
- Validation of psychometric scales

ABSTRACT

Aim One in seven children or adolescents suffer from a high level of dental fear/anxiety (DFA) hindering or delaying their dental service attendance. To overcome this negative psychological condition an early diagnosis should be performed through validated psychometric scales adequate for children, such as the Children’s Fear Survey Schedule-Dental Subscale (CFSS-DS) and the Modified Child Dental Anxiety Scale (MCDAS). The aim of this paper is to review the literature in order to verify the existence of validation studies regarding the above mentioned two questionnaires.

Methods A detailed systematic research of studies published at the end of February 2016 into the most relevant electronic data bases (Medline, Embase and Web of Science) with well calibrated Mesh words was performed. Only studies reporting data about the reliability and validity concerning CFSS-DS and/or MCDAS carried out among Italian children and adolescents were selected for data extraction.

Results The literature review yielded 905 records, for 43 of which the full text was retrieved. In addition, a further 5 full texts were also derived by the searching of available papers. After the examination of all full texts no studies reporting validation procedures carried out among Italian children or adolescents were found.

Conclusion The absence of validated studies in Italy regarding two of the most relevant psychometric scales (CFSS-DS and MCDAS) raises concerns about the attention shown by Italian dental practitioners to the matter of children’s/adolescents’ dental anxiety. Further methodologically well conducted studies in this field should be performed on Italian population.

Introduction

Dental Fear/Anxiety (DFA) is a condition that affects children and adolescents as well as adult population. Almost one in seven subjects suffer from a high level of DFA enough to prevent an adequate treatment at the dental chair in terms of quality and completeness (1, 2). Moreover, DFA is time consuming and increases costs related to treatment (3) as well as stress for dental practitioners (4).

The DFA represents a relevant barrier causing children’s avoidance or delay in undergoing dental visits, comparable for importance with well known social factors such as low family income, parental education level, geographic location, high costs of dental treatments, lack of perceived need, and weak recommendation by pediatricians (5, 6). An immediate consequence of reduced dental service children’s attendance is the presence of 621 million children with untreated deciduous teeth worldwide (7). An early and regular schedule of dental visits, indeed, constitutes a positive habit for children in prevention as well as in early diagnosis and treatment of caries (8). Advantages are particularly evident when dental visits begin among children younger than 3 years (9).

Among the causes of reduced dental service attendance DFA is the one that most involves the dental practitioners (10). The first visit to a dentist can be a fearful experience, particularly when young patients have to cope with specific fear triggers, such as dental injection (11-17), the sight or noise of a dental
drill (11, 12, 15, 18, 19), tooth extraction (19-22), a choking sensation (15), and having a stranger touch them (15, 16, 19).

However, the causes of DFA onset can not be all attributed to the dental setting, in fact other personality traits or factors can play a fundamental role in the onset of dental anxiety, such as general anxiety (10, 23, 24), mood (23), temperament (24, 25), emotional status (26), parental dental fear (11, 27-30) and family social status (31, 32).

The DFA such as “trait” of personality expresses the basal children’s propensity to feel fear during dental visit and treatment and it is usually measured through psychometric scales (33). The psychometric scales allow a preliminary assessment of DFA (before treatment) useful to plan specific treatment procedures for children when high level of DFA are diagnosed (34). The fearful children undergoing dental visits present a higher probability to show bad reaction/behavior such as to prevent to carry out the treatment correctly. Children’s bad reaction at dental chair causes difficulties for dentist in treating the patient, and this is referred to as behavioral dental management problems (BDMP). Also, BDMP might be assessed and measured by dental operators by means of specific scales (i.e. Frank Scale) (35). There are other methods for DFA measurement, such as “physiological” assessment and “projective tests” (2, 36). The physiological assessment is based on variation of patients’ physiological parameters such as pulse or heart rate as well as salivary cortisol levels. However, doubts about validity of physiological measurements are reported in the literature (37). Moreover, for some types of measurements, such as cortisol tests, further doubts were expressed about costs and difficulties for the application in daily practice (33). The projective tests, based on psychological interpretation of children pictures of the dental setting (i.g. the doctor), are deemed an interesting valid method to assess DFA (38), but there are concerns in terms of reliability (36).

After a review of the scientific literature about DFA among children, the only two psychometric scales we could identify as specifically thought and created for children and adolescents are the “Modified Children’s Dental Anxiety Scale” (MCDAS) and “Children Fear Schedule Survey-Dental Subscale” (CFSS-DS). They both are composed of questions (items) that describe situations that children or adolescents are asked to cope with when sitting on the dental chair (i.g. site of injection or dental extraction). For each question the child can show his/her fear through a five grade rating scale, ranging from “not afraid at all” (grade 1) to “very afraid” (grade 5), named the Likert Scale. The CFSS-DS is constituted of 15 items with scores varying from 15 to 75 (39), whereas the MCDAS of 8 items with scores ranging from 8 to 40. Translations of these psychometric scales should be validated for their use among the population where they will be used; also a cut off value to indicate high fearful subjects should be tailored on the tested population.

The aim of this study is to review the current scientific literature in order to understand whether there are validated Italian versions of CFSS-DS and MCDAS in order to measure the prevalence and mean score values of DFA among children and adolescents.

Methods

Inclusion criteria

Study design: This review includes only cross-sectional and cohort studies that reported data about validity and reliability of Italian versions of CFSS-DS and MCDAS.

Population: Children and adolescents (aged 0-19 years) without diagnosed systemic diseases or psychological disorders.

Setting: private or public dental services (general or pediatric) as well as schools and kindergartens.

Endpoints: Primary data were represented by reliability and validity coefficients of two scales used to measure the trait of DFA among children and adolescents: Children’s Fear Survey Schedule-Dental Subscale (CFSS-DS), the Modified Child Dental Anxiety Scale (MCDAS). Secondary outcomes were represented from both mean score and prevalence of DFA recorded in the Italian children and adolescents populations where questionnaires validations were carried out.

Exclusion criteria

Editorials, case reports and retrospective studies were not considered in this review. Studies including fewer than 50 participants, studies reporting validity data alone or reliability data alone were not included. Moreover studies not carried out in Italy as well as studies without clearly expressed correlation indices for CFSS-DS and MCDAS validation procedures were excluded. Lastly, studies that were not written in English or Italian language were also excluded.

Literature search

An adequate search strategy was performed for Medline, but revised appropriately for each database (Medline, Embase, Web Of Science). The entire set of Mesh words as well as their combination in order to perform a detailed literature review about reliability and validity of Italian versions of CFSS-DS and MCDAS are described in Table 1. Search was performed in February 2016.

Selection of studies

All identified records potentially relevant for full text obtained by mean of search conducted over
any database were stored into the bibliographic software package EndNote X7 and merged into one core database. Identified duplicate records were eliminated. Records of interest for this review were searched also consulting other sources such as textbooks and reference lists of relevant trials and reviews. A detailed screening of title and abstract of the entire set of retrieved records was performed by two independent reviewers (GL, EL). Then, the full texts of the articles identified as potentially meeting the inclusion criteria were retrieved for data extraction. The search was carried out until the month of March 2016. Disagreements were resolved by discussion or, when resolution was not possible, through assessment by a third review author (RG).

Data extraction and management
Data extraction was performed by two independent reviewers (SC, LP) and disagreements were resolved by discussion or by asking the opinion of a third reviewer (IA).

The extracted data were collected in a specific table sheet. Retrieved data described the most relevant features of the studies such as year of publication, country and setting of the study, participants’ characteristics (number, age, gender), type of psychometric scale used, type of correlation coefficient used for the analyses of reliability and validity as well as DFA mean score and prevalence data of Italian children population where CFSS-DS and MCDAS were validated.

![Table 1 Search strategy (Medline, Embase, Web Of Science databases)](image-url)

**Table 1** Search strategy (Medline, Embase, Web Of Science databases)
Data analysis
For each study that met inclusion criteria, reliability and validity coefficients of the psychometric scales were evaluated in order to verify whether their values were enough to demonstrate that CFSS-DS and MCDAS are reliable and valid DFA measurement tools. For secondary outcomes, crude prevalence estimates (number of cases/sample size), along with standard errors, were extracted. Prevalence rates were transformed to logit estimates using the following formula: \( \logit p = \ln \left( \frac{p}{1 - p} \right) \), where \( \logit p \) = logit event estimate; \( \ln \) = natural logarithm; \( p \) = study level estimate (40, 41). The DerSimonian and Laird random effects model was used to pool logit event estimates (42).

Pooled logit estimates were subsequently transformed to prevalence estimates by the following formula: \( p = \frac{e^{\logit p}}{1 + e^{\logit p}} \), where \( p \) = prevalence and \( e \) = the base of natural logarithm (43). The heterogeneity of the prevalence rates was assessed using the I2 index (44).

Results
The search in the electronic databases (Medline, Embase, Web Of Science) identified 905 records. From the entire set of selected records, 491 duplicates were removed and 414 records were screened. After detailed evaluation of titles and abstracts, 38 records were assessed as relevant for full text examination. In addition, five full texts were obtained through hand searching procedures from textbooks and reference lists of relevant trials and reviews. Overall, 43 full texts were obtained and assessed for eligibility. The study screening process is described in Figure 1.

All 43 studies were excluded because none of them met the inclusion criteria (Table 2).

Discussion
Dental fear is a worldwide interesting matter described also among the Italian population. Reviewing the literature of the last decade, the most common approach to dental fear was related to adult patients attendance to dental surgical treatment: third molar extraction as well as periodontal or implant surgery. This interest could be due to the fact that surgery is one of the most invasive dental procedures that easily generate anxiety among patients (45-49). In these studies psychometric scales were mostly employed in adult patients, with different characteristics than those considered in this review, such as original or modified versions...
of Dental Anxiety Scale (DAS or MDAS) as well as Visual Analogue Scale (VAS). Still considering Italian adult population ages, a further study was found dealing with dental fear in relation with bruxism, where psychometric scales useful for adults but not for children were used (48).

Few studies describing the dental fear in children as well as in adults were found concerning the Italian population. Three studies reported dental anxiety prevalence among children in relation with a wide range of variables involving the characteristics and experiences of children as well as their family and social environment (50-52). When also adolescence was considered, only three studies involving Italian teen ages were found. The first study, carried out across several homogeneously distributed European countries, correlated dmft/DMFT caries index with dental fear (53); the second study investigated the causes of adolescents’ dental fear whilst the third study compared the level of dental fear between patients undergoing dental treatment versus untreated subjects.

From the analysis it resulted that there are not any studies describing validation procedures among children and adolescents in Italy.

Conclusion
The absence of validation studies carried out among Italian children and adolescents should stimulate further well conducted research to assess the reliability and validity of the most useful children’s psychometric scales such as both CFSS-DS and MCDAS. The absence in Italy of validated psychometric scales for children generates concerns about the real interest from dentists towards the need to measure dental fear in order to individuate targeted strategies to overcome such specific negative personality trait and then perform an adequate dental treatment.

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References
<table>
<thead>
<tr>
<th>Author / year</th>
<th>Exclusion reasons</th>
<th>Psychometric scales</th>
<th>Country</th>
<th>Validation procedure(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Aartman 1998 (54)</td>
<td>It is not a primary study but a literature review</td>
<td>CFSS-DS</td>
<td>---</td>
<td>Reliability and validity</td>
</tr>
<tr>
<td>2. Al-Namankany 2012 (55)</td>
<td>It is not a primary study but a literature review</td>
<td>CFSS-DS and MCDAS</td>
<td>---</td>
<td>Reliability and validity</td>
</tr>
<tr>
<td>3. Alvesalo 1993 (56)</td>
<td>It is not a psychometric scale validation study</td>
<td>CFSS-DS</td>
<td>Finland and Turkey</td>
<td>---</td>
</tr>
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<td>4. Arapostathis 2008 (57)</td>
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<td>CFSS-DS</td>
<td>Grece</td>
<td>Reliability and validity</td>
</tr>
<tr>
<td>5. Armfield 2010 (58)</td>
<td>It is not a primary study but a literature review</td>
<td>CFSS-DS</td>
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</tr>
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<td>6. Bajrić 2011 (59)</td>
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<td>CFSS-DS</td>
<td>Bosnia</td>
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<td>7. Buchanan 2005 (60)</td>
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<td>MCDAS</td>
<td>England</td>
<td>Reliability and validity</td>
</tr>
<tr>
<td>8. Caprioglio 2009 (51)</td>
<td>It is not a psychometric scale validation study</td>
<td>---</td>
<td>Italy</td>
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<td>9. Carson 1997 (61)</td>
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<td>North Ireland</td>
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<td>CFSS-DS , MCDAS (face version)</td>
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<td>11. Daini 2005 (62)</td>
<td>It is not a psychometric scale validation study</td>
<td>Dental Anxiety Scale (DAS)</td>
<td>Italy</td>
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<tr>
<td>12. Desiate 1997 (63)</td>
<td>It is not a psychometric scale validation study</td>
<td>Dental Subscale Test</td>
<td>Italy</td>
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<td>13. El-Housseiny 2014 (64)</td>
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<td>14. Esa 2015 (65)</td>
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<td>15. Gustafsson 2010 (35)</td>
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<td>16. Holmes 2005 (66)</td>
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<td>21. Klingberg 1995 (38)</td>
<td>The tested psychometric scale was different by those considered in this review</td>
<td>Children’s Dental Fear Picture test (CDFP)</td>
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**Table 2: Studies and reasons for their exclusion**
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<th>Country</th>
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<td>Suprabha</td>
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52. Rantavuori K, Zerman N, Ferro R, Lahti S. Relationship between children’s first dental visit and