The Effect of Age, Gender and Socio-Economic Factors on Perceived Dental Anxiety Determined by a Modified Scale in Children

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**Purpose:** The aim of this study was to examine the validity and reliability of the Com-DAS (combined dental anxiety scale) as an indicator for children's perceived dental anxiety and to investigate the effect of age, gender and socio-economic factors on dental anxiety.

**Materials and Methods:** A total of 258 children aged between 8 and 12 years, who had not visited a dentist before, were randomly selected from three different socio-economic status groups. A new scale was developed by combining the C-DAS (Corah's dental anxiety scale) and FIS (facial imaging scale), and named Com-DAS. Original C-DAS was used for validation.

**Results:** There was a high correlation between C-DAS and Com-DAS (r = 0.69). The lowest correlation was in 8-year-old children (r = 0.46), however the mean difference between the scales in this age group was not statistically significant (p > 0.05). The Com-DAS scores showed no statistical difference according to gender, whereas there was a significant difference according to age and socio-economic status (p = 0.001 in both cases).

**Conclusion:** The Com-DAS used in this study may be of use in those communities where the children and their families have limited literacy skills and their understanding of modern dental procedures may be influenced by non-qualified dental practice.

Key words: children, dental anxiety, socio-economic status

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Dental anxiety in children, which affects a child's behaviour, has been recognised as a source of problems in patient management for many years (Kleiman, 1982; Chellappah et al, 1990; Alwin et al, 1991, 1994; Peretz and Efrat, 2000; Buchanan and Niven, 2002). Dentists have had some difficulty in identifying the

**Reprint requests:** Yrd Doç Dr M. Cem Doğan, Çukurova Üniversitesi, Di\_hekimliği Fakültesi, Pedodonti Anabilim Dalı, 01330 Balcali, Adana, Turkey. Fax: +90 322 3387331. Tel: +90 322 3386060. Email: cemdogan@cu.edu.tr stimuli that lead to dental anxiety in the dental office. It is accepted that the aetiology of dental anxiety is a problem made up of a number of different components (Brown and Wright, 1987; Schuurs and Hoogstraten, 1993; Klingberg, 1995; Klingberg et al, 1995; Klingberg and Broberg, 1998; Rantavuori et al, 2002; Wogelius et al, 2003).

Age, gender and socio-economic status play important roles as determining factors in dental anxiety; of these, age is the best known factor for dental anxiety (Holst and Crossner, 1987; Cuthbert and Melamed 1992; Schuurs and Hoogstraten, 1993; Klingberg et al, 1994; Klingberg, 1995; Klingberg et al, 1995; ten Berge et al, 2002). Several studies have implicated the relationship between age and dental anxiety as a decrease in dental anxiety with increasing age (Neverlien, 1991; Folayan et al, 2003). On the other hand, this relationship becomes less important as the child reaches 6-7 years of age, or older. After this age the child can cope better with potentially anxiety-provoking experi-

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ences (Corkey and Freeman, 1988; Folayan et al, 2003).

Another aetiological factor of dental anxiety that remains controversial is gender. The interaction of age and gender in the manifestation of dental anxiety has been highlighted by many researchers (Klienkhect et al, 1973; Corah et al, 1978; Corkey and Freeman, 1988; Chellappah et al, 1990; Alvesolo et al, 1993). For example, Klingberg (1995) found that boys aged between 9 and 11 years tend to score higher on dental anxiety than girls of the same age. Gender may not predict dental anxiety by itself, but interaction with the other variables could predispose children to the problem (Klingberg, 1995; Locker et al, 2001). Wright et al (1980) and Bedi et al (1992a) have reported that there is a relationship between high levels of dental anxiety and low socio-economic status, whereas others have come to the opposite conclusion (Klingberg 1995; Folayan et al, 2003; Folayan et al, 2004).

Several scales have been developed for assessing many aspects of dental anxiety (Schuurs and Hoogstraten, 1993). C-DAS (Corah's dental anxiety scale) (Corah, 1969) is the most well-known and widely used scale in the dental literature (Wright et al, 1980; Bedi et al, 1992a, 1992b; Newton and Buck, 2000). Furthermore, translated versions of C-DAS have proved to be valid and reliable measures of dental anxiety in culturally diverse populations (Schwarz and Birn, 1995; Ekanayake and Dharmawardena, 2003). However, the limitations of vocabulary, understanding and emotional development of younger children means that the C-DAS could only be used with teenagers and adults (Corah, 1969; Peretz and Efrat, 2000). Furthermore, accurate use of rating scales is a difficult developmental task for young school-age children. In order to cope with this problem, Parkin (1989) used a modified C-DAS by replacing the original five qualifying statements of the four questions with a bipolar visual analogue scale. However, it is known that young children tend to select responses at the extremes of the rating scale and not use the middle points (Chambers and Johnston, 2002). There were also several studies that demonstrated the use of children's versions of C-DAS (Wright, 1980; Wright et al, 1980; Brown et al, 1986; Bedi et al, 1992b).

There are different types of picture scales available for assessing the anxiety of children (Williams et al, 1985; Klingberg, 1995; Buchanan and Niven, 2002). One of the valid picture scales, using faces as an indicator of anxiety, is Facial Image Scale (FIS) (Buchanan and Niven, 2002; Buchanan and Niven, 2003). This scale involves five faces ranging from a very happy face to a very unhappy face. The main advantage of this scale is that it is easy to use (Buchanan and Niv en, 2002).

The Com-DAS (combined dental anxiety scale) was developed by combining previously used scales, the C-DAS and FIS. The aim of this study was to examine the validity and reliability of a modified Com-DAS as an indicator for children's perceived dental anxiety, and to investigate the effect of age, gender and socio-economic factors on dental anxiety determined by using this modified scale.

## MATERIALS AND METHODS

This study was approved by the Ethical Committee of Çukurova University and undertaken in Adana, Turkey. Three schools were selected, according to data received from the National Educational Council Board, on the basis that they covered a range of socio-economic groups. One school predominantly had children who had emigrated from remote rural areas. The lists of the children in every school were collected, and 589 children attending 1st to 5th classes, aged between 8 and 12 years, were selected randomly from these lists. Children from low socio-economic groups rarely attend dental services. In order to standardise the children's responses, all those with previous dental experience were excluded from the study. A total of 258 children (51.9% boys; 48.1% girls) who had no previous dental experience participated in the study; 9 children were excluded due to insufficient available data.

The socio-economic data collected included parental occupation, education and level of income of the family. The children were categorised into three different SES (socio-economic status) groups (high, middle, low), according to the information provided.

The Turkish version of C-DAS (Schwarz and Birn, 1995; Seydaoglu et al, 2006) was used to measure perceived dental anxiety and was used for validation. C-DAS contains four multiple-choice questions dealing with the patients' subjective reactions to the dental situation: (a) anticipating a visit to a dental clinic; (b) waiting in the dentist's office for treatment; (c) the drilling of the teeth; and (d) the scaling of the teeth. Five possible answers in an ascending order from '1' to '5' were provided; thus, each question carried a possible maximum score of '5', with a total possible maximum score of '20' for the entire scale.

The Com-DAS was developed by combining the previously used scales, the C-DAS and FIS. The C-DAS was modified together with the FIS by replacing the original five qualifying statements for questions. FIS comprises a row of five faces ranging from very happy to very





Fig 1 Facial Image Scale with image scores, 1-5.

Table 1 Results of the reliability and validity of the Com-DAS					
Statistical test	Com-DAS				
Varimax rotated factor loadings					
Item 4	0.84				
Item 3	0.84				
Item 2	0.76				
Item 1	0.72				
Eigenvalue	2.50				
Accounted % of the variance	63.0				
Cronbach's alpha over	0.80				
Item-total correlations ranging from (r)	0.55-0.69				
The test re-test reliability coefficient (r)	0.74				
Correlation with total C-DAS (r)	0.69				

unhappy (Fig 1). The scale was scored by giving a value of one to the most positively simulated face and five to the most negatively simulated face.

In order to minimise the emotional factors inherent in the questioning process, the children were given the questionnaires in a familiar setting at their school. Each child was given limited help by their teacher to complete the C-DAS and Com-DAS questionnaires.

In order to determine the test-retest reliability, the Com-DAS questionnaire was resubmitted to the children two weeks later.

## **Statistical analyses**

Statistical analyses were performed using the statistical package SPSS v 12.0. A principal component analysis using varimax rotation was computed on the four items of C-DAS scale and Com-DAS. For each continuous variable, normality was checked. Since the data was not distributed normally, an appropriate nonparametric test was chosen. The Student t-test,

Kruskal Wallis, Mann-Whitney U, Wilcoxon Signed Rank test, and the Spearman rho correlation tests were used for continuous data. The chi-squared test was used to compare categorical data between the groups. Univariate analysis of variance was performed for the interaction of variables. Results were presented as n, percent (%), mean  $\pm$  SD (standard deviation).

## RESULTS

#### The reliability and validity of Com-DAS

The results of the principal component analysis of the Com-DAS replicated the one factor solution and indicated that all four items had loadings over 0.72. This one factor had an eigenvalue of 2.50 and accounts for 63% of the variance. The scale shows adequate internal consistency, as demonstrated by Cronbach's alpha over 0.80, and item-total correlations ranging from 0.55 to 0.69 for the Com-DAS. The test-retest reliability coefficient was 0.74 for Com-DAS. The correlation



		C-DAS	Com-DAS	
		$Mean\pmSD$	$Mean\pmSD$	p value <sup>b</sup>
Gender	Male (n = 133)	$10.8 \pm 3.6$	$11.5 \pm 3.5$	0.04
	Female (n = 125)	$10.8\pm4.1$	$11.8 \pm 3.4$	0.001
	p value <sup>a</sup>	0.7	0.4	
Age	8 (n = 61)	$12.3 \pm 3.9$	$13.0\pm3.4$	0.4
	9 (n = 49)	$11.8\pm3.6$	$12.9\pm2.8$	0.01
	10 (n = 57)	$10.5\pm3.9$	$11.2 \pm 2.8$	0.04
	11 (n = 43)	$10.0 \pm 3.7$	$10.5\pm4.2$	0.3
	12 (n = 48)	$9.2 \pm 3.2$	$10.0\pm2.8$	0.01
	p value <sup>a</sup>	0.000	0.000	
SES	Low (n = 84)	$11.7\pm3.6$	$11.8 \pm 3.3$	0.8
	Moderate (n = 92)	$11.9 \pm 3.4$	$13.0\pm2.8$	0.002
	High $(n = 82)$	$8.7\pm3.7$	$9.9 \pm 3.4$	0.001
	p value <sup>a</sup>	0.000	0.000	
	Total (n = 258)	10.8±3.8	$11.6 \pm 3.4$	0.000

<sup>b</sup> Wilcoxon Signed Rank test between C-DAS and Com-DAS within groups

SD, standard deviation

Table 3 Correlation of C-DAS and Com-DAS accordingto gender, age and SES						
		ra				
Gender	Male (n = 133)	0.67				
	Female (n = 125)	0.71				
Age	8 (n = 61)	0.46				
	9 (n = 49)	0.77				
	10 (n = 57)	0.70				
	11 (n = 43)	0.79				
	12 (n = 48)	0.65				
SES	Low (n = 84)	0.54				
	Moderate (n = 92)	0.65				
	High (n = 82)	0.69				
	Total (n = 258)	0.69				
r, correlation coefficient <sup>a</sup> p < 0.001 for all subgroups (Spearman Rho Correlation test)						

between Com-DAS and C-DAS was tested for validation (r = 0.69) (Table 1).

The mean distributions of C-DAS and Com-DAS according to the groups are shown in Table 2. C-DAS and Com-DAS scores showed no statistical difference according to gender. Both mean C-DAS and Com-DAS scores significantly decreased as age and SES increased. Generally, the mean of the Com-DAS was slightly higher than the C-DAS in the subgroups and in total (p < 0.05).

The correlations of the two scales according to the groups are shown in Table 3. The correlation coefficient was lowest in 8-year-old children (r = 0.46) and also in the low SES group (r = 0.54).

The mean distribution of the Com-DAS between age and SES according to gender is shown in Fig 2. The mean of the Com-DAS was statistically different only in the age 12 group by gender (p = 0.03). The mean distribution of the Com-DAS changed according to the SES by gender. However, girls have a higher mean Com-DAS than boys in lower SES (p = 0.001), and boys have a higher mean Com-DAS than girls in high SES (p = 0.006). There was no statistically significant difference between gender and moderate SES. Univariate analysis of variance was performed for the interaction of variables of gender, age and SES. According to variance analyses while there was a significant interaction between SES, age and gender, only SES and age were found to be significant factors on the Com-DAS (F = 4.71, p = 0.000).

The Com-DAS total scores were classified into 3 groups. The first group (children who have a total score



Fig 2 Mean distribution of Com-DAS (a) between age, and (b) between SES according to gender.

Table 4 Distribution of dental anxiety groups according to Com-DAS total score between age, gender and SES							
Dental anxiety groups, n (%)							
		Not anxious	Anxious	Extremely anxious	p-value		
		(4-11 score)	(12-14 score)	(≥15 score)	(Chi-squared)		
Gender	Male (n = 133)	69 (51.9)	40 (30.1)	24 (18.0)			
	Female (n = 125)	63 (50.4)	37 (29.6)	25 (20.0)	0.9		
Age	8 (n = 61)	20 (32.8)	22 (36.1)	19 (31.1)			
	9 (n = 49)	21 (42.9)	18 (36.7)	10 (20.4)			
	10 (n = 57)	30 (52.6)	19 (33.3)	8 (14.0)			
	11 (n = 43)	28 (65.1)	8 (18.6)	7 (16.3)			
	12 (n = 48)	33 (68.8)	10 (20.8)	5 (10.4)	0.005		
SES	Low (n = 84)	34 (40.5)	31 (36.9)	19 (22.6)			
	Moderate (n = 92)	39 (42.4)	33 (35.9)	20 (21.7)			
	High (n = 82)	59 (72.0)	13 (15.9)	10 (12.2)	0.001		
	Total (n = 258)	132 (51.2)	77 (29.8)	49 (19.0)			

between 4 and 11) were named not anxious, the second group (total score between 12 and 14) were named anxious, and the third group (score of equal or more than 15) were named extremely anxious. Of the total 258 children, 49 (19.0%) were classed as extremely anxious. The proportion of extremely anxious children decreased with increasing age (p = 0.005). The percentage of extremely anxious children in high SES was 12.2%, in moderate SES 21.7% and in low SES 22.6% (p = 0.001) (Table 4).

# DISCUSSION

It is generally agreed that the C-DAS has universal application; it is for this reason that it has been used in

this study. However, because of the poor literacy and social skills of many of the children, especially those from low socio-economic groups, it was considered appropriate to investigate the validity of using a modified scale that would entail limited help from an adult. The children therefore completed two questionnaires. In the present study, the teachers were asked to provide minimal support to the children. It is possible that the teachers introduced some bias in the results.

The children in this study had no previous dental experience. The authors wanted to investigate those fears and anxieties that arise from modelling or exposure to threatening information, as described by Rachman (1977).

There are various methods for measuring dental anxiety in adolescents, and the C-DAS is one of them (Schuurs and Hoogstraten, 1993; Newton and Buck, 2000; Peretz et al, 2004). It is also known that there is a general lack of empirical data for measuring dental anxiety of children using the same tool as for adults; however, Neverlien (1991) found C-DAS to be as good a predictor of dental anxiety in patients aged 10–12 years as in adults. C-DAS was used as the standard in the present study as it has high internal consistency and test-retest reliability.

The strong correlation between the Com-DAS and C-DAS scores supports the validity of the Com-DAS. However the low correlation coefficient in 8-year-old children and those in the lower SES group can be explained by low linguistic skills and delayed literacy in younger children and those in the low SES group.

In previous studies there have been some contradictory results concerning the correlation between age and dental anxiety. The study by Folayan et al (2003) revealed no relationship between age and dental anxiety; this was attributed to the homogeneity of the age group studied. However, Klingberg (1995) stated that dental anxiety was closely related to age, with a decrease in occurrence with increasing age. In this study it was found that there was a significant correlation between age and dental anxiety. This is in agreement with most studies (Klienkhect et al, 1973; Corah et al, 1978; Morgan et al, 1980; Corkey and Freeman, 1988; Chellappah et al, 1990; Alvesolo et al, 1993).

The present study showed that there was no relationship between gender and dental anxiety, which is in agreement with other studies (Gatchel, 1989; Otto, 1994). These contradictory findings might be cultural in origin as girls may be allowed to express their anxiety more freely than boys (Zvolensky et al, 2000; Kirmayer, 2001; Folayan et al, 2003). This would naturally transfer to dental anxiety as well (Folayan et al, 2004). However, the children of our study group did not show



any gender differences in their perceived dental anxiety. The number of boys showing fear was only slightly higher than the number of girls. Thus, our results do not support the gender difference hypothesis. However, this study may not be entirely comparable with previous studies because only perceived dental anxiety was investigated.

There are several studies investigating the relationship between dental anxiety and SES (Wright et al, 1980; Bedi et al, 1992a,b; Klingberg et al, 1994; Folayan et al, 2003). Klingberg et al (1994) and Folayan et al (2003) reported that there was no relationship between SES and dental anxiety. However, Folayan et al (2003) noted a relationship between the type of the child's school and dental anxiety. On the other hand, Bedi et al (1992a, 1992b) and Wright et al (1980) observed a relationship between child dental anxiety and low SES.

In the present study, there were three distinct socioeconomic groups of children. Of these, the lowest socio-economic group was found to rate the highest on the perceived dental anxiety scale. This result leads us to conclude that socio-economic status could be a determiner of perceived dental anxiety by itself. However, it must to be taken into consideration that environmental factors such as culture or parental anxiety may also be influential in the formation of anxiety.

As this is the first time that this combined scale has been used, the results must be interpreted with a certain amount of caution, particularly as the children received some support from their teachers.

#### CONCLUSIONS

The Com-DAS used in this study may be of use in those communities where the children and their families have limited literacy skills and their understanding of modern dental procedures may be influenced by nonqualified dental practice.

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