

## ORIGINAL PAPER

doi: 10.5455/medarh.2018.72.192-196

MED ARCH. 2018 JUN; 72(3): 192-196

RECEIVED: MAR 20, 2018 | ACCEPTED: MAY 15, 2018

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# Reliability and Validity of the Modified Version of Children's Fear Survey Schedule-dental Subscale in 9-12 Years Old Schoolchildren in Bosnia and Herzegovina

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## ABSTRACT

**Background:** Dental fear and anxiety (DFA) are present worldwide globally, as well as in children. These psychological clinical entities in its progressive phase lead to avoiding of dentists and dental appointments, and consequent impairments of oral health. If we ignore these facts, we would have the strengthening of this relationship in a way of further oral health impairments and lost of dental hard and soft tissues, as well as appearance of dental phobia as the most negative form of psychological reaction to dental stimuli. Original CFSS-DS scale and its modifications, as the most used instruments for evaluation of DFA presence so far, showed various disadvantages. These were the reasons why we wanted to design new psychometric instrument for better evaluation of DFA presence in children compared to evaluation which the existed scales could offer nowadays, in a form of the Modified Version of CFSS-DS scale (CFSS-DS-mod scale). **Materials and methods:** There were 809 schoolchildren from 8 cities of Bosnia and Herzegovina aged 9-12 years that participated in the study. There was one school per city where the schoolchildren answered to the questions from the CFSS-DS-mod scale. **Results:** 636 schoolchildren correctly answered to the scale questions. The CFSS-DS-mod scale showed excellent internal consistency reliability values (with Cronbach  $\alpha$ -0.9), and also validity results (mostly over 60% of explained variance of obtained results) with two-dimensional concept of DFA presence. **Conclusion:** The CFSS-DS-mod scale represents good psychometric instrument for evaluation of the DFA presence in 9-12 year old schoolchildren in Bosnia and Herzegovina. Some of normative values of this psychometric instrument should be determined, in order to expand its usage in children.

**Keywords:** dental fear and anxiety, schoolchildren, CFSS-DS scale, modifications.

## 1. INTRODUCTION

Dental fear and anxiety (DFA) are present worldwide globally, as well as in children. These psychological clinical entities in its progressive phase lead to avoiding of dentists and dental appointments. These are not the facts that we should neglect, because we are talking about the fifth of the (child) population with the DFA presence, more or less (1). It has been already shown in several times that increased past caries experience (higher DMFT/dmft indexes) were followed with higher DFA prevalence and avoiding of dental treatment. These patients are in a circle where the DFA presence increases DMFT/dmft index and vice versa. If we ignore these facts and do not brake the circle, we would have the strengthening of this relationship in

a way of further impairments and lost of dental hard and soft tissues, as well as appearance of dental phobia as the most negative form of psychological reaction to dental stimuli (2).

It has also been shown that the Bosnia and Herzegovina is the country with pretty high levels of DMFT/dmft indexes in children. It was also recently determined that the DFA prevalence in children aged 8, 12 and 15 years was 11,7%. If we observe these facts we could conclude that the child population of our country could be described with the algorithm: average lower socioeconomic status-higher prevalence and incidence of DMFT/dmft indexes-higher prevalence and incidence of DFA presence-avoiding of dental appointments (2-4).

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There are various ways to evaluate DFA presence in children, and psychometric scales are mostly used due to its characteristics such as applicability, cost effectiveness, interpretation, etc. The Children's Fear Survey Schedule-Dental Subscale (CFSS-DS) and its modifications were the most used instrument so far, and showed good reliability and validity values, but also indicated the ways for improvement of its normative values. These improvements would enhance the evaluation of DFA presence in children (4-7).

These were the reasons why we wanted to design new psychometric instrument for better evaluation of DFA presence in children compared to evaluation which the existed scales could offer nowadays, in a form of the Modified Version of CFSS-DS scale (CFSS-DS-mod scale). After we administered this new scale to the clinical child sample in order to examine its reliability and validity (8), our next step would be to determine its normative values in general sample of schoolchildren in Bosnia and Herzegovina.

## 2. MATERIALS AND METHODS

### *Participants and study design*

The study sample was consisted from the schoolchildren of eight cities in Bosnia and Herzegovina: Sarajevo, Banjaluka, Tuzla, Zenica, Mostar, Dobo, Bihac and Brcko. The study was approved by the Ministry of Education and Science of Federation of Bosnia and Herzegovina. In order to conduct this study in elementary schools in our country, additional permissions from other institutional authorities responsible for educational process also had to be obtained.

DFA presence in schoolchildren was evaluated in one school per city, in period between december 2016 and june 2017. There were four larger and four smaller cities, as well as four urban and four suburban schools. Within each school the DFA presence in pupils was determined in one fourth, one fifth, one sixth and one seventh grade, respectively. Each of the specific grades within the school was randomly selected. There were 809 interviewed schoolchildren in total, with 412 males and 397 females, aged 9, 10, 11 and 12 years, respectively. These age groups were chosen due to the general child cognitive and psychosocial development (9, 10). Before the schoolchildren started to participate in the study, the content and the purpose of the research was explained to them and to their parents. The children's parents signed an informed consent form for the participation of the schoolchildren in the study afterwards. Also, prior to the study, the assents for the participation from the schoolchildren were obtained as well. This research was approved by the Ethical Committee of the Faculty of Dentistry of Sarajevo University, and also was conducted according to the Declaration of Helsinki (11).

DFA presence in schoolchildren was determined with the CFSS-DS-mod scale. This psychometric instrument consisted of 17 items, in a form of questions related to the terms or situations. The scale questions were about general situations, dentist and the dental stuff, non-invasive and invasive dental procedures. Comparing to

the original CFSS-DS scale, 7 items were maintained, 2 of items changed their original meaning, and the 8 new ones were introduced. The answers to the scale questions were ranged by Likert scale with values from 1 (not afraid at all) to 5 (very afraid), with total score in the CFSS-DS-mod scale from 17 and 85 (8).

The pupils from every chosen grade started to participate in the study at the beginning of their class. Prior to answering to the items of the CFSS-DS-mod scale, clear instructions were given to the schoolchildren, and the participants provided answers to the scale questions afterwards by themselves in the classroom, without any help from the researchers, their classmates or the teacher. After about 10 minutes, when the schoolchildren finished, the questionnaires were immediately collected from the participants.

### *Data analysis*

The results obtained from this study were statistically processed as follows:

- descriptive values were presented by descriptive statistics (number and percentage of schoolchildren in the final sample by their age and sex, and school location);
- the Cronbach  $\alpha$  coefficient was calculated for the internal consistency reliability of the CFSS-DS-mod scale in total final sample, and according to the age and sex of the participants, and location of the school in the city (urban or suburban);
- the construct validity of the CFSS-DS-mod scale was determined by explorative factor analysis (EFA) applying Varimax rotation in total final sample, and according to the age and sex of the participants, and location of the school in the city (urban or suburban). The criteria for proper factor analysis were determined by Kaiser-Meyer-Olkin test of sampling adequacy (KMO) and Bartlett test of sphericity (Bartlett). Percentage and cumulative percentage of explained variance, as well as determined Eigen values were also presented.

All statistical analyses were obtained in the IBM Statistical Package for Social Science software (version 23.0) for Windows operative system.

## 3. RESULTS

After collecting and analyzing of obtained data in the study, descriptive characteristics of the sample were further: there were 319 male schoolchildren (50.16%) and 317 female schoolchildren (49.84%) who properly and precisely answered to 17 scale items questions, with 636 schoolchildren participants in total final sample. Dropout caused with errors in fulfilling the questionnaire was 21.38% in total sample (out of 809 potential participants), with 22.57% in boys (out of 412 potential participants) and 20.15% in girls (out of 397 potential participants). So, in the final sample there were 125 schoolchildren aged 9 years (19.65%), 196 aged 10 years (30.82%), 142 aged 11 years (22.33%) and 173 aged 12 years (27.20%), respectively. In order to better interpret the reliability and validity of the CFSS-DS-mod scale, the schoolchildren sample was divided to younger (321 participants aged

Normative Values of CFSS-DS-mod Scale in Schoolchildren in Bosnia and Herzegovina

study sample groups and subgroups	participants from total sample	younger participants (9 and 10 years old)	older participants (11 and 12 years old)	male participants	female participants	participants from urban schools	participants from suburban schools
Cronbach $\alpha$ coefficient	0.945	0.946	0.945	0.935	0.952	0.929	0.956
CFSS-DS-mod scale items	corrected item-total correlations						
item 1	0.632	0.612	0.656	0.558	0.679	0.632	0.628
item 2	0.678	0.653	0.708	0.619	0.723	0.663	0.686
item 3	0.678	0.676	0.690	0.624	0.713	0.587	0.733
item 4	0.612	0.663	0.558	0.599	0.617	0.483	0.685
item 5	0.665	0.650	0.682	0.585	0.719	0.558	0.733
item 6	0.707	0.714	0.699	0.680	0.723	0.668	0.742
item 7	0.677	0.709	0.641	0.631	0.710	0.574	0.739
item 8	0.667	0.692	0.639	0.639	0.694	0.581	0.739
item 9	0.702	0.762	0.634	0.651	0.742	0.617	0.769
item 10	0.760	0.764	0.756	0.714	0.796	0.708	0.805
item 11	0.801	0.815	0.786	0.784	0.821	0.749	0.836
item 12	0.758	0.768	0.747	0.759	0.758	0.688	0.811
item 13	0.747	0.746	0.752	0.705	0.780	0.699	0.786
item 14	0.736	0.708	0.770	0.715	0.754	0.696	0.767
item 15	0.734	0.736	0.733	0.752	0.716	0.690	0.766
item 16	0.766	0.762	0.770	0.753	0.774	0.761	0.773
item 17	0.608	0.557	0.665	0.576	0.628	0.598	0.641

Table 1. Cronbach  $\alpha$  coefficient values in the CFSS-DS-mod scale and corrected item-total correlations of the CFSS-DS-mod scale items in the total sample and in the study subgroups

study sample groups and subgroups	participants from total sample		younger participants (9 and 10 years old)		older participants (11 and 12 years old)		male participants		female participants		participants from urban schools		participants from suburban schools	
	factor		factor		factor		factor		factor		factor		factor	
	1	2	1	2	1	2	1	2	1	2	1	2	1	2
item 1	0.218	0.763	0.185	0.780	0.261	0.761	0.133	0.786	0.718	0.314	0.293	0.703	0.161	0.833
item 2	0.296	0.745	0.254	0.762	0.356	0.732	0.208	0.791	0.686	0.401	0.366	0.666	0.252	0.815
item 3	0.378	0.657	0.350	0.693	0.433	0.615	0.390	0.584	0.700	0.374	0.293	0.636	0.461	0.643
item 4	0.246	0.706	0.398	0.622	0.156	0.734	0.386	0.555	0.800	0.152	0.118	0.674	0.372	0.680
item 5	0.255	0.771	0.222	0.802	0.317	0.734	0.190	0.767	0.765	0.320	0.146	0.760	0.364	0.755
item 6	0.457	0.610	0.476	0.603	0.445	0.614	0.394	0.669	0.519	0.554	0.449	0.575	0.495	0.619
item 7	0.345	0.691	0.473	0.602	0.252	0.747	0.362	0.630	0.733	0.339	0.308	0.600	0.426	0.695
item 8	0.416	0.599	0.517	0.527	0.341	0.643	0.470	0.514	0.648	0.397	0.396	0.506	0.489	0.625
item 9	0.469	0.590	0.570	0.565	0.406	0.564	0.505	0.490	0.644	0.462	0.360	0.602	0.596	0.541
item 10	0.697	0.414	0.667	0.447	0.729	0.368	0.647	0.404	0.401	0.753	0.665	0.383	0.730	0.425
item 11	0.660	0.511	0.663	0.523	0.667	0.481	0.698	0.439	0.585	0.614	0.598	0.516	0.718	0.484
item 12	0.672	0.441	0.703	0.416	0.659	0.438	0.729	0.369	0.525	0.593	0.637	0.387	0.716	0.454
item 13	0.796	0.286	0.808	0.262	0.823	0.257	0.783	0.221	0.332	0.798	0.824	0.183	0.781	0.338
item 14	0.818	0.245	0.814	0.200	0.833	0.266	0.796	0.216	0.274	0.819	0.823	0.183	0.817	0.267
item 15	0.754	0.315	0.677	0.396	0.803	0.254	0.751	0.326	0.281	0.771	0.721	0.292	0.781	0.310
item 16	0.773	0.333	0.753	0.338	0.772	0.336	0.724	0.357	0.300	0.818	0.748	0.358	0.807	0.287
item 17	0.663	0.241	0.649	0.173	0.681	0.295	0.712	0.119	0.320	0.618	0.635	0.256	0.694	0.240
% variance	55.215	7.506	55.741	7.164	54.877	8.277	51.073	8.375	58.316	7.246	48.390	7.868	60.582	7.465
% cumulative	55.215	62.722	55.741	62.905	54.877	63.154	51.073	59.447	58.316	65.562	48.390	56.259	60.582	68.048
Eigen value	9.387	1.276	9.476	1.218	9.329	1.407	8.682	1.424	9.914	1.232	8.226	1.338	10.299	1.269

Table 2. Factor loadings, Eigen values, and % of variance explained in the results obtained with the CFSS-DS-mod scale. Extraction Method: Principal Component Analysis. Rotation Method: Varimax with Kaiser Normalization. Rotation converged in 3 iterations.

9 and 10 years) and older pupils (315 participants aged 11 and 12 years). There were equally 318 schoolchildren (50%) from urban and suburban schools.

In the Table 1 there were results of determining the internal consistency reliability of the CFSS-DS-mod scale.

Calculated Cronbach  $\alpha$  values in the study sample group and subgroups, represented in the Table 1, showed excellent internal consistency reliability of the CFSS-DS-mod scale. When the obtained corrected item-total correlations of the total sample and the study subgroups

were observed (Table 1), they mostly had values over 0.600. But, in some cases mainly 4th scale item („fear of people in white uniforms“) and 17th scale item („fear of being unable to breath during dental treatment“) showed lower values, mostly  $\leq 0.600$ , and  $\leq 0.500$  in one case.

After performing EFA with Varimax rotation in order to determine construct validity of the scale in the total sample and the study subgroups, the obtained results showed further:

- criteria for conducting EFA were fulfilled, with the KMO value that was always over 0.9, as well as and Bartlett  $p \leq 0.0005$ .
- the CFSS-DS-mod scale was always two-dimensional, with the fear of non-invasive dental procedures and situations as one, and the fear of invasive dental procedures as the other factor; these two factors explained in most situations more than 60% of the results obtained in the scale;
- the fear of invasive dental procedures as dominant one mostly explained variance of the results obtained in the scale. But, in the girls, the situation was reversed, with fear of non-invasive dental procedures and situations that mostly explained the variance of obtained results in the scale.

In the Table 2 there were results of determining the construct validity of the CFSS-DS-mod scale.

#### 4. DISCUSSION

Comparing to the previous study of evaluation of DFA presence with CFSS-DS-mod scale in clinical sample where Cronbach  $\alpha$  was 0.907 (8), internal consistency reliability of this scale has proven much better values in the schoolchildren sample (Table 1). The other worldwide studies of evaluation of DFA presence in children with original CFSS-DS scale and its modifications that have been conducted so far did not show higher internal consistency reliability values (Cronbach  $\alpha$  was between 0.82 and 0.92) (7, 12-25). Different methodologies of these other studies and ours (age, size and type of the sample, type of the informant, for example) should be taken into consideration due to more profound analysis and comparing of the results.

The same situation as with the internal consistency reliability was with the corrected item-total correlation values, where the items from schoolchildren sample showed higher results (8). Nevertheless, some of the items (4th and 17th) still showed lower corrected item-total correlation values in some situations. These two scale items in the CFSS-DS-mod scale design were the only ones mostly related to not just specifically dental situations, but at the same time to the general and medical fearful situations. These findings of not specifically dental items that could possibly had lowering potential to the internal consistency reliability values, has been following our previous clinical sample research with the original CFSS-DS scale and also CFSS-DS-mod scale (7, 8). This fact could be taken into serious further considerations whether to include not specifically dental items to the scale that was supposed to evaluate DFA presence in (child) patients in the future.

If we observe results of CFSS-DS-mod scale construct validity in schoolchildren sample (Table 2) we could emphasize that this construct of this instrument better explained DFA as clinical dental phenomenon in schoolchildren sample than in the previous clinical sample study (where just 49.613% of the variance of the obtained results were explained) (8). Construct validity findings of the original CFSS-DS scale and its modifications in the other worldwide studies showed various results, mostly in the number of extracted factors (between two and four) (7, 12-25).

Although original design of CFSS-DS-mod scale comprised four different dimensions (general dental situations, dentist and the dental stuff, non-invasive and invasive dental procedures), the two-dimensional validity construct of the previous clinical sample (8) was confirmed also in this schoolchildren sample. In this way, we could say about the evaluation of DFA presence with the CFSS-DS-mod scale, that children mostly afraid of the things in dentistry that could hurt them, endanger their physical integrity, or cause the pain. They could be named as „the fear and anxiety of invasive dental procedures“. The other things in dentistry, represented also as the items of the CFSS-DS-mod scale, that are not invasive ones, could be named as „the fear and anxiety of non-invasive dental procedures and situations“. This division of two extracted factors in CFSS-DS-mod scale corresponds to the general division of the factors that could cause DFA appearance, where the main group of factors directly cause the DFA appearance, and the other group could cause DFA appearance indirectly (26-28).

Also, the reason for postponed creation of study subgroups in the schoolchildren sample (by schoolchildren age and sex, as well as by school location) was justified by the obtained results of the CFSS-DS-mod scale construct validity, in a way that these results could better explain the nature of DFA emerge, appearance and existence. So, when the answers of the younger and older pupils were observed, their explanation of DFA presence was pretty high and similar. But, the explanation of DFA presence by the answers from the boys and the urban schoolchildren was poor comparing to the girls and the suburban schoolchildren. Children's age, sex and socioeconomic state (related to the suburban schools) are well known as exact factors that could predispose the emergence and appearance of DFA, in a way that the younger children, girls and the children from families with lower socioeconomic status could have higher incidence and prevalence of DFA presence (27-28). Also, the fact that the scale answers to non-invasive dental procedures and situations mostly explained the DFA appearance in girls showed maybe different insight and approach of understanding this dental clinical phenomenon in the future.

In order to expand the usage of CFSS-DS-mod scale, there are various directions where the future studies with this scale should be conducted, such as determination of its cut-off score(s), type of informant for evaluation of DFA presence, different age of child patients, etc.



## 5. CONCLUSION

The CFSS-DS-mod scale represents good psychometric instrument for evaluation of the DFA presence in 9-12 year old schoolchildren in Bosnia and Herzegovina. Its internal consistency reliability results showed excellent values, and the construct validity results showed two-dimensional concept of DFA presence in children. Some of normative values of the CFSS-DS-mod scale should also be determined, in order to expand its usage in children.

- **Acknowledgements:** This study was financed by the grant of the Ministry of Education and Science of Federation of Bosnia and Herzegovina and was supported by the institutions and authorities responsible for educational process in Bosnia and Herzegovina, including the school authorities in the field of study research.
- **Author's contribution:** All authors of this manuscript had equal substantial contribution to conception and design, to acquisition of data, to analysis and interpretation of data, in drafting the article, in critically revising the article for important intellectual content, and in final approval of the version to be published.
- **Conflict of interest:** Authors of this paper declare that they do not have financial or any other kind of interest during conduction of the study or writing of this manuscript.

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