Reliability and validity in Mexico of the Spanish version of the Children's Fear Survey Schedule – Dental Subscale



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Abstract

Aim Low attendance and abandonment of dental treatment caused by dental fear varies from 6% to 20%. Various specific scales have been used to evaluate and measure dental fear, like Children´s Fear Survey Schedule – Dental Subscale, which is considered the "gold standard", due to its efficacy and validity. However, not all the studies that have been conducted have performed the Exploratory Factorial and Confirmation Analysis to infer the validity of the scale's content, which is why this study has as its main objective to analyse the confidentiality and validation of this scale.

Materials and methods In a sample of 163 school age children, from 6 to 12 years old, of both genders, from a public school, a Children's Fear Survey Schedule – Dental Subscale was applied to measure dental fear. The internal consistency of the scale was estimated with the Cronbach's alpha, we also performed the Exploratory Factorial Analysis with the method of the main component with Varimax rotation and the Confirmatory Factorial Analysis to confirm the structure of the factors.

Results The Cronbach's alpha was obtained with a .837 ($p<.05$). The adequate coefficients were determined with the Kaiser-Meyer-Olkin (KMO = .843) and the Bartlett's test of specificity ($\chi^2 = 565{,}325$, $p= .000$), in which there was a good adequate data, expressing an appropriate and intercorrelation between items or strongly related. The factorial structure showed four factors extracted, 4 factors explain the 53.57% of the accumulated variation; 14 items were above the .40. The statistics of the second and third model obtained adequate values in the statistics of goodness of fit index.

Conclusions The Mexican version of the CFSS-DS in the present study gives us data about the adaptation and validation of the dental fear scale of CFSSS-DS by the Exploratory Factorial Analysis through a model of structural equations. This means that this instrument is a trusting and valid tool to measure dental fear in the children's population of Mexico.

KEYWORDS Children´s Fear Survey Schedule – Dental Subscale, Dental fear, Factorial Analysis, Mexican version of the CFSS-DS, Reliability, Validation.

Introduction

In the dental practice, it is more common to observe oral health issues in children with either low attendance to the dentist or no attendance, in comparison with children who attend their dentist appointments regularly. In general, the low attendance or the abandonment of dental treatment is caused by dental fear, which becomes a possible problem for the management of the behaviour of children [Dahlander et al., 2017; Attri et al., 2018; Singh et al., 2010].

The origin of dental fear is multifactorial and it has been related to the personality of the children, age of the patient, gender, bad experiences in previous dental visits, or painful experiences [Dahlander et al., 2017; Raj et al., 2013]. Negative experience affects the children's cooperation, which is why the dentist, based on scientific evidence, should adopt strategies to achieve an assertive communication in order to elicit motivation and cooperation from the patient [Shinde and Hedge, 2017; Coric et al., 2014; Fonseca and Sanchis, 2013].

Due to the fact that dental fear is a psychological barrier, it is fundamental that dentists acquire the necessary knowledge to understand the emotion of the dental fear, both conceptually and operationally, identify fear early in the visit before the dental treatment and plan it accordingly [Cianetti et al., 2017; Fonseca, 2013]. Other studies have found that the dental fear of parents has a great influence on the negative conduct and fearful emotions that the child displays, which is why the dental professional must identify the level of fear in them, and reinforce the role that parents play as positive reinforcement to improve the child behaviour and acceptance of treatment [Venkataraghavan et al., 2016; Ma, 2015; Fonseca, 2013].

The prevalence of dental anxiety and fear in paediatric and teenage patients varies from 6% to 20%, with a median of 11% [Klingberg and Broberg, 2007] and it decreases as the age increases [Raj et al., 2013].

In order to measure dental fear in children, several methods have been proposed, such as the Frankl scale (1926) used to evaluate the behaviour during dental visits, measurement of pulse, blood pressure, and muscular tension [Sullivan et al., 2000] as well as psychometric scales [Singh et al., 2010; El-Housseiny, 2017]; also samples of children's drawings are used

as a means to evaluate dental fear [Klingberg et al., 1995].

The physiologic changes in biomarkers in blood, urine, and saliva have also been evaluated [Aoyagi-Naka et al., 2013]. For the identification and measurement of the response of children to dental treatment, self-reported questionnaires, to analyse external behaviour, and internal physiological changes are also used. The physiological reactions are greater in individuals with acquired fear toward the dentist [Rodríguez and Cano-Vindel, 1995].

Different scales have been suggested to measure dental fear, such as Dental Fear Survey (DFS), Dental Cope Questionnaire (DCQ), and Children´s Fear Survey Schedule - Dental Subscale (CFSS-DS) [Cutberth and Melamed, 1982]; the latter scale evaluates dental fear in children and has been widely used and considered the "gold standard", due to its precision and validity [Fonseca, 2013]. Structure of dental fear in children is categorised in both general situations and situations specifically related to dentistry [Cianetti et al., 2017; El-Housseiny, 2016, 2014, 2014; Ah-Hyeon et al., 2015; Ma et al., 2015; Venkataraghavan et al., 2013; Raj et al.,2013].

The CFSS-DS has been applied in different populations; in Holland, Berge et al. [2002], applied it to 322 children (aged 4–12) and its results showed scores of 45.90, which is significantly high. The items "the noise of the dentist drilling", "dentists" and "injections" received the highest scores, with an internal consistency by Cronbach's alpha of 0.83. The analysis of main components shows 4 factors with values higher than 1.0 (4.51, 1.85, 1.45 and 1.20). After the Varimax rotation, the results of the 4 factors explain the 60% of the variance. The first factor consisted of general aspects of dental treatment; the second factor was related to the medical aspect of the treatment like "doctors" and "having to go to the hospital"; the third factor consisted of the "noise of the dentist drilling", and the fourth factor was related to the "doctors" and the issue of "having a stranger touch you".

In Japan, Nakai et al. [2005] evaluated the Japanese version of CFSS-DS, and obtained a good internal consistency with a Cronbach's alpha of 0.86. The higher scores were observed for the following items: "injections", "choking", "having a stranger touch you" and "the noise of the dentist drilling". The results show 3 factors by Varimax rotation, that together explain the 54.8% of the variance. The first factor refers to highly invasive procedures and explains the 20% of the variance; the second factor refers to less invasive procedures and explains the 19.7% of the variance; the third factor is characterised by the victimisation and explains the 14.9%.

Ahmad et al., [2017] applied CFSS-DS to 204 children, and obtained a confidentiality of Cronbach's alpha of 0.93, and in the factor analysis the obtained 3 factors and the items were: "the noise of the dentist drilling" and "choking" which shows the highest scores. Raj et al. [2013] evaluated 600 children (ages 4–14) and the results show a score of 27 points, with no differences between genders. The higher score was observed in the items: "injections", choking, and "the noise of the dentist drilling". The same scale was used in the population of Italy [Paglia et al., 2017] in 210 children aged between 4–7, and it proved to be valid and dependable in paediatric patients.

All of the previous studies of the CFSS-DS present a good validity of the Cronbach's alpha, however, not all studies performed the exploratory and confirmatory factor analysis to be able to infer about the validity of the content of the scale.

Due to the lack of information that we currently have of the normative data of the CFSS-DS in children of the Northeastern part of Mexico, this study has as its main objective to analyse the validity and credibility of this scale. Through the confirmatory factor analysis, a structural equations model was evaluated, and adequate values of goodness of fit index were obtained.

Patients and methods

The probability sample was 163 children in the school age of 6–12 years old, with an average of 8.8 years, and a median of 9 years and a mode of 8 years of age. The population was 51.5% (n=84) male and 48.5% (n=79) female. All students were enrolled in a public school in the metropolitan area of the city of Monterrey (Mexico).

Included in the study were all children in scholar age, whose parents/tutors gave their consent (those who did not fill the questionnaire correctly were excluded). The dependent variable was dental fear and the independent variables were age, gender, grade in school, visits to the dentist, and washing their teeth.

The parents/tutors of the children involved in the study, signed and informed consent and were given a brief description of the main objective of the investigation; this information was given to both parents and teachers. Children answered the survey in the classroom. Every step was done respecting the internal regulations of the school, as well as the confidentiality rights of the personal information of the participants.

The Children´s Fear Survey Schedule – Dental Subscale (CFSS-DS) of dental fear [Cuthbert and Melamed, 1982] was utilised to measure dental fear in paediatric patients. The original scale consists of 15 items related to the aspect of dental are, with a Cronbach's alpha of 0.92, where the answers were evaluated in a Likert scale. The answers vary from 1 to 5 (1= not afraid at all; 2= a little afraid; 3= a fair amount afraid; 4= pretty much afraid; 5= very afraid), and the total score ranges from 15 to 75 points. The cutoff values were: higher than 32 points for anxious children, while higher than 39 points are considered dentally anxious children [Majstorovic et al., 2003].

The IBM SPSS statistics version 21 was used, starting with the descriptive analysis: measurements of the central tendency for the variables of age and gender. The internal consistency of the scale was estimated with the coefficient Cronbach's alpha in general and also for each of the items. Considering a confidentiality index of 95%, with statistical significance level below 0.05 [Cronbach, 1951]. To perform the factor analysis, the sample size was adjusted to fit the recommendations of Kline [2005], which consider an appropriate sample size to be between 100 to 200 subjects, to perform the analysis with structural equations, while other authors suggest 10 cases per parameter or per item, or 3 to 8 subjects per item and latent variable [Lloret et al., 2014; Vargas and Mora, 2017].

For the exploratory factor analysis, the method of main components was followed with Varimax rotation, with the purpose of identifying the number of factors that explain the maximum proportion of the common variance of all the variables, as well as to recognize a simpler and easier to interpret structure of the CFSS-DS.

For the confirmatory factor analysis, the AMOS programme version 21 was used (IBM, 2012) to confirm the structure of factors that had been previously determined by the factor

exploratory analysis. For the evaluations of the adjustment of the model, the following were considered as adequate values by statisticians [Hooper et al., 2008]: the CMIN or Chi-square, 2/gl <2, or up to 5 still indicates a reason adjustment; goodness-of-fit statistic (GFI) 1, or up to 0.9 is considered adequate; adjusted goodness-of-fit statistic (AGFI) greater than 0.9; Tucker-Lewisindex (TLI), normed-fit index (NFI) greater than 0.9; comparative-fit index (CFI) 0.95; standardised-root-mean-square-residual (SRMR) 0.08; root-mean-square-error of approximation (RMSEA) ideal value of < 0.05.

Results

The scores of the scale CFSS-SD vary from 0 to 75 points. The results show that 45.4% of the children were moderately afraid, 28.8% were little afraid, 14.7% showed more or less fear, and 4.3% reported feeling very afraid, according to the instrument used.

In the internal consistency of the 15 items of the instrument utilised (CFSS-SD) for this investigations, the level of Cronbach's alpha obtained was 0.837 with a significance level of p<0.05, keeping in mind that these are situations that children perceive about the dentist.

For the statistics of the corrected correlation of total items, values higher than 0.35 [Spector, 1992] were considered adequate ranges. The results varied from 0.24 to 0.62. The lowest result was the item "people in white uniforms" and the highest item was "Having someone look at you".

For the exploratory factor analysis, the main components method was followed with Varimax rotation. For the validity of the content, the results of the statistics of sample adequacy were determined with Kaiser-Meyer-Olkin (KMO = .843), being a high value and the of Bartlett's test of specificity (χ^2 = 565,325, p=.000) was significant, rejecting the null hypothesis of the independent elements. There is a good adequacy of data, expressing appropriate or strongly related intercorrelations between items [Bartlett, 1950].

The factorial structure shows 4 factors, with values higher than 1.0. The results of the 4 factors explain the 53.57% of the variance accumulated, and an explained variance of 30.94% (auto-value = 4.64) in the first factor, 8.19% (auto-value = 1.23) in the second factor, 7.42% (auto-value = 1.11) in the third factor and 7.0% (auto value = 1.01) in the fourth factor [Kaiser, 1960].

For the items retention (Table 1), a conservative criteria was followed, which considered factorial weight higher than 0.30 [Spector, 1992; Morales, 2013]. Following the criteria of weight between 0.40 to 0.70 of the 15 items, 12 items were above 0.40 which is ideal for the moderate condition of the saturations [Lloret, 2014].

Confirmatory Factor Analysis

With the goal of explaining how the variables (items) influence dental fear in children in the dental office, a structural equation model (SEM) was evaluated [Batista et al., 2014].

The first model evaluated was considered with the factors from the CFSS-DS reported by [Berge, 2002]: F1. Highly invasive, F2. Less invasive, and F3. general medical aspects, in the results of the AFC, some of the statistics do not have the adequate goodness of fit index (Table 2).

A second model was analysed based in the factorial structure of 4 factors that were obtained by the AFE in that study: F1. Dental procedure, F2. Dental instruments, F3. Related to the mouth, and F4. dental office. In Table 2, we can observe that the statistics have a better adjustment and the effects in the majority are significant (p<.05).

For the analysis of a third model, and due to the quantity of variance explained in the first model and the difference within the values between the first factor and the 3 factors remaining, it was determined to analyse a uni-factorial structure. This uni-factorial structure shows results with all the parameters of significance, and adequate indexes of goodness of fit index, allowing a covariance between some measurement errors. The effects range from 269 "People in white uniforms" up to .665 "Having somebody look at you" (Fig. 1).

Discussion

The present study aimed to assess the reliability and validation of the dental scale CFSS-DS in children from the Northeastern part of Mexico, with the goal to provide normative data of the scale. Through the confirmatory factor analysis, the model of structural equations was analysed and the statistical values of the goodness of fit index were obtained.

The internal consistency of the Mexican version of the scale CFSS-DS of 15 items, in a sample of 163 children, is very good, α= 0.837, similar to the study of Paglia [2017] in a sample of 210 children with confidentiality α=.088. This results match with the results reports by [Ahmad et al., 2017], who used the same scale in a sample of 204 children and obtained a confidentiality of α= 0.934. In Africa, Nakai et al. [2005] used the same scale CFSS-DS and obtained a good internal consistency of α= 0.86. Lalic et al. [2017] analysed the Serbian version of the scale and obtained α= 0.88.

Although the studies that have used the CFSS-DS scale in different countries have shown that a good internal consistency

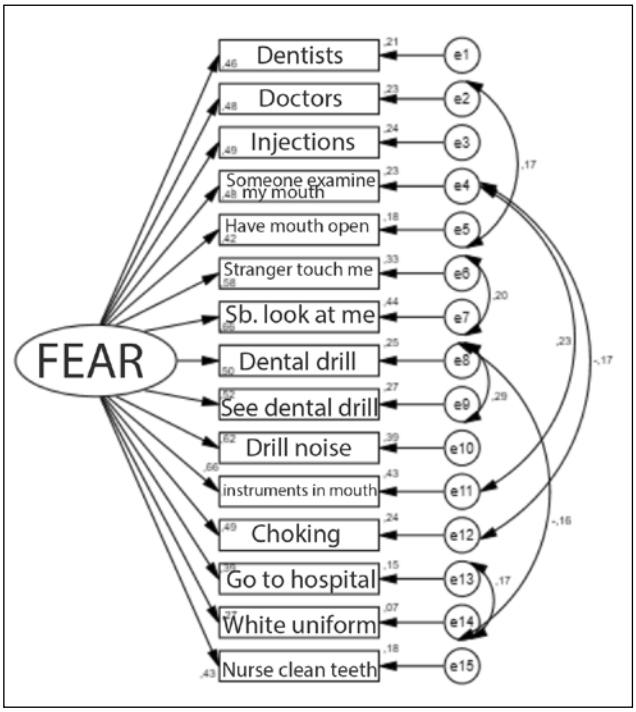


FIG. 1 Standardised estimates of the final model.

	Factor loading	Factor 1	Factor 2	Factor 3	Factor 4
1. Dentists	.495	.578			
2. Doctors	.538			.608	
3. Injections	.546	.364			
4. Having someone examine your mouth	.539			.763	
5. Having to open your mouth	.502			.606	
6. Having a stranger touch you	.625	.693			
7. Having somebody look at you	.711	.576			
8. The dentist drilling	.564		.714		
9. The sight of the dentist drilling	.594		.684		
10. The noise of the dentist drilling	.650	.594			
11. Having someone put instruments in your mouth	.699			.538	
12. Choking	.517	.640			
13. Having to go to the hospital	.440				.633
14. People in white uniforms	.305				.746
15. Having the nurse clean your teeth	.483		.690		
Extraction methods: Principal component analysis. Rotation: Varimax with Kaiser.					

TABLE 1 Scale factor loading Children's Survey Schedule Dental Subscale (CFSS-DS).

Model	χ^2	gl.	p	χ^2/gl.	GFI	AGFI	TLI	NFI	RMSEA	CFI	SRMR
1	121.886	87	.008	1.401	.913	.880	.913	.792	.050	.928	.0568
2	97.841	84	.143	1.165	.931	.902	.964	.833	.032	.971	.0506
3	84.290	83	.440	1.016	.939	.911	.997	.856	.010	.997	.0469
Goodness of fit index				< 2, to 5	1 o to .9	> .9	> .9	> .9	< .05	.95	<.08

TABLE 2 Criteria of goodness of fit index of the statistics

with the Cronbach's alpha above 0.80, there are very few studies that use the exploratory factor analysis and exploratory.

Ahmad et al. [2017], in a population in Pakistan, evaluated 204 children between the ages of 4 and 8, and used the exploratory factor analysis and with the confirmatory factor analysis with orthogonal varimax rotation, obtained a solution of 3 factors, which explains the 67% of the variance, with a statistics of sample adequacy KMO= 0.912, p<0.001. The results include factor 1: "having someone examine your mouth", factor 2: fear of less invasive dental procedures like "having to go to the hospital" or having a nurse clean your teeth", and factor 3 includes the fear to highly invasive procedures such as "the dentist drilling".

In Saudi Arabia, in a population of 220 children between the ages of 6 to 12 years, El-Housseiny et al. [2014], conducted a validation of the content and determined the results of the statistics of sample adequacy with the tool of Kaiser-Meyer-Olkin, obtaining high values of KMO= 0.85. Through the analysis of main components and varimax rotation, 4 factors were obtained explaining the variance of 64.45%:

- factor 1 common dental procedures;
- factor 2 injections and personal oral health;
- factor 3 fear of strangers;
- factor 4 general medical aspects.

This results are in line with those of the present study, in which a factorial structure was determined with 4 factors with values higher than 1.0. The results of the 4 factors explain the 53.57% of the accumulated variance.

In Japan, Nakai et al. [2015] with the CFSS-DS scale, achieved a good internal consistency with Cronbach's alpha of 0.86. reliability and validity, where the item that generated the most fear were injections, followed by choking, having stranger touch you, and the sight of the dentist drilling. There were 3 factors identified by Varimax rotation that together explained the 54.8% of the variance. The first factor refers to highly invasive procedures and explains the 20% of the variance. The second factor refers to the less invasive procedures and explains the variance of 19.7%, while the third factor is characterised by the victimisation and explains the 14.9%.

In the works of Berge et al. [2002] in 322 children in Holland (4–12 years old), through the analysis of main components by Varimax rotation, they were able to extract 4 factors with values above 1.0 (4.51, 1.85, 1.45 y 1.20): factor 1 = general aspects of dental treatment; factor 2 = aspects related to the medical aspect, doctors and hospitals; factor 3 = the drill; factor 4 = strangers.

The Mexican version of this scale obtained acceptable absolute indexes. The proposed initial model is adequate and adjusts well to the data. With the AFC, goodness of fit index was obtained with adequate adjustments: the NFI value was NFI=0.856; this value is much lower than 0.9, which is the value that the authors considered the minimum for the adequate adjustment. It happens with the statistical value

CFI, whose values were 0.997 that is slightly superior to the minimal models demanded for a good model of adjustment. The statistical value of GFI, which is 0.939, is below the minimum value expected which is 0.9. The statistical value of the RMSEA is 0.010 and is inferior to the maximum expected value for this index, which is 0.05. Lastly, the value of SRMR is 0.46, inferior to 0.08, which is the minimum value expected for the adjustment of a good model.

Conclusion

The results obtained through the Mexican version of the CFSS-DS are very similar to those reported in different populations. Nevertheless, the present study provides data about the adaptation and validation of the scale of dental fear CFSS-DS, through the exploratory and confirmatory factor analysis by a model of structural equations in a population in Mexico. This means that this instrument is a reliable and valid tool for application in the children population in Mexico to measure the dental fear in children seeking dental care.

Conflict of Interest

The authors declare no conflict of interest.

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