**Anxiety, stress and coping patterns in children in dental settings**

**Pop-Jordanova Nadica1\***, Sarakinova Olivera2, Pop Stefanova Trposka Maja2, Zabokova Bilbilova Efka3

1Macedonian Academy of Sciences and Arts, Skopje, R. Macedonia

2Faculty of Dentistry, European University, Skopje, R. Macedonia

3Department for Pediatric and Preventive Dentistry, “Ss. Cyril and Methodius” University, Faculty of Dentistry, Skopje, R. Macedonia

**Abstract**

*Background*: Fear of the dentist and dental treatment is a common problem. It can cause treatment difficulties for the practitioner, as well as severe consequences for the patient.

As it known, the level of stress can be evaluated thought electro dermal activity, cortisol measure in saliva, or indirectly by psychometric tests.

*Aim and methodology*: The present study examined the psychological influence of dental interventions on the child as well as coping patterns used for stress diminution.

We examined two matched groups of patients: a) children with orthodontic problems (anomalies in shape, position and function of dentomaxillofacial structures) (N=31, mean age 10, 3 ± 2, 02) years; and b) children with ordinary dental problems (N= 31, mean age 10, 3 ± 2, 4 years).

As psychometric instruments we used: 45 items Sarason’s scale for anxiety, 20 items simple Stress-test adapted for children, as well as A- cope test for evaluation coping patterns.

*Results:* Obtained scores confirmed the presence of moderate anxiety in both groups as well as moderate stress level. For Sarason’s test obtained scores for the group with dental problems are 20, 63 ± 8, 37 (from max 45); and for Stress test 7, 63 ± 3, 45 (from max 20); for the orthodontic group obtained scores are 18, 66 ±6, 85 for Sarason’s test, while for the Stress test were 7, 76 ±3, 78. One way ANOVA confirmed significant difference in values of obtained scores related to the age and gender. Calculated Student t-test shows non-significant differences in obtained test results for both groups of examinees.

Coping mechanisms evaluated by A-cope test shows that in both groups the most important patterns used for stress relief are: developing self-reliance and optimism; avoiding problems and engaging in demanding activity.

*Conclusion*: this study confirmed that moderate stress level and anxiety are present in both groups of patients (orthodontic and dental). Obtained scores are depending on gender and age.

As more used coping patters in both groups are developing self-reliance and optimism; avoiding problems and engaging in demanding activity.

Some strategies in managing this problem are discussed.

**Keywords**: stress, anxiety, coping system, children, dentistry

Correspondence and requests for offprint to:

Nadica Pop Jordanova

Macedonian Academy of Sciences and Arts, Skopje, R. Macedonia

e-mail: [popjordanova.nadica@gmail.com](mailto:popjordanova.nadica@gmail.com)

**Introduction**

Dental fear usually indicates a unpleasant emotional reaction to specific threatening stimuli occurring in situations associated with dental treatment, while dental anxiety is an excessive and unreasonable negative emotional state experienced by dental patients.

Anxiety, fear and perceived stress in dental setting are common worldwide. It is especially the problem related to the pediatric dentistry. It was assumed that fear and anxiety have a mean prevalence between 10% and 20%, being particularly high in the earliest ages.

Statistics show that generally people from low socioeconomic status groups reported a higher level of dental fear than those individuals from high socioeconomic groups. The reported incidence of high dental fear and anxiety was 10% in an Icelandic study but slightly higher in a Singaporean population, at 17.1%. A cross-cultural study of Chinese and Danish patients reported moderate to high dental fear in 30% of Chinese and 15% of Danish participants. In 2009, a study of dental fear prevalence in Netherlands reported 24.3% of the participants had moderate to high dental fear. Dental fear studies on German populations have reported a mean Dental Anxiety Score of 8.6 and a dental phobia incidence of 11%. The highest prevalence of dental fear appears to be in Japan, where a study of 3041 students and adults reported that 42.1% had high dental fear ([Ava Elizabeth Carter](http://pubmedcentralcanada.ca/pmcc/solr?term=author:(Ava%20Elizabeth%20Carter)), 2014).

However, perceived stress in dental setting can arises in both, patients as well as in dental practioners. Many studies demonstrated that stress in dental practioners arises from pediatric examination and treatment and can be broadly divided into those produced by the child and those produced by the child's guardian (usually the mother). On the other side, the patients (children) usually manifest some discomphor in dental setting which could be manifested as anxiety, worry or stress. In some patients this anxiety can be so high and be presented as odontophobia. Fearful patients might neglect their teeth and oral hygiene and avoid any treatment procedures.

Processes known to contribute to the etiology of dental fear and phobia especially, include a variety of genetic, behavioral, and cognitive factors. Genetic vulnerability factors may interact with other etiological elements that cause the phobia.

The theory of classic conditioning explains acquired fear as a result of previous negative or traumatic experiences. Consequently, negative experiences during dental treatment are possible factors that promote dental anxiety, and several studies have findings that support this (Storjord et al. 2014).

In our previous study (Pop-Jordanova et al. 2013) in a sample of 50 schoolers we showed the presence of high anxiety level among all children undergoing dental intervention. It was confirmed differences in anxiety scores between girls and boys, girls having higher scores. Personality characteristics (evaluated with Eysenck personality questionnaire) showed low psychopathological traits, moderate extroversion and neuroticism, but accentuated insincerity (evaluated with L scale). We do not found the correlation between personality traits (obtained scores for EPQ) and anxiety, except for the neuroticism which was positively correlated with the level of anxiety.

The aim of this study was to evaluate anxiety and perceived stress in two groups of patients: orthodontic and dental, and elaborate the patterns of coping mechanisms they use to mediate the stress level.

**Methodology and sample**

The evaluated sample comprises two groups of schoolers: a) children with orthodontic problems (anomalies in shape, position and function of dentomaxillofacial structures) (N=31, mean age 10, 3 ± 2, 02 years); and b) children with ordinary dental problems (N= 31, mean age 10, 3 ± 2, 4 years). Both genders are presented equally. Examinees were selected by chance.

As psychometric test we used: Sarason’s General Anxiety Scale, Stress test for children and A-Cope questionnaire for assessing coping style.

The **Sarason’s General Anxiety Scale for Children (GASC)** is a 45 item yes/no scale for use with children in grades 1-9. It measures chronic, generalized anxiety. Obtained score of 12 or below ranks in the low anxiety range. A score of 12-20 ranks in the medium range. Any score above 20 signifies high anxiety. Scoring 15 or greater is a good indication that child experience considerable discomfort about the situation in which he is (12).

**Stress-test** is simple yes/no 20 items questionnaire where the higher scores are related to higher stress level [13].

**The A-COPE** is a coping inventory designed to explore children’s coping behaviors that result from the normal stress associated with trying to create a balance between being connected to and at the same time independent from one’s family (15). The coping inventory identifies the behaviors children’s find helpful in managing problems or difficult situations. The A-COPE can be used as one single scale or broken into 12 sub-scales that reflect 12 different coping patterns: 1) ventilating feelings (like yelling and blaming), 2) seeking diversions (like sleeping or watching TV), 3) developing self-reliance and optimism (like organizing his/her life), 4) developing social support (like helping others solve their problems), 5) solving family problems (like working through family rules), 6) avoiding problems (like substance use or ignoring the problems), 7) seeking spiritual support (like talking to clergy), 8) investing in close friends (like boyfriends or girlfriends), 9) seeking professional support (like getting help from a counselor), 10) engaging in demanding activity (like strenuous physical activity or academically challenging activity),11) being humorous (like making a joke of the situation), and 12) relaxing (like listening to music).

Psychological tests in this study were applied prior dental intervention. Usually, children were accompanied by their mothers and they gave prior consent for the study.

For statistical calculations the online package Statistics 8 is used.

**Results**

As we mentioned, two samples of examinees comprised a) 31 children with orthodontic problems, mean age 10, 3 ± 2, 0 2 years; and b) 31 children with simple dental problems, mean age 10, 3 ± 2, 4 years. Samples are matched by age and gender.

For Sarason’s anxiety test obtained scores for the group with dental problems are 20, 63 ± 8, 37 (from max 45); this results correspond to moderate anxiety level. For Stress test 7, 63 ± 3, 45 (from max 20), which correspond to small stress level. For the orthodontic group obtained scores are 18, 66 ± 6, 85 for Sarason’s anxiety tests and 7, 76 ±3, 78 for Stress test (Fig 1).

***Fig. 1*** *Obtained scores for both psychometric test in orthodontic and dental patients*

Calculated one-way ANOVA showed significant variance in scores obtained for Sarason’s anxiety scale for age in both groups of patients (Table 1).

**Table 1.** ANOVA for age related variance on scores for Sarason’s test in both groups

a)



b)



Calculated one-way ANOVA for significance of age in stress test is presented on Table 2. In this calculation results also confirmed the influence of the age on variance of obtained scores.

**Table 2.** ANOVA for age and scores for stress-test in both groups

a)



b)



Correlation between age and scores for Sarason’s anxiety test is shown in Fig. 2. We obtained small positive correlation between mentioned two variables.

  a) b)

***Fig. 2*** *Correlation between age and scores obtained for Sarason’s anxiety test*

Correlation between scores obtained for Stress-test for both the group of patients is presented on Fig. 3.

 

a) b)

***Fig. 3*** *Correlations between age and obtained scores for Stress-test in both groups of examinees*

As can be seen, the correlation between age and obtained scores for Stress-test is negative for orthodontic patients, but positive for dental patients.

Finally, we calculated Student t-test for obtained scores in both groups for both psychometric tests (Fig 4 and 5).





***Fig. 4*** *T-test for scores obtained for Sarason’s anxiety test in both groups*





***Fig. 5*** *T-test for scores obtained for Stress-test in both groups*

It is clear, that Student t-test showed not significant differences in obtained scores for both tests in both groups of examinees.

Coping can be defined as a set of cognitive and affective actions that arise in response to a particular concern. They represent an attempt to restore the balance or remove the turbulence for the individual. This may be done by solving the problem (removing the concern) or accommodating the concern without bringing about a solution.

The A-COPE applied in this research can be used as one single scale or broken into 12 sub-scales that reflect 12 different coping patterns: 1) ventilating feelings (like yelling and blaming), 2) seeking diversions (like sleeping or watching TV), 3) developing self-reliance and optimism (like organizing his/her life), 4) developing social support (like helping others solve their problems), 5) solving family problems (like working through family rules), 6) avoiding problems (like substance use or ignoring the problems), 7) seeking spiritual support (like talking to clergy), 8) investing in close friends (like boyfriends or girlfriends), 9) seeking professional support (like getting help from a counselor), 10) engaging in demanding activity (like strenuous physical activity or academically challenging activity), 11) being humorous (like making a joke of the situation), and 12) relaxing (like listening to music).

Obtained all 12 coping patterns for patients in both groups are presented on Fig. 6.

Coping mechanisms evaluated by A-cope test shows that in both groups the most important patterns used for stress relief are: developing self-reliance and optimism (3); avoiding problems (6) and engaging in demanding activity (10).

***Fig. 6*** *Obtained 12 coping patterns in both groups of patients*

**Discussion**

As we presented in the Results, our study showed the presence of moderate anxiety and relatively low stress level in evaluated school children in both groups (orthodontic and dental settings). This results differ for our previous study (Pop-Jordanova et al. 2013) where the obtained anxiety scores were more accentuated and higher for girls compared to the boys. We suppose that pretreatment preparation organized in the last period, as well as teaching children for necessity of oral hygiene in elementary school are very important for diminish anxiety/ stress manifestations. Our results are quite similar to the other studies in this context.

In a recent study published by [Nelson](http://pubmedcentralcanada.ca/pmcc/solr?term=author:(Travis%20M.%20Nelson)) et al. (2015) the aim was to identify factors related to young children’s distress during preventive oral health visits. Study showed that the majority of parents report that young children experience moderate to severe distress during preventive dental treatment. Pre-examination distress and difficulty with prior medical examinations and immunizations are significantly associated with distress during dental exam. Additionally, it was suggested that dental providers can help parents of young children to develop a habit of routine paediatric preventive care by anticipating child behaviors, informing parents about possible child reactions, providing parent coaching, and altering their own style to facilitate a positive experience.

Similar study related to anxiety in dental practice was performed by [Storjord](http://pubmedcentralcanada.ca/pmcc/solr?term=author:(Helene%20Persen%20Storjord)) et al. (2014). The authors compared dental anxiety in students of dentistry, biology, and psychology and showed that dental students demonstrated a lower degree of dental anxiety compared to psychology students and biology students. Senior dental students with clinical experience also showed a lower dental anxiety level than junior dental students. The practice-oriented dentistry education at the study university might contribute to the differences in anxiety levels between new and experienced dentistry students.

Having in mind that dental fear and anxiety are strong negative emotions associated with dental treatment especially among children and adolescents [Cianetti](http://pubmedcentralcanada.ca/pmcc/solr?term=author:(Stefano%20Cianetti)) et al. (2017) published a meta-analysis about interventions used to diminish these problems. Two main techniques have been analyzed: pharmacological and non-pharmacological. Non–pharmacological interventions can be theoretically grouped into: improved communication skills, rapport and trust building; behaviour modification techniques; cognitive behavioural therapy and physical restraints. Authors supported the second approach as more available and useful. In an older study, [Hunter](http://pubmedcentralcanada.ca/pmcc/solr?term=author:(M.%20J.%20Hunter)) et al. (1990) proposed rectally administered methohexital as a safe, effective sedative to ameliorate the stress of the dental surgical experience for the uncooperative child.

Unlike dental care for adults, care for young children necessitates a triadic relationship among the patient, parent, and clinician. Research demonstrates that the dental fear of a child who is 8 years or younger is significantly related to the dental fear of the parent. Emotional aspects of the dental experience, for the child and the parent, influence a parent’s decision to return for subsequent dental visits.

Recommendations derived from the literature suggest that medical providers’ use of distraction, nonprocedural talk, breathing exercises, specific directions to the child, and physical contact such as bouncing, patting, and rocking may improve a child’s reaction to care. It has been suggested also to use the live or Filmed modeling technique as an effective intervention to prepare the child for a dental visit ([Afshar](http://pubmedcentralcanada.ca/pmcc/solr?term=author:(Hossein%20Afshar)) et al. 2011).

Intervention which can be useful for fear diminution are Cognitive behavioral therapy, relaxation therapy, computer-assisted relaxation learning, hypnotherapy, group therapy, individual systematic desensitization, pharmacological, flooding (implosion), and swallowing relaxation. These forms of treatment are essentially a form of counter conditioning to reverse the fear/ anxiety into a state of acceptance and calm. Our own experience with peripheral biofeedback procedure showed very positive effect to stress diminishing in different groups of children-patients (9, 10, 11). We propose the use of this technique broadly.

**Conclusions**

The study confirmed moderate anxiety and relatively normal stress level in school children undergoing orthodontic and dental interventions.

Obtained scores for psychometric tests are significantly variable according to the age (one-way ANOVA).

Not significant differences are obtained between mean values of scores in both groups of examinees and for both psychometric tests (t-test was > 0, 05).

For Sarason’s anxiety test very small positive, but not significant correlation was obtained for age and scores (r= 0, 13; r= 0, 7 respectively).

For Stress-test, calculated correlations between age and scores differs: it is positive for dental (r= 0, 33) and negative for orthodontic group of patients (r= -0, 20), but without statistical significance.

For stress mediation evaluated children used three main coping patterns: developing self-reliance and optimism (3); avoiding problems (6) and engaging in demanding activity (10).

We propose the use of peripheral biofeedback for diminishing anxiety and stress as a most easy for application and highly cost-benefit procedure for children.

**References**

1. [Afshar](http://pubmedcentralcanada.ca/pmcc/solr?term=author:(Hossein%20Afshar)) H, [Nakhjavani](http://pubmedcentralcanada.ca/pmcc/solr?term=author:(Yahya%20Baradaran%20Nakhjavani)) YB, [Mahmoudi-Gharaei](http://pubmedcentralcanada.ca/pmcc/solr?term=author:(Javad%20Mahmoudi-Gharaei)) J, [Mehrsa Paryab](http://pubmedcentralcanada.ca/pmcc/solr?term=author:(Mehrsa%20Paryab)) M, [Zadhoosh](http://pubmedcentralcanada.ca/pmcc/solr?term=author:(Sommaye%20Zadhoosh)) S. The Effect of Parental Presence on the 5 year-Old Children's Anxiety and Cooperative Behavior in the First and Second Dental Visit. Iran J Pediatr. 2011; 21(2): 193–200.

2. [Basudan](http://pubmedcentralcanada.ca/pmcc/solr?term=author:(Sumaya%20Basudan)) S,[Binanzan](http://pubmedcentralcanada.ca/pmcc/solr?term=author:(Najla%20Binanzan)) N,[Alhassan](http://pubmedcentralcanada.ca/pmcc/solr?term=author:(Aseel%20Alhassan)) A. Depression, anxiety and stress in dental students. Int J Med Educ. 2017; 8: 179–186.

3. [Carter](http://pubmedcentralcanada.ca/pmcc/solr?term=author:(Ava%20Elizabeth%20Carter)) AE,  [Carter](http://pubmedcentralcanada.ca/pmcc/solr?term=author:(Geoff%20Carter)) G, [Boschen](http://pubmedcentralcanada.ca/pmcc/solr?term=author:(Mark%20Boschen)) M, [Al Shwaimi](http://pubmedcentralcanada.ca/pmcc/solr?term=author:(Emad%20AlShwaimi)) E, and [George](http://pubmedcentralcanada.ca/pmcc/solr?term=author:(Roy%20George)) R. Pathways of fear and anxiety in dentistry: A review. World J Clin Cases. 2014 November 16; 2(11): 642–653.

4. [Cianetti](http://pubmedcentralcanada.ca/pmcc/solr?term=author:(Stefano%20Cianetti)) S, [Paglia](http://pubmedcentralcanada.ca/pmcc/solr?term=author:(Luigi%20Paglia)) L, [Gatto](http://pubmedcentralcanada.ca/pmcc/solr?term=author:(Roberto%20Gatto)) R, [Montedori](http://pubmedcentralcanada.ca/pmcc/solr?term=author:(Alessandro%20Montedori)) A, [Lupatelli](http://pubmedcentralcanada.ca/pmcc/solr?term=author:(Eleonora%20Lupatelli)) E. Evidence of pharmacological and non-pharmacological interventions for the management of dental fear in paediatric dentistry: a systematic review protocol. BMJ Open. 2017; 7(8): e016043.

5. [Hunter](http://pubmedcentralcanada.ca/pmcc/solr?term=author:(M.%20J.%20Hunter)) MJ, [Griswold](http://pubmedcentralcanada.ca/pmcc/solr?term=author:(J.%20D.%20Griswold)) JD, [Rosenberg](http://pubmedcentralcanada.ca/pmcc/solr?term=author:(M.%20Rosenberg)) M. Administration of methohexital for pediatric outpatient dentistry. Anesth Prog. 1990; 37(5): 248–251.

6. [Nelson](http://pubmedcentralcanada.ca/pmcc/solr?term=author:(Travis%20M.%20Nelson)) TM,  [Huebner](http://pubmedcentralcanada.ca/pmcc/solr?term=author:(Colleen%20E.%20Huebner)) CE, [Kim](http://pubmedcentralcanada.ca/pmcc/solr?term=author:(Amy%20Kim)) A, [Scott](http://pubmedcentralcanada.ca/pmcc/solr?term=author:(JoAnna%20M.%20Scott)) JM, [Pickrell](http://pubmedcentralcanada.ca/pmcc/solr?term=author:(Jacqueline%20E.%20Pickrell)) JE. Parent-Reported Distress in Children Under 3-years Old During Preventive Medical and Dental Care. [Eur Arch Paediatr Dent. 2015; 16(3): 283–290.](http://www.ncbi.nlm.nih.gov/entrez/eutils/elink.fcgi?dbfrom=pubmed&retmode=ref&cmd=prlinks&id=25514877)

7. [Paryab](http://pubmedcentralcanada.ca/pmcc/solr?term=author:(Mehrsa%20Paryab)) M, [Zeinab Arab](http://pubmedcentralcanada.ca/pmcc/solr?term=author:(Zeinab%20Arab)) Z. The effect of Filmed modeling on the anxious and cooperative behavior of 4-6 years old children during dental treatment: A randomized clinical trial study. Dent Res J (Isfahan). 2014; 11(4): 502–507.

8. Pop-Jordanova N**.**, Sarakinova O., Markovska-Simoska S., Loleska S. Anxiety and personality characteristics in children undergoing dental interventions. Прилози. МАНУ (Одд. мед. науки) / Contributions. MASA (Sec. Med. Sci.), 2013; 34 (3): 93-103.

9. Pop-Jordanova N. Electrodermal response based biofeedback in pediatric patients. Paediatr. Croat. 1999; 43: 117-120.

10. Pop-Jordanova N. Biofeedback application for somatoform disorders and attention deficit hyperactivity disorder (ADHD) in children, International Journal of Medicine and Medical Sciences, 2009; 1(2): 17–22.

11. Pop-Jordanova N., Demerdzieva A. Biofeedback Training for Peak Performance in Sport - Case Report. Macedonian Journal of Medical Sciences, 2010; 3(2): 113-118.

12. Sarason IG. The test anxiety scale: concept and research. In Spielberg CD, Sarason IG, Stress and Anxiety (vol. 5) Washington DC, Hemisphere Publishing Co.1978.

13. Spence SH, Barrett PM, Turner PM. [Psychometric Properties of the Spence Children's Anxiety Scale with Young Adolescents](http://www.scaswebsite.com/docs/spence-barrett-turner2003.pdf). J Anxiety Disord 2003;17(6): 605-625.

14. [Storjord](http://pubmedcentralcanada.ca/pmcc/solr?term=author:(Helene%20Persen%20Storjord)) HP, [Teodorsen](http://pubmedcentralcanada.ca/pmcc/solr?term=author:(Mari%20Mj%C3%B8nes%20Teodorsen)) MM, [Bergdahl](http://pubmedcentralcanada.ca/pmcc/solr?term=author:(Jan%20Bergdahl)) J, [Wynn](http://pubmedcentralcanada.ca/pmcc/solr?term=author:(Rolf%20Wynn)) R, and [Kolset Johnsen](http://pubmedcentralcanada.ca/pmcc/solr?term=author:(Jan-Are%20Kolset%20Johnsen)) JA. Dental anxiety: a comparison of students of dentistry, biology, and psychology. J Multidiscip Healthc. 2014; 7:413-418.

15. Stanton AL., Kirk SB., Cameron CL., & Danoff-Burg S. Coping through emotional approach: Scale construction and validation. Journal of Personality and Social Psychology, 2000; 78(6), 1150-1169.