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**ORIGINAL ARTICLE**

# Dental anxiety and temperament in 15-year olds

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**Abstract**

***Objective.*** The aim of the present study was to analyze the prevalence of dental anxiety and its association with temperament, sociodemographic factors and previous painful and unpleasant experiences of dental care among 15-year old individuals. ***Materials and methods.*** The sample included 263 randomly selected 15-year old individuals living in the municipality of Jönköping, Sweden. The school, parental and adolescent consent was acquired. Three self-reported questionnaires were used, one included items of sociodemography, while the others dealt with dental anxiety assessed by the Dental Fear Survey (DFS) and temperament assessed by an adapted version of The EAS Temperament Survey for Children modified for adults, the EASI temperament survey. ***Results.*** The results showed that 6.5% of the adolescents were classified as dentally anxious and with girls proportionally more fearful than boys. The three temperaments activity, impulsivity and emotionality were significantly correlated with dental anxiety. A hierarchical multiple linear regression analysis showed that pain at the last dental appointment or previous pain experiences during dental care treatment were the strongest predictors regarding dental anxiety in 15-year olds. The temperament dimensions activity and impulsivity were also significantly predictive of dental anxiety. ***Conclusions.*** Although some of the temperament dimensions are correlated with dental anxiety, which may emphasize an important finding with regard to personality, this study showed that previous pain experiences during dental care treatment is a strong predictor for high dental anxiety in 15-year olds.

**Key Words:** *adolescents, cross-sectional, dental anxiety, epidemiology, temperament*

## Introduction

Dental anxiety (DA) and dental behavior management problems (DBMP) in children and adolescents are two common conditions associated with dental care. Klingberg and Broberg [1] concluded that the prevalence of DA and DBMP in children was estimated to be ~ 9% in normal populations in Australia, Canada, Europe and the US. The two conditions were more common among girls and associated with general fear. Epidemiological studies in children and adolescents concerning dental anxiety only have shown varying results [2–14], with a prevalence between 5.7–21% in Scandinavia as well as in other parts of the world.

Causes of dental anxiety may be that the child has been exposed to painful dental treatment or have had a feeling of lack of control in the dental treatment [7,10,15–17]. Correlations have also been found between children and parents with regard to dental anxiety [16,18]. More than one previous painful or unpleasant treatment experience has also been found to increase the risk to avoid dental care [19].

Temperament has also shown a clear association with dental anxiety [20–24]. Temperament means an emotional capacity that varies between individuals, is fairly stable over time and situations, has some genetic influence and appears early in life [25–27]. It has been stated that an individual's temperament illustrates that individual's characteristic way of being; that is, the individual's relatively similar behaviors and reactions in various situations, where an important point has been the individual's typical way of reacting to news [28]. The child's orientation in temperament has been described as the basis for personality [29–31], while personality develops as a result of both environmental factors and the original base of temperament [27,30,32].

Buss and Plomin [33] introduced a theory that saw temperament originally composed of four parts or dimensions, emotionality, activity, sociability and

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impulsivity (EASI), where also shyness, later, was included [34]. Some of the various dimensions in temperament may differ between gender [21,33].

Previous results concerning the relationship between dental anxiety and temperament is that temperament, and then foremost shyness and possibly shyness combined with emotionality, may be contributing factors in the development of dental anxiety in children [20]. Mere shyness has also been attributed to be the cause of arisen dental anxiety [23]. Other findings suggest temperament, more in general, as the cause of development of dental anxiety in young adults [24], whereas Lundgren et al. [21] found that adult patients with high levels of dental anxiety had significantly higher values of emotionality and impulsivity than patients without dental anxiety. Bergdahl and Bergdahl [35] examined personality and temperament among dental anxiety adults and found the characteristics and traits that seemed to form a delicate and vulnerable individual with risk of developing dental anxiety. Other studies have also shown a relationship, but between temperament and DBMP, linked to dental anxiety in children [36–38].

Jointly for the studies conducted on children and young people is that they are performed on young children, alternatively, older adolescents, but, as far as the authors of this study know, there is a lack of cohort studies of 15-year-olds which analyze the relationship between dental anxiety and temperament.

The aim of the present study was to analyze the association between dental anxiety, temperament, sociodemography and experiences of dental care among 15-year old individuals.

## Materials and methods

The present cohort study was a cross-sectional study and based on a sample of adolescents selected by a random two-shape cluster-method. The participants were 15 years of age and residents in the municipality of Jönköping, Sweden. Thus, out of 10 local secondary schools, 12 classes in four schools were chosen. The sample included 263 adolescents or 15% of the total number of 15-year-olds in the city of Jönköping, Sweden in 2004. One of the authors (MH) and a dental hygienist student visited the schools and had permission from the respective principal to meet the randomly selected classes and students in their classrooms. The students were then asked to participate. All students present agreed to participate and the questionnaires were completed in the classrooms. However, at the time of implementation of the study, 42 individuals were absent from the classrooms which meant a dropout of 16%. The absent students participated in other education/activities or were reported as absent due to illness.

The study met the regulations of the Swedish research ethical law and the Helsinki declaration.

### *Measures*

Questions regarding background data contained variables of gender, parental education level, last visit to a dentist, pain experience at last dental appointment, previous uncomfortable dental treatments or pain experiences during dental care treatment and if someone in the family was afraid to go to the dentist.

The degree of dental anxiety was measured with the Swedish version of the Dental Fear Survey (DFS), a questionnaire containing 20 items specifically measuring the level of dental anxiety [39] and which is the preferred clinical tool for this purpose [40]. A good stability, high reliability and an acceptable validity of the instrument have previously been demonstrated [39,41]. DFS has been used in Scandinavia for several years [10,42]. Moreover, DFS has been used in international epidemiological studies for over 30 years. The answers to the questions are set out on a 5-point Likert scale, where 5 is ranked as the most intense fear. Based on the total sum of points, dental anxiety is graded between 20–100. In this study, the DFS has been used as continuous scale or with specific limit values. A DFS score of 60 points or more has been assessed as dental anxiety and a score of less than 60 points has been assessed as non-dental anxiety [43]. The internal consistency of the DFS scale of the sample in this study was analyzed and resulted in a Cronbach alpha coefficient of 0.94.

The temperament of the adolescents was measured using the EASI, an improved version of 'The EAS Temperament Survey for Children' [34], translated into Swedish by Hagekull and Bohlin [32], now consisting of 25 items, which has been modified for self-reporting by adults [21]. Each temperament (emotionality, activity, sociability, impulsivity and shyness) was measured by five items. Each item was measured on a 1–5 scale which 1 stands for 'not true at all' and 5 stands for 'true a great deal'. The total value for each temperament was, according to Buss and Plomin [34], divided by five (the number of items), in order to express an average value between 1 and 5, which then was used for the analysis. A high point value implies that the temperament is well prominent. Each temperament was examined concerning internal reliability and resulted in Cronbach alpha coefficients of the different temperaments of between 0.59–0.73 (Emotionality = 0.73; Activity = 0.64; Sociability = 0.67; Impulsivity = 0.59; Shyness = 0.70).

### *Statistics*

All analyses were performed using the Statistical Package for the Social Sciences (SPSS) 16.0. The *t*-test, Mann-Whitney U-test and $\chi^2$ test were used to analyze differences between variables. Fisher's exact test was used when the conditions for the $\chi^2$ test was not met. Pearson correlation coefficient was used to

analyze relationships between variables. Hierarchical multiple regression analysis assessed the ability of the EASI questionnaire to predict dental anxiety and reveal the amount of variance explained in the models. Pairwise exclusion was used for missing data. Cronbach's alpha was used for the analysis of internal reliability.

## Results

Table I of the total sample, the 221 students who were present in the classrooms and responded to the survey, 105 girls and 116 boys were included.

### *Dental anxiety*

A few students ($n = 5$) had not filled out all questions in the DFS questionnaire and was therefore excluded but, of the 216 students who responded to the DFS questionnaire completely, a total of 14 students (6.5%) were classified as having dental anxiety (DFS ≥ 60). The mean DFS score for the overall group was 34.2 (SD = 14.9) and the median DFS score was 30 (range 78). One of the five students had chosen not to respond to 13 of the 20 questions and the other four students had not answered to one item each. The major part of the subjects had a low total DFS score which indicated a skewed distribution. There was a significant difference regarding gender and dental anxiety using either categorical or continuous scales with $\chi^2 = 9.1$, $p = 0.003$ and $t = 4.9$, $p < 0.001$, respectively, with girls having higher levels of dental anxiety (Table I).

### *Temperament*

Thirty-two (14.5%) of the 221 completed forms contained missing values for any of the different temperaments of the EASI scale (less than 2 answers per student were missing in the 32 forms). Each temperament dimension and the total sum of EASI was found normally distributed. The girls were shown to have higher values than boys in all temperaments, except activity (Table II). The observed differences between girls and boys concerning emotionality ($t(211) = 6.6$, $p < 0.001$), sociability ($t(209) = 2.2$, $p = 0.031$) and impulsivity ($t(211) = 2.5$, $p = 0.012$) was noted significant.

The relationship between gender and the different temperaments in the entire student group was investigated. Correlation analyses showed that gender explained 17.6% ($p < 0.001$) of the variance concerning emotionality and 2.9% ($p < 0.05$) regarding impulsivity. The girls were associated with the higher values.

Individuals with dental anxiety were found to have higher mean values in all temperaments, except activity, as compared to the students without dental anxiety (Table III). The differences concerning activity ($t(205) = -2.4$; $p = 0.015$), emotionality ($t(206) = 2.1$; $p = 0.037$) and impulsivity ($t(207) = 2.4$; $p = 0.016$) were found significant. The relationship between the sum of DFS and the different temperaments were investigated, which revealed that DFS scores correlated significantly with three of the temperaments, emotionality (positive), activity (negative) and impulsivity (positive) (Table IV).

Table I. Mean and median DFS scores for girls and boys.

| Gender | *n* | Mean | Median | SD | SEM |
|---|---|---|---|---|---|
| Girls* | 101 | 39.3 | 35.0 | 16.3 | 1.6 |
| Boys | 115 | 29.7 | 24.0 | 11.8 | 1.1 |

*$p < 0.001$.

Table II. Mean values concerning the different temperaments in girls and boys.

| Gender | Shyness | Emotionality | Sociability | Activity | Impulsivity |
|---|---|---|---|---|---|
| Girls | | | | | |
| *n* | 100 | 99 | 101 | 101 | 101 |
| Mean | 2.5 | 2.9* | 3.7** | 3.3 | 2.8*** |
| SD | 0.9 | 0.8 | 0.8 | 0.9 | 0.7 |
| Boys | | | | | |
| *n* | 112 | 114 | 110 | 111 | 112 |
| Mean | 2.4 | 2.2* | 3.5** | 3.4 | 2.6*** |
| SD | 0.7 | 0.7 | 0.8 | 0.8 | 0.7 |
| Total | | | | | |
| *n* | 212 | 213 | 211 | 212 | 213 |
| Mean | 2.4 | 2.5 | 3.6 | 3.3 | 2.7 |
| SD | 0.8 | 0.9 | 0.8 | 0.8 | 0.7 |

*$p < 0.001$; **$p = 0.031$; ***$p = 0.012$.

### *Background data and experiences of previous pain*

The major part of the students, 87.6% girls and 89.7% boys, stated that it was less than a year since they last visited the dentist, while 8.6% of both girls and boys reported such a visit for 1–2 years ago. A few of them, 2.9% of girls and 1.7% of boys, said they had not visited a dentist in 3–5 years or more.

Eighty students said they experienced pain at some level at the last dental visit, with a significant difference between genders ($\chi^2 = 5.0$, $p = 0.025$), where the girls in a higher degree were those who reported this. Over half of all students said that they had experienced one or more painful or unpleasant dental treatments with a significant difference between sexes ($\chi^2 = 6.5$, $p = 0.011$), where again it was the girls who reported more experience of pain than boys. Twenty-three per cent answered that they had one member or more in the family who was afraid to go to the dentist with a statistically significant gender difference ($\chi^2 = 14.2$, $p < 0.001$), where the girls were more often those who reported this.

Table III. Mean values of the different temperaments with respect to dental anxiety.

| | | Shyness | Emotionality | Sociability | Activity | Impulsivity |
|---|---|---|---|---|---|---|
| No dental anxiety | *n* | 195 | 196 | 193 | 194 | 195 |
| | Mean | 2.4 | 2.5 | 3.6 | 3.4 | 2.7 |
| | SD | 0.8 | 0.8 | 0.8 | 0.8 | 0.7 |
| Dental anxiety | *n* | 12 | 12 | 13 | 13 | 14 |
| | Mean | 2.7 | 3.0 | 3.7 | 2.8 | 3.1 |
| | SD | 0.9 | 0.9 | 1.2 | 1.0 | 0.8 |
| Total | *n* | 207 | 208 | 206 | 207 | 209 |
| | Mean | 2.4 | 2.5 | 3.6 | 3.3 | 2.7 |
| | SD | 0.8 | 0.9 | 0.8 | 0.8 | 0.7 |

There were differences identified between the students with and without dental anxiety with regard to the issue of pain at the last visit to the dentist ($\chi^2 = 11.4$, $p = 0.001$) and the issue of having had one or more painful or unpleasant dental treatment during childhood ($\chi^2 = 7.3$, $p = 0007$). Within the group with dental anxiety there were a higher proportion of pupils who reported more exposure to pain than in the non- dental anxiety group. When asked if anyone in the family was afraid to go to the dentist, differences were also found between those with dental anxiety and with no dental anxiety ($p = 0.016$). Thus, it was a higher proportion among those with dental anxiety responding that they have a family member who was afraid to go to the dentist.

*Dental anxiety, temperament and background data*

Hierarchical multiple regression was used to predict the impact of different temperaments on dental anxiety, while adjusting for the other independent variables. Table V shows the result of this analysis when all background data was entered as a first step and explaining 29.1% of the variance in dental anxiety as measured by the sum of DFS scores (Model 1). The different temperaments were entered as a second step and the overall model explained 35.0% ($F(11, 181) = 8.87$, $p < 0.0001$) (Model 2). Since the effects of all background data were controlled for statistically, the five temperaments explained 6.0% ($R^2$-change = 0.060, $F$ change (5, 181) = 3.32, $p = 0.007$) of the variance in dental anxiety, where the two temperaments activity and impulsivity, showed significant correlation.

## Discussion

The aim of the study was to analyze the prevalence of dental anxiety and its association with temperament, socio-demographic factors and previous painful and unpleasant experiences of dental care among 15-year old individuals. Three of the temperaments correlated significantly with dental anxiety in the 15-year-olds, while the clearest predictors were gender and reported pain or unpleasant experiences during dental care treatment.

*Dental anxiety*

The results show that, of the 15-year-olds in Jönköping in 2004, there were 6.5% which were classified as dentally anxious. The majority of the DA-students were girls, which also is consistent with other studies [2–13]. The overall prevalence, however, may be considered somewhat low, as the studies that have made use of DFS as questionnaires have resulted in a prevalence of 10–19% in the age groups 12–18 years, albeit in different countries [7,10,11]. The results of epidemiological studies [2–14] made over the years have also shown that the prevalence of dental anxiety in children and adolescents varies between different studies and measurement methods and is between 5.7–21% in Scandinavia as well as in other parts of the world. Differences in prevalence between surveys may be

Table IV. Correlation between the sum of DFS and the different temperaments.

| | | Shyness | Emotionality | Sociability | Activity | Impulsivity |
|---|---|---|---|---|---|---|
| Total | DFS | 0.12 | 0.31** | −0.00 | −0.24** | 0.29** |
| No dental anxiety | DFS | 0.06 | 0.31** | −0.01 | −0.16* | 0.26** |
| Dental anxiety | DFS | 0.37 | −0.02 | −0.31 | −0.33 | 0.17 |

**$p < 0.001$; *$p < 0.05$.

Table V. Hierarchical multiple regression analysis regarding the characteristics of the participants and their temperaments. The dependent variable is DFS sum of scores.

| Model | | Standardized Beta | *t*-value | *p*-value |
|---|---|---|---|---|
| 1 | Gender | −0.24 | −3.60 | 0.000 |
| | Mother's education | −0.05 | −0.62 | 0.535 |
| | Father's education | 0.03 | 0.46 | 0.646 |
| | Pain at the last dental appointment | 0.35 | 5.50 | 0.000 |
| | Previous pain experiences during dental care treatment | 0.21 | 3.24 | 0.001 |
| | Is someone in the family afraid to go to the dentist? | −0.08 | −1.31 | 0.193 |
| 2 | Gender | −0.18 | −2.54 | 0.012 |
| | Mother's education | −0.02 | −0.34 | 0.737 |
| | Father's education | 0.04 | 0.52 | 0.602 |
| | Pain at the last dental appointment | 0.33 | 5.13 | 0.000 |
| | Previous pain experiences during dental care treatment | 0.18 | 2.88 | 0.004 |
| | Is someone in the family afraid to go to the dentist? | −0.05 | −0.81 | 0.419 |
| | Shyness | 0.01 | 0.08 | 0.937 |
| | Emotionality | 0.06 | 0.87 | 0.383 |
| | Sociability | 0.09 | 1.28 | 0.202 |
| | Activity | −0.16 | −2.03 | 0.044 |
| | Impulsivity | 0.15 | 2.22 | 0.028 |

due to sample selection, specific drop-outs or non-participation or it actually mirrors the true occurrence in respective populations. This study design included a random selection of participants; however, no non-participation analysis was possible to include due to students being absent from the classrooms. The number of students absent at the time of the survey was low, indicating a reasonably low risk of bias concerning the actual prevalence of dental anxiety.

*Temperament*

The differences found between girls and boys with regard to dimensions in temperaments may be considered small, although there were statistical significances. The fact that girls were shown to have significantly higher values than boys on emotionality and sociability are, however, well in line with Buss and Plomin [33]. The higher value in boys concerning activity, albeit not significant in the present study, have also been shown to be consistent with Buss and Plomin [33]. The results of Lundgren et al. [21], on the other hand, identified only a difference in emotionality in adult men and women, where the women had the higher mean scores. Their results also coincide well with the correlation analysis performed in this study, which showed a good correlation between sex and emotionality. When it comes to the observed difference between the sexes regarding impulsivity, in contrast, Buss and Plomin [33] did not report any results of such difference. A small correlation between gender and impulsivity was, however, evident in the correlation analysis, even though not especially distinctive.

Previous studies have shown that shyness [20,23] and shyness in combination with emotionality could be a contributing factor to the development of dental anxiety in children [20]. This study shows a slightly different result, possibly to be interpreted with caution because the group with dental anxiety included few individuals. The higher values concerning emotionality and impulsivity, in the group with dental anxiety in this study, may be related to girls being over-represented regarding dental anxiety, which could therefore affect the results in that direction. The results, however, overlap otherwise well both with the results of Lundgren et al. [21] and Arnrup et al. [36]. Lundgren et al. [21] showed that patients with higher levels of dental anxiety had significantly higher values, both in emotionality and impulsivity, than patients with no dental anxiety. The results of Arnrup et al. [36] showed that the uncooperative children had a significantly higher mean, considering dental anxiety, emotionality as well as impulsivity, compared with the reference group. Klingberg and Broberg [20], however, showed that children with dental anxiety not only had significantly higher values in emotionality, but also values regarding shyness were higher, which does not coincide with the results of this study.

In the case of the observed positive correlation between DFS scores and impulsivity, it is also true

with results from a previous study [21]. The negative correlation between the sum of the DFS score and activity that emerged did not find counterparts in the other studies but is consistent with the significantly higher average current activity in the non-dental anxiety students.

*Dental anxiety, temperament and previous experiences of dental care*

Klingberg [16] showed that the experience of painful dental treatments increases the risk of developing dental anxiety and dental behavior management problems. Several other studies have also shown that dental anxiety may be acquired by the child or youth if they have been exposed to painful dental experiences [7,10,15,17]. The hierarchical multiple regression that was performed in the present study revealed a result that is in the same direction. The results of the analysis showed that temperament may be a contributing factor for dental anxiety, but that gender and previous experience of pain had an even higher impact on the level of dental anxiety. That result coincides well with the results of Liddell [37], who concluded that, although the factors that have to do with the temperament have a contributing factor, it is nevertheless the unpleasant dental experiences that are crucial for the development of dental anxiety. The results of that study, where the individuals were 12 years of age, showed that the children who seemed to be more likely to report dental anxiety were those who showed the most pain or distress at previous dental visits.

Other studies [20,21,23,24], which were intended to look at the relationship between temperament and dental anxiety, have not reached the same conclusion. Part of those results have, as is clear from the discussion, however, coincided with the results of this study, but the main results are different. However, the other studies have used individuals of different ages. None of the studies have, as far as the authors of this study know, been controlling for the effects of previous experiences of pain during dental care statistically with multivariate analysis.

The strength of the study was the randomly selected sample using a cluster selection method. Moreover, the sample site should be considered acceptable with few refusals and missing answers in the questionnaires. Thus, the results may be found representative for 15-years old individuals. However, the results cannot be interpreted with respect to causal relationships due to the lack of a temporal design.

## Conclusions

There were fewer of the adolescents in this study who were classified as dentally anxious, compared with other similar studies using the DFS as a questionnaire. Although three of the temperaments correlated significantly with dental anxiety, which may emphasize an important finding with regard to personality, the most significant predictors of dental anxiety among 15-year-olds were gender and reported painful or unpleasant dental treatments.

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