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The Children's Fear Survey Schedule–Dental Subscale in Japan

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Abstract – *Objectives:* The aims of this research are to examine the reliability and validity of the Japanese version of the Dental Subscale of Children's Fear Survey Schedule (CFSS-DS), and to examine the responses of children in the dental setting and in the community. *Methods:* The CFSS-DS was translated into Japanese and administered to three samples. The first sample comprised 134 child patients aged 8–15 years, of whom 100 were assigned for test–retest analysis, and the behavior of the remaining 34 additional children were rated during their dental appointments, and compared with their questionnaire results. A second sample of 532 child patients aged 8–15 years, completed the CFSS-DS and also one additional item measuring fear of returning to the dentist. A third sample of 1250 school children aged 8–15 years was surveyed using the CFSS-DS and the additional item measuring fear of returning to the dentist. *Results:* The Japanese version of the CFSS-DS showed good internal consistency (alpha = 0.91) and test–retest reliability ($r = 0.90$), as well as good criterion validity assessed by the relationship with actual child behavior ($r_s = 0.51$). It also showed good construct validity assessed by correlation with willingness to return to the dentist. Fear levels were higher in the school sample than in the clinic sample (27.7 versus 24.6). Girls reported more fear than boys (26.2 versus 23.2 in the clinic sample, and 30.7 versus 24.8 in the school sample). Injections, choking, having a stranger touch them, and drilling were the most common fears. Factor analyses demonstrated a factor pattern similar to the results found in other cultures. *Conclusion:* The results suggest that the CFSS-DS is reliable and valid and operates in Japan as it does in other cultures.

Key words: children; dental anxiety; dental fear; Japan; reliability; validity

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Childhood dental fear has been shown to be widespread. Its prevalence varies from 6 to 52%, depending in part on how it is measured, the ages of the children being assessed, and the culture (1–14). A number of different methods have been used to assess dental fear in children, including behavioral ratings such as the Frankl Scale (15), physiological measurements such as heart rate, galvanic skin reflex, and nasal skin temperature (16, 17), and questionnaires. Community-based and other large studies conducted in schools or clinics typically rely on questionnaire data to assess the prevalence of dental fear (1–3, 6–9, 11, 14).

One questionnaire assessing dental fear is the Children's Fear Survey Schedule–Dental Subscale (CFSS-DS; 18). Scherer and Nakamura (19) introduced the Fear Survey Schedule for Children (FSS-FC) as an inventory for assessment for fear in children. Cuthbert and Melamed (18) used this instrument in their research and modified it to assess dental fear. The instrument has been translated into several languages (1, 5, 7, 8, 14, 20–22). It has good internal and test–retest reliability in English and several other languages (21–23).

The criterion validity of the CFSS-DS has been assessed in several ways, including observing a child's behavior during dental treatment (5, 21),

comparing chart records of behavioral problems (24, 25), and asking the dentist to rate the child's fear (14, 24, 26). In these studies, children with higher CFSS-DS scores have been found to display more disruptive and fearful behavior during dental treatment, and also were more likely to have histories of disruptive treatment.

Interestingly, some of the studies reviewed above have focused on school-based samples for the assessment of reliability and validity of the CFSS-DS (1, 18, 20), while others have used clinic samples (5, 21, 22). School-based samples offer the advantages of faster data collection (because the children can be surveyed in groups), and better representation of children of that locale (because even dental avoiders are likely to attend school). On the contrary, criterion validity is easier to measure in the clinic (where the dentist can be asked to rate the child's behavior).

Previous studies on childhood dental fear in Japan have focused on clinical observation of individual patients (16, 17). While no community-based study of the CFSS-DS has been conducted in Japan, one study has examined the relationship between a Japanese language version of the CFSS-DS and the behavior of Japanese child patients during dental examinations (27). The investigators mailed the CFSS-DS to 100 child patients between the ages of 5 and 12 years who were rated as uncooperative during a dental examination, as well as 195 child patients rated as cooperative. About two-thirds of the uncooperative children and approximately 70% of the cooperative children returned the questionnaire. In general, the CFSS-DS scores were higher in the uncooperative group.

Despite these promising results, several questions are raised by the design of this study. First, it is possible that some of the children labeled as 'cooperative' during the dental examination might have been judged to be 'uncooperative' during more painful aspects of dental treatment. As previous validity studies have assessed the child's behavior during the entire dental visit (5, 21, 24, 25), it is possible that an assessment made solely during examination may not be comparable. Second, no information is provided about the non-responders, who make up 33 and 29% of the uncooperative and cooperative samples. Third, no reliability data are presented. Finally, it is not clear that the Japanese translation used is comparable with the original English version. For example, in three items the wording has been changed to specifically refer to dentists ('Having a stranger touch you', 'Having somebody look at you', and 'Having to go to the hospital' have been changed to 'To be touched by a dentist', 'To be seen by a dentist', and 'To have to visit a dentist'). In addition, the translation uses the passive voice in several items (e.g. 'Having the nurse clean your teeth' has been changed to 'To have your teeth brushed by a nurse'), which may connote a negative rather than neutral experience. For these reasons, we felt that it was important to retranslate the CFSS-DS, to study it using methods in which we could obtain more complete samples, and to use a treatment-long measure of child behavior.

In Japan, most individuals see dentists in private clinics (28). Dentists are reimbursed for invasive procedures such as restorations, extractions, and the like, but not for examinations alone or preventive procedures (28). Thus, children seen in private dental offices are likely to attend primarily when symptomatic. On the contrary, pediatric clinics which are affiliated with universities see children in recall appointments in addition to children needing restorations and the like. Thus, these clinics provide access to a broader sample of pediatric dental experiences, compared with the private clinics. Even so, a clinic sample is less likely to include children who avoid going to the dentist. Together, these considerations indicate that it would be valuable to study Japanese children in two samples: a university pediatric clinic, and at school.

In this paper, we describe our research with a Japanese version of the CFSS-DS. Three interrelated studies are presented. After developing the questionnaire and assessing its internal and test–retest reliability and criterion validity, we administered it to two additional samples of children aged 8–15 years in Okayama: children attending the Pediatric Dental Clinic in the Okayama University Dental Hospital (one of the largest dental clinics in Japan), and children enrolled in a number of primary and junior high schools in the same area.

Development of the questionnaire

The CFSS-DS was translated from English into Japanese by a single native speaker, and then back-translated by another native speaker to ensure comparability with the original form. The Japanese version was then pretested with a small number of Japanese children and the translation modified to further ensure comparability. As with the English version, children rate their level of fear on a five-point scale, ranging from 'not at all afraid' to 'very afraid'. Examples of the items are 'dentist drilling',

Table 1. Mean CFSS-DS item scores and standard deviations for all children, boys and girls of the Japanese clinic population

	All ($n = 532$)		Boys ($n = 277$)		Girls ($n = 255$)	
Items	Mean	SD	Mean	SD	Mean	SD
1. Dentists	1.3	0.7	1.3	0.7	1.4	0.6
2. Doctors	1.5	0.8	1.4	0.8	1.6	0.8
3. Injections (shots)	2.5	1.4	2.3	1.4	2.7	1.4
4. Having somebody examine your mouth	1.3	0.6	1.3	0.7	1.2	0.5
5. Having to open your mouth	1.1	0.4	1.1	0.5	1.1	0.4
6. Having a stranger touch you	2.0	1.2	1.8	1.0	2.3	1.4
7. Having somebody look at you	1.6	0.9	1.5	0.9	1.8	1.0
8. The dentist drilling	2.0	1.2	1.8	1.1	2.2	1.2
9. The sight of the dentist drilling	1.7	1.1	1.5	1.0	1.9	1.2
10. The noise of the dentist drilling	1.8	1.1	1.6	1.1	1.9	1.2
11. Having somebody put instruments in your mouth	1.6	1.0	1.5	1.0	1.7	1.0
12. Choking	2.4	1.2	2.2	1.2	2.5	1.3
13. Having to go to the hospital	1.6	1.0	1.6	1.1	1.6	0.9
14. People in while uniform	1.1	0.4	1.1	0.5	1.1	0.4
15. Having the nurse clean your teeth	1.1	0.4	1.1	0.5	1.1	0.4

Table 2. Mean CFSS-DS item scores and standard deviations for all children, boys and girls of the Japanese school population

	All ($n = 1250$)		Boys ($n = 636$)		Girls ($n = 614$)	
Items	Mean	SD	Mean	SD	Mean	SD
1. Dentists	1.5	0.9	1.3	0.8	1.6	0.9
2. Doctors	1.5	0.9	1.4	0.9	1.6	0.8
3. Injections (shots)	2.5	1.3	2.2	1.3	2.7	1.3
4. Having somebody examine your mouth	1.4	0.8	1.3	0.8	1.5	0.8
5. Having to open your mouth	1.2	0.7	1.2	0.7	1.3	0.6
6. Having a stranger touch you	2.5	1.4	2.0	1.3	2.9	1.4
7. Having somebody look at you	2.0	1.2	1.7	1.1	2.3	1.2
8. The dentist drilling	2.2	1.3	1.9	1.2	2.5	1.3
9. The sight of the dentist drilling	2.0	1.3	1.7	1.2	2.4	1.3
10. The noise of the dentist drilling	2.0	1.3	1.7	1.2	2.3	1.4
11. Having somebody put instruments in your mouth	1.8	1.1	1.6	1.1	2.0	1.2
12. Choking	2.9	1.5	2.7	1.5	3.1	1.4
13. Having to go to the hospital	1.8	1.1	1.7	1.1	1.9	1.2
14. People in while uniform	1.2	0.7	1.2	0.8	1.3	0.7
15. Having the nurse clean your teeth	1.3	0.7	1.2	0.7	1.3	0.7

'injections', and 'people in white uniforms'. The dental items are summed to create an index of child's dental fear that ranges from 15 to 75. The original items in English are included in Tables 1 and 2. The Japanese language script and questionnaire are available from the senior author (Y. Nakai).

Study 1: Reliability and criterion validity

Material and methods

The study population was 134 consecutive child patients 8–15 years old seen at the Pediatric Dental Clinic in the Okayama University Dental Hospital. The children were primarily seen for recall (54%) or restoration (28%), followed by silver fluoride application/ART (9%), extraction (5%), root canal (4%), and simple orthodontic treatment (2%). The mean age was 10.0 (SD = 1.8), and 60% were boys. The first 100 children (mean age = 10.1, SD = 1.9, 59% boys) were assigned to a subsample (group 1) for test–retest analysis, and the remaining 34 (mean age = 9.6, SD = 1.4, 62% boys) were assigned to another subsample (group 2) for criterion validity analysis. Criterion validity was assessed to examine the relationship between CFSS-DS scores and the actual behavior of children during dental examination and treatment.

The Frankl Scale was originally developed to assess the cooperation of children undergoing treatment (15). A trained observer rates the child at several points during treatment, such as during the oral examination, injection, and so on, using a four-point scale where 1 equals 'definitely negative' (e.g. child is crying forcefully, behaving in a fearful manner), 2 equals 'negative' (child is reluctant, uncooperative), 3 equals 'positive' (child may be cautious but willing to comply), and 4 equals 'definitely positive' (child and dentist have good rapport, child is laughing). The overall score may be defined in a number of ways (29–33). In this study, the overall score was defined as the lowest score that the child had received, and the scores were then dichotomized. Children who scored in the two negative categories were classified as 'negative', and the others were classified as 'positive'. The Frankl Scale was reported to have good reliability, and the scale correlates moderately well with questionnaires assessing dental anxiety (32).

The Director of the Clinic approved the research proposal. Parents were approached in the waiting room and invited to participate. Interested parents provided consent, and interested children assented. None of the families declined to participate. The CFSS-DS was read out loud to the child in the clinic waiting room by one of the researchers, employing a script in order to consistently introduce the survey. (The script is available from the first author.) The parents were not allowed to participate or help their children complete the questionnaire. After the questionnaires were collected, the first 100 children were assigned to group 1, and the remaining 34 to group 2. The parents of the children in group 1 were given a second copy of the questionnaire and instructed to ask the child to complete it again 1 week later, and then to mail it back. During the dental appointment, the behavior and facial expressions of the 34 children in group 2 were recorded by two video cameras and later rated by two pediatric dentists trained to use the Frankl Scale (15). Each videotape was coded independently by both raters. The inter-rater reliability for the Frankl Scale was good; Kappa = 0.89. The raters did not have access to the CFSS-DS scores of the children.

Data were entered into the computer and checked for accuracy. Data management and analyses were conducted using SPSS Version 11.5. Cronbach's alpha was used to compute the internal consistency based on the entire sample. Since the CFSS-DS scores were not expected to be normally distributed (most children scoring low), Mann–Whitney *U*-test was used to assess gender differences. Spearman's rho was used to determine the relationship between CFSS-DS scores and age. In group 1, Pearson's correlation was used to assess the test–retest reliability of the paired CFSS-DS questionnaires. In group 2, Mann–Whitney *U*-test was used to compare the CFSS-DS scores between 'negative' and 'positive' children assessed by the Frankl Scale.

Results

There were no significant differences in gender, age, type of treatment, or CFSS-DS scores between the 100 children in group 1 and the 34 in group 2. Therefore, CFSS-DS data from the two groups were combined. The mean CFSS-DS score was 24.8 (median = 21.0, SD = 9.9, range = 15–67). There were no age or gender differences. Cronbach's alpha was 0.91.

Of the 100 children in group 1, 79 completed the second CFSS-DS questionnaire. There were no significant differences in gender, age, type of treatment, or CFSS-DS scores between those who completed both questionnaires and those who completed only the first one. The test–retest reliability was high ($r = 0.90$, $P < 0.01$).

No child received a score of '1' (definitely negative) on the Frankl Scale. Five children received a score of '2' (negative), 28 received a score of '3' (positive), and one received a score of '4' (definitely positive). The single child who received a score of '4' was combined with the 28 who had received a score of '3' and these children were categorized as 'positive'. The five children who received a score of '2' were categorized as 'negative'. Categorization on the Frankl Scale was not related to the type of treatment received by the child ($\chi^2 = 16.46$, d.f. = 12, $P = 0.171$). Children categorized as 'negative' on the Frankl Scale showed significantly higher levels of dental fear on the CFSS-DS than those categorized as 'positive' (mean scores 45.0 versus 24.1, SD 14.6 versus 9.6, $U = 14$, $P < 0.01$).

Study 2: CFSS-DS in child clinic patients

Material and methods

Five hundred fifty consecutive 8–15-year-old patients seen at the Pediatric Dental Clinic at Okayama University Dental Hospital, Okayama, were eligible to participate. Two families declined

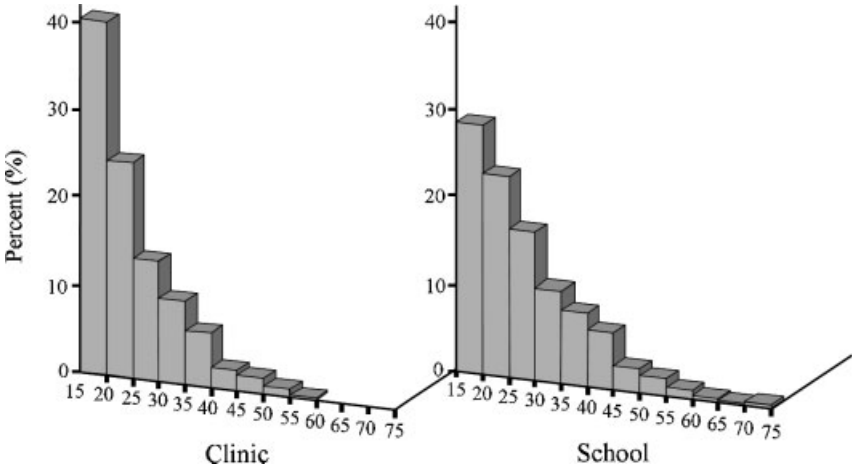

Fig. 1. The distribution of the total CFSS-DS scores for clinic and school populations.

to participate. No child participated in both studies 1 and 2. Of 548 children who assented to participate, 532 completed the CFSS-DS. These children had a mean age of 11.3 years (SD = 2.2) and 52% were male.

One item was added to the CFSS-DS ('How afraid are you of returning to the dentist soon?') to provide additional information about the construct validity of the CFSS-DS: higher levels of dental fear as measured by the CFSS-DS should be associated with higher levels of fear when contemplating returning to the dentist soon. This item was scaled in the same way as the CFSS-DS.

The Clinic Director gave approval for the study, and the parents and children were approached in the waiting room in the same manner as described for study 1. Parental consent and child assent were obtained. The CFSS-DS (and additional item) was read aloud to the child using the script, as described above for study 1.

Descriptive analyses were carried out as described earlier. In addition, Spearman's rho was used to assess the correlation between fear of returning to the dentist soon and overall fear of dentistry, as measured by the CFSS-DS. A factor analysis (principal components, varimax rotation) was also employed.

Results

The mean item scores on the CFSS-DS for the entire sample, as well as for boys and girls separately, are shown in Table 1. The mean CFSS-DS sum was 24.6 (median = 25, SD = 8.3, range = 15–56). Girls scored significantly higher than boys (mean 26.2 versus 23.2, median 24.0 versus 20.0, $U = 25691.5$, $P < 0.01$). Figure 1 shows the distribution of total CFSS scores (this figure also shows the distribution for the school sample). The most feared items for both boys and girls were 'Injections (shots)', 'Choking', 'Having a stranger touch you', 'The dentist drilling', 'The noise of the dentist drilling', and 'The sight of the dentist drilling'. The internal consistency (alpha) was 0.86. Age was inversely correlated with CFSS-DS ($r_s = -0.15$, $P < 0.001$). Fear of returning to the dentist soon was significantly correlated with CFSS-DS ($r_s = 0.51$, $P < 0.01$). The factor analysis pattern after varimax rotation is shown in Table 3. Three factors were identified, which together account for 54.8% of the variance. Factor I, accounting for 20.2% of the variance, is characterized by fear of highly invasive procedures such as drilling. Factor II, characterized by fear of less invasive procedures, such as having one's mouth examined, accounted for 19.7% of the variance. Factor III, characterized by fear of potential victimization, such as being touched by a stranger, accounted for 14.9% of the variance.

Study 3: CFSS-DS in school children

Material and methods

All children in grades primary 4, 5 and 6 in 10 public primary schools and in grades 1, 2 and 3 in two junior high schools in Oku-cho, Chuo-cho, Ochiai-cho and Kasaoka-shi, Okayama, Japan, were surveyed. These schools are located in four rural areas of greater Okayama. These rural areas are distinct from Okayama city (where the Okayama University Dental Hospital is located), and no child who participated in either study 1 or 2 participated in study 3. The average attendance rate on the day of the survey was 98%. A total of 1347 were eligible to participate. Ten parents and/or children declined and the data from an additional 87 children were excluded because they

Table 3. Rotated CFSS-DS factor matrix for the clinic population

Item	Factor I	Factor II	Factor III
1. Dentists	**0.450**	**0.562**	−0.112
2. Doctors	0.355	**0.599**	0.167
3. Injections (shots)	**0.561**	0.290	0.028
4. Having somebody examine your mouth	0.155	**0.667**	0.201
5. Having to open your mouth	0.000	**0.612**	0.298
6. Having a stranger touch you	0.061	0.093	**0.821**
7. Having somebody look at you	0.133	0.084	**0.785**
8. The dentist drilling	**0.815**	0.156	0.274
9. The sight of the dentist drilling	**0.795**	0.081	0.219
10. The noise of the dentist drilling	**0.796**	0.160	0.105
11. Having somebody put instruments in your mouth	**0.424**	**0.422**	0.394
12. Choking	0.290	0.194	**0.622**
13. Having to go to the hospital	0.326	**0.589**	0.290
14. People in while uniform	0.038	**0.653**	−0.085
15. Having the nurse clean your teeth	0.175	**0.567**	0.105

Strong factor loadings are present in bold face.

omitted one or more items on the CFSS-DS. Thus, the subjects were 1250 children aged 8–15 years (mean = 11.0, SD = 2.0), and 51% were boys. The children were assessed with the same questionnaire as in study 2.

The local Departments of Education gave permission for the survey to be given to children in specific schools in their jurisdictions. In addition, the Principals of each of the specific schools gave permission. Parents gave consent, and the children provided assent. Researchers came to the classroom and administered the questionnaire to the children by reading it aloud. The same script was used in the classroom as had been used in studies 1 and 2.

Results

Descriptive statistics were calculated as in the previous studies. The mean CFSS-DS score was 27.7 (median 25.0, SD = 10.6, range 15–75). No age differences were found. Girls showed significantly higher scores than boys (mean 30.7 versus 24.8, median 29.0 versus 22.0, Mann–Whitney $U = 120472.5$, $P < 0.01$). Table 2 shows the mean fear scores on the items of the CFSS-DS for all participants and also for boys and girls separately, while Fig. 1 shows the distribution of the total CFSS-DS scores. 'Choking', 'Having a stranger touch you', 'Injections (shots)', 'The dentist drilling', 'The sight of the dentist drilling', and 'The noise of the dentist drilling' were rated as the most feared items by both boys and girls. The internal consistency of the CFSS-DS was very good; Cronbach's alpha = 0.89. The CFSS-DS score was significantly correlated with the fear of returning to the dentist soon ($r_s = 0.58$, $P < 0.01$). The factor analysis pattern was essentially the same as that found for the clinic population; a copy of the results may be obtained from the corresponding author.

Comparisons of children in studies 2 and 3 revealed that there were no gender differences between the samples. The children in the clinic were slightly older than those in school (11.3 versus 11.0 years, t (1873) = −2.8, $P < 0.01$). The CFSS-DS scores were significantly higher in the school children compared with the clinic patients (27.7 versus 24.6, Mann–Whitney $U = 277\,420$, $P < 0.01$).

Discussion

Dental fear research in children has been carried out in a number of countries. As cultural and social norms of behavior can affect the development and expression of children's fear, and as dental care systems can vary considerably across cultures, normative data in each culture are needed. In the present study, a Japanese version of the CFSS-DS was demonstrated to have very good internal consistency, test–retest reliability, and construct and criterion validity. This study addresses serious weaknesses in a previous attempt to translate and validate a Japanese version of this questionnaire.

The overall scores from the Japanese clinic and school samples (mean of 24.6 and 27.7) fall within the range of scores reported from other samples. These vary from lower scores, such as 22.1 for Finns (20), 23.1 for Swedes (7), and 23.2 for Dutch (14), to somewhat higher scores, such as 28.7 for the

USA (18), 30.6 for children in Singapore (1), 31.9 for Chinese children in Canada (5) and 35.7 for children in China (5).

In both the large clinic and school samples, girls were more fearful than boys. Some studies have shown that girls score higher on the CFSS-DS (1, 8, 14, 20, 24), while others have found no difference (5, 22). The gender differences may vary by age (7). No meaningful age effect was found either in the clinic or school samples, consistent with a number of other studies (5, 20, 22, 24). The clinic patients were only slightly older than the school children.

In both the clinic and school samples, children were most afraid of choking, injections, having a stranger touch them, and drilling. Choking, injections, and drilling have been found to be among the most feared items in studies in other cultures (1, 7, 8, 14, 20, 25), and indicates that these specific dental concerns of children appear to be constant across cultures even if the overall level of fear varies by culture.

Factor analyses of the CFSS-DS have been previously reported for four populations: the Netherlands (22), Finland (20), China (5), and Chinese children living in Canada (5). Using the same methods reported in this paper, the same three factors have been consistently reported in other populations (the Netherlands, Finland, and China). In the Canadian sample, the same method resulted in four factors: three that were similar to those described above, plus one additional factor, that of fear of being looked at or touched. Thus, with the exception of the additional factor found in the Canadian sample, the results in Japan are consistent with those found in other cultures.

Dental fear scores were higher in children in the school compared with children in the clinic. This can be seen in the mean and median on the total CFSS-DS, as well as on individual items. In addition, the item 'Dentists' loaded very highly on factor I (fear of highly invasive procedures) for the school children, but showed a smaller loading on factor II (fear of less invasive procedures) for the clinic patients. This difference in levels of dental fear is likely to be due in part to the probability that dental avoiders did not participate in the clinic study, but were part of the school sample. In addition, as mentioned previously many of the children seen in the clinic were recall patients, which is not typical of the dental experiences of most Japanese children. A comprehensive study of dental clinics in a district of neighboring Hiroshima revealed that about 45% of dental visits of children aged five to 17 involved restorations, while only about 5% involved preventive treatment (34). The high rate of recall in our clinic sample may be related to lower fear levels as the children had fewer experiences with restorations, because of greater use of preventive treatments and/or earlier detection, and because they have had proportionately more dental visits associated with non-painful treatment. Another possibility is that the university-affiliated dentists may be using more effective techniques with the children, compared with dentists in private clinics.

The difference in fear levels found in our two large samples also raises the question as to which results are more indicative of fear levels in Japanese children. As most children in Japan are not seen at university clinics (28), we believe that our school sample is currently more representative of Japanese children in general. Moreover, the current practice of not reimbursing dentists for simple examinations and/or preventive procedures is under criticism (28). As more Japanese children begin to receive these kinds of services, we believe that expressions of dental fear will decrease and more closely approximate the findings of our clinic sample.

Our study found that 15% received a 'negative' Frankl rating, when observed throughout their dental treatment. A previous study of Japanese children observed during routine examinations in a university pediatric dental clinic found that 8% of them were rated as 'negative' (Frankl) (27). The higher percentage of 'negative' child patients found in our study is likely because the observations continued past the examination phase. Nevertheless, the type of treatment received was not found to affect the children's negative behavior.

Future studies are needed to further relate Japanese CFSS-DS scores to actual behavioral and/or physiological observations of children during treatment in order to determine a valid cut-off for clinically meaningful child fear. Then, the tool will allow clinicians to distinguish children in need of extra attention and subsequently select the most appropriate treatment approach for these children. Researchers may then also use the instrument to select subjects for studies or use it to evaluate the outcome of interventions.

In conclusion, this Japanese version of CFSS-DS is a highly reliable and valid instrument to assess dental fear in children, and operates the same in Japan as it does in Western cultures.

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