Reliability and validity of the Greek version of the Children's Fear Survey Schedule–Dental Subscale

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Background. The Children's Fear Survey Schedule– Dental Subscale (CFSS–DS) is a commonly used questionnaire which measures children's dental fear. **Objective.** The aim of this study was to gather data to evaluate the psychometric properties of a Greek version of the CFSS–DS.

Methods. A sample of 260 children aged 4–12 completed the Greek version of the CFSS–DS while in the waiting room of a paediatric dentist. The dentist, who was unaware of the children's scores, rated the children's behaviour during the dental appointment using the Frankl scale. Children who

Introduction

As parents and dentists know, a number of children are afraid of dental procedures. Because dental anxiety may complicate the delivery of dental treatment, dentists often wish to be able to identify children with these fears. Perhaps the most commonly used questionnaire for assessing children's dental anxiety is the Children's Fear Survey Schedule-Dental Subscale (CFSS-DS)¹. This 15-item questionnaire covers a variety of dental stimuli, such as injections, having to open one's mouth, drilling, having one's teeth cleaned, and the like. Children rate their fear on each of the 15 items on a 1–5 scale, with 1 meaning 'not afraid at all' and 5 meaning 'very afraid'. Sum scores may range from 15 to 75, with higher scores indicating higher dental fear. The CFSS–DS has been found to have good reliability and validity^{2,3}.

returned for a second dental appointment during the study period completed the CFSS–DS a second time. **Results.** The mean CFSS–DS score was 24.80 (standard deviation = 9.17). Age and gender were not related to mean scores. Invasiveness of dental treatment was not related to mean scores. Children who were most uncooperative/fearful on the Frankl had the highest mean scores (Kruskal–Wallis $\chi^2 = 9.48$; d.f. = 2; *P* = 0.009). The internal consistency (Cronbach's alpha) was 0.85, and the test–retest reliability (intraclass correlation) was 0.74. **Conclusions.** The Greek version of the CFSS–DS appears to be reliable and valid. Further samples should include school samples, to include children who may not go to the dentist.

The CFSS-DS was first examined in schoolbased samples¹. Since then, some researchers have assessed translations of the scale in school populations⁴⁻⁶, while others have used clinic samples^{7,8}. Most of the criterion validity research of this measure has examined the relationship between CFSS-DS scores and cooperation during dental treatment. Researchers have found that children previously classified as non-cooperative on the Frankl scale⁹ or dentists' classifications have higher CFSS-DS scores than their cooperative peers^{10–14}. In addition, in samples of patients not previously classified according to cooperation, children with higher CFSS-DS scores display more fearful and disruptive behaviour in the operatory on the Frankl¹⁵ or similar behavioural rating scales^{16,17}.

Originally written in English and developed in the USA, the English version of the CFSS– DS has been used in other countries, such as Singapore⁴. The scale has been translated into several other languages, including Swedish, Dutch, Finnish, Danish, Croatian, Bulgarian, Vietnamese, Chinese, and Japanese^{5–8,12,15,17–19}.

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A few authors have also reported using a subset of the 15 $\text{items}^{20,21}$.

A Greek version of the CESS-DS was mentioned in an assessment of the psychometric properties of another measure in Cypriot schoolchildren²². The authors report that the scale was found to have very high internal consistency and performed in a way which provided evidence for the construct validity of the measure they were studying. This suggests that their Greek version performed similarly to other translations of the CFSS-DS. However, the authors did not report the test-retest reliability or criterion validity of their version. Communication with the corresponding author and others in Greece and Cyprus failed to locate either the translation or the co-author responsible for it. Thus, further psychometric research with this translation was not possible. In addition, there may be cultural differences between Greek children in Greece and Greek children in Cyprus, manifested in differences in translation and/or dental fear patterns. The aim of our research was to gather data to evaluate the reliability and validity of a Greek version of the CFSS-DS. Because we were unable to locate the translation used in Cyprus, we elected to begin with our own translation and carry out our study in Greek children in Greece.

Materials and methods

Questionnaires

The child's questionnaire consisted of the CFSS-DS items and a 5-point pictorial scale [Facial Image Scale (FIS)]^{23,24}. The FIS consists of five drawings of a face, displaying affective features ranging from extremely negative through neutral to extremely positive. Children are presented with the five images, and asked to select which one best corresponds to how they are feeling. The faces are scored 1–5, with 1 assigned to the most positive face and 5 assigned to the most negative face. The FIS has been found to be a reliable and valid method for children's self-report of dental fear in samples as young as 3 years old²³. Because the young children in our sample were not likely to be familiar with a 5-point verbal scale, we added the five facial images to the questionnaire.

Pilot testing revealed that young children were able to answer the CFSS–DS items with reference to the facial images. To maintain consistency, all children saw the facial images during the questionnaire administration. The CFSS–DS items were translated into Greek and backtranslated by two bilingual dentists. (The translation is available from the first author.)

The dentist's questionnaire consisted of a consecutive list of dental stimuli that the child might encounter, beginning with when the dentist enters the operatory, through phases of treatment, and ending with the exit of the child from the operatory. For each stimulus, the dentist could rate the child as '1 = definitely negative' (e.g., behaving in a fearful manner, crying forcefully), '2 = negative' (the child is reluctant and/or uncooperative, but not to the degree seen in the previous category), '3 =positive' (the child is willing to comply, but may be cautious), or '4 = definitely positive' (the dentist and child share good rapport, the child is laughing) on the Frankl Scale⁹. The dentist also recorded the treatment the child received, and whether or not the child received anaesthesia. The dentist's questionnaire was also in Greek.

Methods

The parents of all patients aged 4–12 seen in one paediatric private practice in a large Greek city over a 10-month period were invited to participate. The receptionist administered the CFSS–DS before the child received dental treatment. The receptionist also collected demographic information.

Following completion of the CFSS–DS, the children were invited into the operatory for treatment. The dentist was unaware of the children's responses to the questionnaire. As each phase of treatment concluded, the dentist rated the child's behaviour for that phase according to the Frankl scale. The dentist had been previously trained in the use of the Frankl scale and calibrated for another research project. At the conclusion of treatment, the dentist also noted the type of treatment received, and whether or not the child received anaesthesia.

If the child returned for a second visit within the study period, the CFSS–DS was administered again in the same way.

Date entry and statistical analyses

The child's and dentist's questionnaires were paired for each child, coded, and the data were entered into the computer. Data were entered into the computer and checked for accuracy. Only subjects with complete data were used in the analyses. Analyses were carried out with SPSS version 14.0 (SPSS Inc., Chicago, IL, USA). Because there were low numbers of children who received certain types of dental treatment, the variable measuring whether or not the child received anaesthesia was used in analyses instead of the type of dental treatment. (In all cases, less invasive treatments, such as cleaning and fluoride application, did not require anaesthesia, while more invasive treatments, such as root canal therapy, did require anaesthesia.) In addition to descriptive statistics, internal consistency was calculated with Cronbach's alpha. Test-retest reliability was calculated with intraclass correlation. Because the CFSS-DS distribution was not normal (most children had low levels of fear), Spearman's rho was used to calculate the relationship between age and CFSS-DS. Mann-Whitney was used to compare the boys' and girls' responses on sum scores, the relationship between CFSS-DS scores and receiving anaesthesia, and the relationship between having received anaesthesia at the first appointment and the CFSS-DS scores from the second appointment. The child's overall Frankl score was defined as his/her lowest Frankl score for any segment of treatment. Because there were few children in Frankl categories 1 and 2, they were combined into one group (negative), and the differences between the resulting three groups (negative, positive, and definitely positive) were compared with the Kruskal-Wallis test. Other than the test-retest calculation, the analyses were carried out on data from the first CFSS-DS administration.

Ethical issues

This study was approved by Institutional Review Boards at Aristotle University, Thessaloniki, Greece, and the University of Washington, Seattle, WA, USA. Parents provided written consent, and children gave verbal assent.

Results

Of those eligible, 465 (approximately 95%) of the parents agreed to participate, and 260 children completed the CFSS–DS. The mean age of the children was 8.3 years [standard deviation (SD) = 2.2; range = 4-12], and 52% were boys. The majority (141) received cleaning/ fluoride application for dental treatment, followed by restorations (55), examination only (27), and extractions (26). The remainder received root canal therapy (7), had a crown prepared and/or placed (3), or had sealants only (1).

A further examination of the 205 incomplete questionnaires revealed that an additional 161 children (78.5%) completed all but the three items related to drilling. These children had a mean age of 7.4 (SD = 2.1; range = 4–12), and most (56%) of them were boys. Because they did not complete the CFSS–DS, they were not included in any further analyses.

Fifty-eight children returned for a second appointment within the time frame of the study and agreed to fill out the questionnaire a second time. Their mean age was 8.5 (SD = 2.3; range = 4–12), and 53% were boys. Fifty of them completed the questionnaire. The mean age of the children who completed it was 8.6 (SD = 2.2; range = 4–12), and 54% of them were boys. The length of time between the two visits for those children who completed the questionnaire both times ranged from 1 week to 9 months; for 52% of these children, the interval between visits was 5 months or longer.

The mean CFSS–DS sum was 24.80 (SD = 9.17; range = 15–58). Neither age nor gender was significantly related to the CFSS–DS score. The means and SDs for all items are shown in Table 1 for all children, and also for boys and girls separately. For all children, as well as for the boys and girls separately. For all children, as well as for the boys and girls separately, going to the hospital, the dental injection, having a stranger touch them, choking, having instruments in their mouth, the dentist drilling, and having someone looking at them were the most feared items.

The internal consistency (Cronbach's alpha) was 0.85. The invasiveness of the first appointment's dental treatment (receiving anaesthesia versus not receiving it) was not related to the

Item	All children		Boys		Girls	
	Mean	SD	Mean	SD	Mean	SD
1. Dentists	1.25	0.71	1.27	0.81	1.23	0.59
2. Doctors	1.30	0.81	1.29	0.82	1.33	0.82
3. Injections (shots)	2.38	1.46	2.32	1.45	2.46	1.48
4. Having someone examine your mouth	1.21	0.64	1.24	0.68	1.17	0.60
5. Having to open your mouth	1.12	0.55	1.11	0.54	1.14	0.57
6. Having a stranger touch you	2.32	1.41	2.10	1.30	2.57	1.51
7. Having somebody look at you	1.64	1.11	1.50	1.01	1.81	1.20
8. The dentist drilling	1.80	1.26	1.82	1.33	1.80	1.18
9. The sight of the dentist drilling	1.31	0.79	1.29	0.79	1.33	0.80
10. The noise of the dentist drilling	1.38	0.83	1.40	0.95	1.36	0.67
11. Having somebody put instruments in your mouth	1.82	1.30	1.88	1.39	1.75	1.19
12. Choking	2.30	1.52	2.25	1.50	2.38	1.53
13. Having to go to the hospital	2.51	1.60	2.41	1.62	2.64	1.59
14. People in white uniforms	1.21	0.62	1.18	0.59	1.25	0.65
15. Having the nurse clean your teeth	1.26	0.80	1.31	0.86	1.20	0.73

Table 1. Mean Children's Fear Survey Schedule–Dental Subscale item scores and standard deviations (SDs) for all children, boys and girls.

CFSS–DS sum scores at the second appointment. The test–retest reliability (intraclass correlation) was 0.74; P < 0.001.

Turning to the validity results, the invasiveness of dental treatment (receiving anaesthesia versus not receiving anaesthesia) was not related to the CFSS–DS sums. The children in the negative group had the highest mean CFSS–DS sum (29.47; SD = 12.75), followed by children in Frankl groups 3 (positive; mean = 25.62; SD = 8.95) and 4 (definitely positive; mean = 22.95; SD = 7.81), respectively. These differences were significant by the Kruskal–Wallis test (χ^2 = 9.48; d.f. = 2; *P* = 0.009). Figure 1 shows the distribution of the CFSS–DS scores by Frankl group assignment.

Discussion

Our results indicate that the Greek version of the CFSS–DS has good reliability and validity. It appears that the Greek version of this measure performs the same way in this language and culture as it has in others.

The mean score of the CFSS–DS was 24.8, falling within the range reported by other researchers. Mean scores of the CFSS–DS in different countries have ranged from 22.1 in Finland⁵, 23.1 in Sweden¹⁸, and 23.8 in Denmark¹² at the lower end, to as high as 34.2 in the USA¹⁹ and 35.7 in China¹⁷. Our results are closer to the lower end of this range, and



Fig. 1. Boxplot of Children's Fear Survey Schedule–Dental Subscale (CFSS–DS) scores by Frankl group assignment.

are lower than the mean of 29.9 previously reported for Cypriot schoolchildren²². While this suggests that Greek children experience less dental fear than children in many other countries, it is difficult to make firm comparisons given the differences between samples in terms of age ranges, selection of the children in the sample (school versus dental clinic versus representative population sample), and other factors. In addition, results have now been reported since the mid-1990s through the mid-2000s, and it is possible that there may be cohort differences between children measured in different years. The most feared items included going to the hospital, the dental injection, having a stranger touch them, choking, having instruments in their mouth, the dentist drilling, and having someone looking at them. Similar results have been found in other countries^{1,4,12,18}. Thus, even though overall levels of fear may vary by country, Greek children appear to have similar concerns about specific aspects of dental treatment in common with children from other cultures.

We did not find gender or age differences in our samples. Some researchers have found that older children are less fearful^{1,12,18}, while others have found no differences^{5,7,11,15,17}. Similar mixed results have also been reported for gender differences. Some authors have reported that girls have higher fear levels^{4–6,10,15,19}, while others have found no differences^{7,8,11,12}.

In our sample, 56% of the children completed the CFSS–DS. A similar proportion for completion of the measure (58%) was reported by Klingberg *et al.*¹⁸, who asked parents to complete the scale for their children. We found that the majority of the incomplete questionnaires (78%) were characterized by the omission of only the three items about drilling. Similarly, Klingberg *et al.*¹⁸ reported that the most commonly omitted items were one or more of the three items about drilling.

When asked about the missing items, the receptionist who administered the CFSS–DS replied that the children who omitted the three items had never experienced dental drilling. Although the range of ages was similar for children who completed all 15 items and those who completed all but the three items about drilling, those who completed only the 12 items were approximately 1 year younger on average than those who completed the CFSS–DS. If future researchers continue to find samples in which these three items are frequently omitted, there may be a need to develop norms for 12-item versions of the CFSS–DS which do not include the drilling items.

In our study, we added the five drawings of faces of the FIS to the verbal scale of the CFSS–DS, because we were concerned that the younger children might not be familiar with the 5-point verbal format of the measure. Recently, another group of researchers have developed a psychometrically sound questionnaire of dental fear for children as young as 5 years, which combines the written items from the Modified Child Dental Anxiety Scale with five facial images²⁵. Their results provide additional evidence for the utility of including facial graphics in questionnaires for young children.

There are several limitations to our study design which should be noted. First, our sample was based on a single clinic and thus the results may not be representative of all children of this age in Greece. Also, as Nakai *et al.*¹⁵ pointed out, dental fear scores may be higher in school samples compared with clinic samples, because even those children who avoid going to the dentist because of dental fear (and thus would not be selected in clinic samples) are likely to attend school.

While we found a significant relationship between the Frankl ratings and CFSS-DS scores, consistent with other studies, it would also be useful to gather additional validity data on the Greek version of the CFSS-DS. For example, it would be helpful to examine the relationship between the child's self-report of fear and other measures of fear (rather than behaviour, which could be seen as an indirect, rather than direct, measure of fear). In an English-speaking sample, Carson and Freeman²⁰ invited dentists and dental nurses to rate the anxiety level of children during dental treatment, using a subset of items from the CFSS-DS, and compared their ratings to the scores given by the children themselves before treatment. They found the ratings to be very similar. It would be desirable to repeat this design, using all 15 items of the CFSS-DS.

Further studies could also provide evidence for the construct validity of the measure. For example, in a Chinese-speaking sample, Milgrom *et al.*¹⁷ found that children with higher CFSS– DS scores were rated as having significantly higher somatization ratings on the Child Behaviour Checklist. Similarly, Klingberg and Broberg²⁶ found that children with higher CFSS–DS scores also scored significantly higher on scales of shyness and negative emotionality, in a Swedish sample. Future studies in Greece could use these or similar scales of behaviour, temperament, and the like.

In conclusion, our results provide evidence for the reliability and validity of the Greek version of the CFSS–DS. Further samples of Greek children, including school-based samples, can provide additional information about this measure.

What this paper adds

- This paper adds to the growing body of CFSS–DS literature by describing the reliability and validity of a Greek version of this measure.
- A considerable minority of children in our sample had not experienced dental drilling, which may imply that a new version of the scale which omits items related to drilling should be developed.

Why this paper is important to paediatric dentists

- Paediatric dentists who have Greek-speaking children in their practice can use a Greek version of a wellknown dental fear measure.
- The results provide additional evidence that children of different cultures often fear the same dental stimuli.

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