

Līga Kroniņa

CORRELATION
OF THE CHILDREN'S
DENTAL FEAR AND ANXIETY
WITH ORAL HEALTH AND
PSYCHOSOCIAL FACTORS

Summary of the Doctoral Thesis
for obtaining the degree of a Doctor of Medicine

Speciality – Dentistry

Riga, 2017

The Doctoral Thesis was carried out at Rīga Stradiņš University Institute of Dentistry Rīga Stradiņš University Department of Conservative Dentistry and Oral Health.

Scientific supervisors:

Dr. med., Professor **Rūta Care**,
RSU Department of Conservative Dentistry and Oral Health, Latvia
Dr. psych., Professor **Malgožata Raščevska**,
University of Latvia Faculty of Education, Psychology and Art

Official reviewers:

Dr. med., Professor **Ilze Akota**,
RSU Department of Oral and Maxillofacial Surgery, Latvia
Dr. med., Assistant Professor **Daiga Kviļūna**,
Children's Clinical University Hospital, Latvia
Dr. psych., Assistant Professor **Inga Skreitule-Pikše**,
University of Latvia Faculty of Education, Psychology and Art,
Department of Psychology

Defence of the Doctoral Thesis will take place at the public session of the Doctoral Council of Medicine on 19 June 2017 at 16.00 in Hippocrates Lecture Theatre, 16 Dzirciema Street, Rīga Stradiņš University.

Doctoral Thesis is available in the RSU library of and at RSU webpage:
www.rsu.lv.

Secretary of the Promotional Council:

Dr. med., Professor **Anda Brinkmane**

CONTENT

ABBREVIATIONS	5
INTRODUCTION	6
The aim of the study	8
Hypothesis of the study	9
Scientific novelty of the study	10
1. MATERIAL AND METHODS	11
1.1. Study subjects	11
1.2. Study procedure (course).....	11
1.3. Study tools (methods).....	12
1.4. Statistical methods of the study	14
2. RESULTS	16
2.1. DFA, children's age and gender.....	16
2.2. DFA and oral health	17
2.3. DFA and child's dental behaviour	18
2.4. Children's and the parents' dental fear	18
2.5. DFA and various psychosocial factors	18
2.5.1. DFA and socio-economic factors	18
2.5.2. DFA and the children's medical experience	19
2.5.3. DFA and the children's dental experience	21
2.5.4. DFA and parents and information factors	24
2.5.5. DFA and the children's oral care habits	27
2.5.6. DFA and the children's personality factors.....	28
2.5.7. DFA and family stress factors	29
2.6. DFA and regression analysis of psychosocial factors.....	29
3. DISCUSSION.....	37
3.1. CFSS-DS reliability and validity.....	37
3.2. DFA and children's internal factors	38

3.2.1. DFA and children’s age.....	38
3.2.2. DFA and children’s gender	39
3.2.3. DFA and the child’s temperament.....	39
3.2.4. DFA and the child’s general anxiety	40
3.2.5. DFA and the number of non-dental fears	40
3.2.6. DFA and children’s dental behaviour.....	41
3.3. DFA and external family factors	41
3.3.1. The children’s and the parents’ DFA	41
3.3.2. DFA and information transferred from parents	42
3.3.3. DFA and socio-economic indicators	43
3.4. DFA and different external dental factors	45
3.4.1. DFA and the child’s first dental visit.....	45
3.4.2. DFA and previous negative experiences	46
3.4.3. DFA and traumatic medical experience	47
3.5. DFA and oral health	48
3.6. Regression analysis of DFA-explaining factors	50
3.7. Study limitations.....	50
CONCLUSIONS	55
PUBLICATIONS AND PRESENTATIONS	59
AKNOWLEDGEMENTS	62
BIBLIOGRAPHY.....	63

ABBREVIATIONS

ANOVA	analysis of variance
ANCOVA	analysis of covariance
ANCOVA F	a criterion showing relationship between intergroup variance and intragroup variance
Beta (β)	standardized regression coefficient (relative value)
B	non-standardized regression coefficient (absolute value)
BII	blood-injury-injection phobia
DFA	dental fear and anxiety
CFSS-DS	Children's Fear Survey Schedule - Dental Subscale
CFSS-SF	Children's Fear Survey Schedule - Short Form
DFA	dental fear and anxiety
DSM IV	Diagnostic and Statistical Manual of Mental Disorders, 4th Edition
EASI	Emotionality – Activity – Sociability - Impulsivity
ICDAS	International Caries Detection and Assessment System
DFM	number of decayed, filled and missing teeth in a mouth
df	number of decayed and filled deciduous teeth in a mouth
dfm	number of decayed, filled and missing milk teeth in a mouth
M	mean (mean value)
MDAS	Modified Dental Anxiety Scale
N	number of all respondents in the selection
n	number of respondents in the subselection
NE	negative experience
p	statistical significance
r	correlation coefficient
R ²	square of multivariate correlation coefficient
SD	standard deviation
SE	standard-error
t	Student t test value
WHO	World's Health Organization

INTRODUCTION

Dental fear at all times has been a subject of broad and current interest. Regardless of increasingly progressive technologies of the 21st century (lasers, ozone, ultrasound, sedation, Wand and general anaesthesia) this kind of fear still remains, especially in the youngest part of the population, namely, in children. People's fear of dentists has consequences in different fields – physiological (sweating, dry mouth, increased heart rate), cognitive (negative thoughts, memories, narrowing of consciousness), behavioural (avoidance of dentists, eating of certain products, watching certain media and films), health (sleep disorders, nightmares, as well as deterioration of oral health) and social (avoidance of engaging in deeper professional and personal relationships) (Cohen *et al.*, 1985).

Studies of the recent decades have explored the link between dental fear and various internal factors, such as the child's age and sex (Winer, 1982; Klingberg & Broberg, 2007), other specific fears and their number (Berggren, 1992; Klingberg *et al.*, 1995) and sensitivity/vulnerability (Armfield *et al.*, 2008), anxiety as a personality trait (Fuentes *et al.*, 2009), the child's temperament (Arnrup *et al.*, 2007), neurotism (Schoor *et al.*, 1986), stress levels (Alfayad & Al-Hadithy, 2012), the child's behaviour in the dental office (Klingberg *et al.*, 1994), and heredity (Thomson *et al.*, 2009; Ray *et al.*, 2010). Correlation between dental fear and external factors of children and adults related to dental care, such as behaviour of the dental team (Zhou *et al.*, 2010), a negative experience with the dentist (Locker *et al.*, 1996), the child's first dentist appointment (Rantavuori *et al.*, 2002), early dental treatment (Locker *et al.*, 1999) has also been studied. Many studies have also been carried out on correlation between dental fear and non-dental external factors, such as general diseases and frequent hospitalizations (Wogelius *et al.*, 2003, 2009), injuries

(*De Jongh et al.*, 2006), children's and parents' fear (*Themessl-Huber et al.*, 2010), socio-economic and socio-demographic factors of the family (*Folayan et al.*, 2004), including parents' level of education (*Pohjola*, 2007), income level (*Hittner & Hemmo*, 2009) and parents living together or separately (*Gustafsson et al.*, 2007). Finally, much has been studied on correlation between dental fear and regularity of dental appointments or avoidance thereof (*Berggren et al.*, 1984; *Armfield et al.*, 2007), reduced number of dental appointments (*Carillo-Diaz et al.*, 2012), oral care habits (*Pohjola et al.*, 2016), as well as oral health and its link with the quality of life (*Cohen*, 1985; *Taani et al.*, 2005; *Akbay-Oba et al.*, 2009; *Beena*, 2013).

Most often, correlation between various factors and dental fear has been studied in simple correlative studies. A few studies have covered regression analysis of some factors (*Klingberg et al.*, 1995; *Milgrom et al.*, 1995; *Majstorovič et al.*, 2001; *Milsom et al.* 2003; *Suprabha et al.*, 2011; *Paryab & Hosseinbor*, 2013), while only a few studies have been targeted at explanation of simultaneous contribution of many factors in development of dental fear (*Armfield et al.*, 2009), especially in children (*Lee et al.*, 2008). Therefore, it seemed important to examine a simultaneous, multifactorial link with the children's fear of the dentist.

Until now no quality studies on children or adult dental fear has been carried out in Latvia. Only doctoral thesis by Sandra Bērziņa on caries and periodontal pathology prevalence in children and adolescents in Latvia, based on pupils' survey data, have stated that the main reason to discourage the 11 to 15 year olds from dentist appointments, is their fear of pain and treatment, and such an answer was given by 45% of the surveyed adolescents (*Bērziņa*, 2004). Also, until now no investigations have been carried out in Latvia on how much children's and parents' dental fear affects oral condition and what psychosocial factors correlate with dental fear and anxiety in children.

The aim of the study

To assess the correlation between the children's dental fear/anxiety, oral health and various psychosocial factors.

The objectives of the study

1. To assess reliability and validity of the CFSS-DS (Dental Subscale of the Children's Fear Survey Schedule) for analysis of dental fear of children of various age groups in Latvia.
2. To assess correlation between the children's dental fear and anxiety and children's internal (personality and behaviour) factors – the child's age, sex, temperament, general anxiety, number of non-dental fears and dental behaviour.
3. To assess the relationship between the children's dental fear and anxiety and external family (parents and information) factors – parents' dental fear and anxiety, information and preparation of the child for the dental appointment, as well as socio-economic/socio-demographic indicators of parents.
4. To assess the relationship between the children's dental fear and anxiety and external dental factors – the child's age at the first dental examination, as well as during the first dental treatment, previous negative experiences in dental situations and traumatic medical experiences.
5. To assess the relationship between the level of the children's dental fear and anxiety and the child's oral health.
6. To assess psychosocial factors that most significantly explain dental fear and anxiety.

Hypothesis of the study

1. CFSS-DS (Dental Subscale of the Children's Fear Survey Schedule) Latvian version is a reliable and valid survey for evaluation of the children's dental fear.
2. The children's dental fear is correlated with children's internal (personality and behaviour) factors – the child's age, sex, temperament (activity, emotionality and shyness), general anxiety, number of non-dental fears and dental behaviour
3. The children's dental fear is correlated with external family (parents and information) factors – parents' dental fear and anxiety, information and preparation of the child for the dental appointment, as well as socio-economic/socio-demographic indicators of parents.
4. The children's dental fear is correlated with external dental factors – the child's age at the first dental examination, as well as during the first dental treatment, previous negative experiences in dental situations and traumatic medical experiences (such as in-patient treatment and/or chronic illnesses).
5. The children's dental fear and anxiety positively correlates with the number of decayed and missing teeth and surfaces and negatively correlates with the number of filled teeth and surfaces;
6. The child's dental fear, to varying extent, are explained by the child's previous dental and medical experience, the child's personality factors, parental and information factors, socio-economic/socio-demographic factors, dental care habits, as well as the family stress factors.

Scientific novelty of the study

1. This is the first extensive study in Latvia on the children's dental fear, its relationship with psychosocial factors and oral health.
2. Scientific novelty includes research of investment of various psychosocial factors on development of the children's dental fear.
3. Novelty includes determination of differences in dental fear levels in relation to types of specific explanations provided by parents to children before their dentist appointments.

1. MATERIAL AND METHODS

1.1. Study subjects

The study included 260 randomly selected children aged 4 to 12 years (mean age was 7.94 (SD = 2.60) years, 133 girls and 127 boys) and their parents. The complete set of data with questionnaires, as well as assessment of oral condition and the child's behaviour in the dentist's office was obtained from 240 participants (mean age was 7.96 (SD = 2.61) years, 122 girls and 118 boys).

1.2. Study procedure (course)

Prior to the study, a permission for execution of such a study was obtained from RSU Ethics Committee along with confirmation that the work complies with Helsinki Conference criteria. The study was carried out by one dentist (the author) from December 2010 to September 2013 at RSU Institute of Dentistry Paediatric Department. The author of the study approached the potential subjects of the appropriate age who during the study had to come to a routine dentist appointment, as well as their parents. The participants were not recruited purposefully (e.g., by special invitation to an appointment), however the study sample was approximately squared by age and sex. Since the use of factorial analysis was anticipated, the minimum number of subjects was 200. When the number of respondents exceeded 200 reaching enough respondents (≥ 15) in one age group, no more participants were approached to. No patients were also approached when the doctor or potential respondents were busy, as well as when parents refused to participate. However, these cases were not specifically recorded. Refusal to participate in the study had no effect on the

child's opportunity to receive dental services. If parents had agreed to participate in the study, they were informed of its procedure. After signing informed consent parents completed the survey questionnaire (optional in Latvian or Russian) before or during treatment of the child's teeth. After sitting the child in a dental chair, his or her dental condition was assessed along with the child's behaviour in the dental chair (by Frankl Scale). Assessment of dental status and the child's behaviour was performed by one dentist – the author of the study. Time and the fact of the first appointment and dental treatment (i.e., dental hygiene, filling and/or extraction) was recorded retrospectively in accordance with the record in the patient's outpatient card (if it was possible). The outpatient card was also used for clarification of the dental status, such as in case of tooth extraction.

1.3. Study tools (methods)

Parents rated their level of fear by *MDAS* (*Humphris et al.*, 1995., adapted to Latvian, *Kroniņa*, 2008). The questionnaire contained five questions about the parents' feelings before or during dental procedures. Answers were assessed by Likert scale from 1 ("relaxed") to 5 ("I sweat or feel nauseous"). Scores ranged from 5 to 25. Reliability of the method or Cronbach's alpha was high (0.85).

The children's DFA was assessed by *CFSS-DS* (*Cuthbert & Melamed*, 1982, adapted to Latvian, *Kroniņa*, 2008). The questionnaire included the question "How much is your child afraid?" and 15 dental and medical factors were given to be evaluated by Likert scale from 1 ("not afraid at all") to 5 ("very afraid"). Possible scores ranged from 15 to 75. Reliability of the method or Cronbach's alpha was high (0.91).

Various psychosocial factors that may affect a child's rapport and behaviour, as well as promote dental fear were assessed by an originally developed questionnaire within the study. It was comprised of seven blocks: socio-economic/socio-demographic (number of family members, age of parents, their education, employment, income), child's medical experience (chronic diseases, frequency of illnesses and doctors' appointments, traumatic experiences with doctors, child's attitude towards medical staff), dental experiences (the age of the child at the time of his/her first dentist appointment, during the dentist appointment, previous dental treatment, his/her negative experience with a dentist and coping with it, the child's attitude towards dental treatment), parents and information factor (how parents prepare the child before the dentist appointment, where they obtain information on the child's preparation and dental care, who accompanies the child to the dentist), dental care habits (how regularly they clean their teeth, what is the child's attitude towards dental care, use of fluorides), the child's character traits and behaviour (sociability, activity, emotionality, shyness, impulsivity, lability, general anxiety, ability to recompose themselves, the child's fear of other things and/or phenomena, number of the child's fears), as well as stress factors (in the parents' personal life, in the family and in relation to work). The child's dental status was determined by visual tactile method in a dental chair under examination light and by bitewing X-ray. Dental status was marked by letters: A – intact deciduous tooth, B – carious deciduous tooth, C – filled deciduous tooth, D – non-erupted permanent tooth, E – extracted permanent tooth, P – erupted permanent tooth. Tooth damage level was set under *ICDAS* (Ismail *et al.*, 2007) criteria (0 – intact tooth 2 – enamel caries, 3 – dentine caries, 4 – caries with pulp involvement, 5 – filled with primary caries, 6 – filled with secondary caries, 7 – filled, 8 – excluded surfaces, 9 – sealants or varnish). After the appointment, the number of carious, filled

and extracted teeth was calculated (separately for deciduous (df) and permanent teeth (DMF), as well as the sum of both showings (DMF + df)). Enamel caries-affected teeth and surfaces were regarded as intact ones and not as carious ones.

The child's behaviour in the dentist's office was measured by Frankl Scale (1 – very negative, 2 – rather negative, 3 – rather positive 4 – clearly positive) (*Frankl et al.*, 1962).

1.4. Statistical methods of the study

Both for *MDAS* and *CFSS-DS*, descriptive statistics (mean, standard deviation, minimum and maximum value) for each question and the sum of questions were calculated. Descriptive statistics were calculated also for characteristic indicators (df, DMF, DMF + df) in each child's oral health.

In order to test correlation between the children's and the parents' dental fear, the children's age, the child's dental behaviour and the number of decayed, filled and extracted teeth, Pearson's correlation analysis was carried out. Depending on the value of the correlation coefficient, correlation was assessed as strong (when $r \geq 0.7$), medium ($0.3 < r < 0.7$) or weak (when $r \leq 0.3$). Sex-related children's dental fear was tested by Student's t-test analysis. To test the link between the child's dental fear and the way of children's preparation for the dentist appointment, ANCOVA analysis was performed (the child's age was controlled). The results were assessed as statistically significantly diverse when the null hypothesis probability (p) was equal to 0.05 or less.

In order to determine which factors were decisive in development of the children's dental fear, Pearson's correlation and subsequent stepwise linear regression was performed with independent variables within the blocks of

psychosocial factors. The stepwise regression analysis of psychosocial factors included all independent variables which correlated with DFA with a reliability level $p < 0.1$. Variables with such a level of reliability could emerge as significant independent variables which reliably explain dental fear. In each linear regression step, one statistically significant independent variable was added until the step was reached (fixed), in which there was the maximum number of independent variables to explain the dependent variable (dental fear) in a statistically significant level, forming a certain model. Step number (for example, Step 4) described the number of dependent variables (e.g., 4) in this model. Coefficient R^2 described the extent to which (as a percentage) the resulting model or set of variables explained the variation in dental fear.

The statistical analysis was performed with SPSS version 22.0.

2. RESULTS

2.1. DFA, children's age and gender

The children's dental fear showed a statistically significant negative correlation with the age of the children, namely, the older the child was, the lower was the level of the child's dental fear ($r = -0.23$, $p < 0.001$). Mean levels of the children's fear peaked at 4 years of age (see Table 2.1), while the lowest – at 12 years of age. However, decline of the level of fear did not happen in a linear manner, as the six year olds had the third lowest level of fear, while in the eleven-year-olds – one of the highest levels of dental fear.

Table 2.1
Children's Fear Survey Schedule – Dental Subscale (CFSS-DS)
descriptive statistics indices by age and sex

Child's age	Total sample			Boys' sample			Girls' sample		
	n	M	SD	n	M	SD	n	M	SD
4	30	39.57	13.07	16	42.12	14.59	14	36.64	10.88
5	25	35.72	12.23	11	37.09	14.55	14	34.64	10.51
6	27	30.33	9.66	13	31.08	10.59	14	29.64	9.07
7	25	31.32	9.91	12	32.17	10.10	13	30.54	10.07
8	28	33.32	11.42	15	34.07	12.44	13	32.46	10.54
9	26	31.23	7.58	14	30.21	8.41	12	32.42	6.64
10	25	27.84	7.60	12	28.08	8.13	13	27.62	7.41
11	28	33.61	12.50	13	34.38	15.44	15	32.93	9.79
12	26	27.85	8.33	12	26.58	8.24	14	28.93	8.55
Total	240	32.45	10.97	118	33.13	12.30	122	31.80	9.50

At the mean, boys showed higher levels of dental fear than girls (respectively $M = 33.13$ ($SD = 12.30$), and $M = 31.80$ ($SD = 9.50$), however the differences were no statistically significant ($t = 0.94$, $p = 0.35$). The highest

mean level of fear was found in four years old boys – $M = 42.12$ ($SD = 14.59$), while the lowest mean level of fear was found in twelve-years old boys – $M = 26.58$ ($SD = 8.24$) and ten-years old girls – $M = 27, 62$ ($SD = 7.41$) (see Table 2.1). In examining convergent validity of CFSS-DS, correlation of the item 1 of the survey (“fear of dentists”) with the sum of other items was $r = 0.71$ ($p < 0.001$).

2.2. DFA and oral health

The children’s dental fear had statistically significant positive correlation with both the number of carious teeth (deciduous and permanent teeth) and a total of DMF ($DMF + df$) and df (see Table 2.2).

Table 2.2

Correlation between the number of decayed, missing and filled teeth (DMF and df) in permanent and deciduous teeth and the children's dental fear (CFSS-DS)

Dental health indicators:	Pearson’s correlation with children's dental fear (r)	p value
Total of DMF ($DMF+df$)	0.28	0.000
Permanent teeth (DMF)	0.07	0.340
Deciduous teeth (df)	0.33	0.000
Total of decayed teeth ($D+d$)	0.42	0.000
Permanent teeth (D)	0.17	0.021
Deciduous teeth (d)	0.43	0.000
Total of filled teeth ($F+f$)	- 0.11	0.079
Permanent teeth (F)	- 0.05	0.486
Deciduous teeth (f)	- 0.05	0.445
Total of extracted teeth (E)	- 0.07	0.378

There was no statistically significant correlation with the number of filled teeth (deciduous and permanent teeth) or with the number of extracted teeth.

2.3. DFA and child's dental behaviour

In examining the relationship between the children's dental fear (CFSS-DS) and the child's behaviour in the dentist chair (Frankl Scale), $r = -0.69$ ($p < 0.001$). This means that the more explicit was the child's dental fear of the dentist's, the more negative was the child's dental behaviour. This measurement was also used to test the CFSS-DS convergent validity.

2.4. Children's and the parents' dental fear

In examining the correlation between the children's and the parents' dental fear, $r = 0.28$ ($p < 0.001$). This means that the more explicit was the parents' dental fear, the stronger was the children's fear of the dentist.

2.5. DFA and various psychosocial factors

This chapter will look at the relationship between the children's fear and anxiety and various psychosocial factors such as parents' information and the family socio-economic/socio-demographic and stress factors, the child's medical and dental experience and attitude, the child's personality factors, as well as oral health and oral care factors.

2.5.1. DFA and socio-economic factors

In examining the relationship between the children's dental fear and the family's socio-economic/socio-demographic factors, there was found a statistically significant negative correlation with the number of family

members ($r = - 0.21$, $p = 0.001$), the number of household members ($r = - 0.17$, $p = 0.008$) and the number of children in the family ($r = - 0.21$, $p = 0.001$) (see Table 2.3).

Table 2.3

Relationship between the children's dental fear and socio-economic/socio-demographic factors

Socio-economic/socio-demographic factors	Pearson's correlation with the children's dental fear (r)	p value
Number of family members	- 0.21	0.001
Number of household members	- 0.17	0.008
Number of children	- 0.21	0.001
Marital status (married)	- 0.12	0.059
Marital status (cohabitation)	- 0.07	0.315
Mother's age	- 0.11	0.090
Father's age	- 0.04	0.499
Mother's education	- 0.10	0.122
Father's education	- 0.14	0.044
Mother's employment	- 0.01	0.844
Father's employment	- 0.00	0.958
Family income level	0.05	0.454

This means, the larger was the family and the household and the more children were in the family, the lower was the children's dental fear. A statistically significant negative correlation was found also in regard to the father's education ($r = - 0.14$, $p = 0.04$). Thus, the higher was the father's education, the lower was the children's dental fear.

2.5.2. DFA and the children's medical experience

In examining the relationship between the children's fear of the dentist, children's medical experience and attitude towards doctors (excluding dentists), there was found a statistically significant positive correlation with the

frequency of the child's ailments ($r = 0.13$, $p = 0.047$), doctor appointments exceeding 4 times a year ($r = 0.19$, $p = 0.003$), cautiousness towards doctors ($r = 0.28$, $p < 0.001$) and timidity (anxiety) towards doctors ($r = 0.41$, $p < 0.001$), as well as traumatic experience with doctors excluding dentists ($r = 0.14$, $p = 0.03$) (see Table 2.4).

Table 2.4

Relationship between the children's dental fear and the children's medical experience and attitude towards doctors

Medical experience and attitude factors	Number of respondents	Pearson's correlation with children's dental fear (r)	p value
Chronic illnesses	240	0.02	0.786
Frequency of medical conditions	240	0.13	0.047
Frequency of doctor appointments	238	0.13	0.053
Doctor's appoint. exceeding 4x/year	238	0.19	0.003
Friendly towards doctors	240	- 0.30	0.000
Neutral towards doctors	240	- 0.26	0.000
Cautious towards doctors	240	0.28	0.000
Anxious (timid) towards doctors	240	0.41	0.000
Frequency of doctor's appointments	239	0.11	0.099
Traumatic experience with the doctors	238	0.14	0.030
Number of traumatic experiences	44	0.27	0.081
Age at the traumatic experience	41	0.05	0.770
In-patient treatment	240	- 0.05	0.485
Number of in-patient treatments	135	0.07	0.409
Age at the in-patient treatment	128	- 0.16	0.069
Treatment under general anaesthesia	240	- 0.07	0.290
Number of treatments under general anaesthesia	71	- 0.17	0.161
Age during treatments under general anaesthesia	69	- 0.14	0.237
Child's physical traumas	240	0.01	0.936
Number of the child's traumas	72	0.00	0.975
Age in the time of the child's traumas	65	- 0.25	0.044

Dental fear statistically significantly negatively correlated with friendly attitude towards doctors ($r = - 0.30$, $p < 0.001$), neutral attitude towards

doctors ($r = -0.26$, $p < 0.001$), as well as the child's age, when he or she experienced the first trauma which led to the need for emergency assistance ($r = -0.25$, $p = 0.044$). This means, the earlier the children suffered from serious injuries, the more often these children fell ill and visited doctors, and the more cautious and timid they were towards doctors in general, the greater was their fear of the dentists. No statistically significant correlation between the children's dental fear and chronic illnesses was found.

2.5.3. DFA and the children's dental experience

In examining the relationship between the children's dental fear, children's dental experience and attitude towards dentists showed a strong statistically significant positive correlation with difficulties occurred during previous dental treatments ($r = 0.68$, $p < 0.001$), as well as the child's fear and crying on the dentist appointment ($r = 0.55$, $p < 0.001$). There was also a statistically significant positive correlation between the child's panic and hysteria on to the dentist appointment ($r = 0.34$, $p < 0.001$), the child's active protest and resistance to the dentist appointment ($r = 0.30$, $p < 0.001$), negative experiences with dentist ($r = 0.30$, $p < 0.001$) and coping with negative experience during dental treatment under general anaesthesia ($r = 0.31$, $p = 0.003$), the child's dental treatment under general anaesthesia ($r = 0.28$, $p < 0.001$), failure to take the child to the dentist at all ($r = 0.19$, $p = 0.003$) and the child's dental appointment in the first half of the day ($r = 0.13$, $p = 0.042$) (see Table 2.5). This means that children with greater fear of the dentist more often show fear and crying or actively protest or panic or are hysterical on the dentist appointment, they have had negative experiences with dentists, dental treatment always or almost always has progressed with great difficulty, and teeth had been treated under general anaesthesia.

By contrast, a statistically significant negative correlation was found between dental fear and the child's neutral attitude towards dentist appointment ($r = -0.36$, $p < 0.001$) and the child's willingness and interest in regard to going to the dentist ($r = -0.29$, $p < 0.001$), the child's previously received dental hygiene ($r = -0.24$, $p < 0.001$), previous dental filling under local anaesthesia ($r = -0.18$, $p = 0.005$), and the child's age (in months) at the first dental appointment indicated by parents ($r = -0.16$, $p = 0.011$) (see Table 2.5). This means children who had undergone dental hygiene and treatment under anaesthesia and have a positive or neutral attitude towards the dentist, are less afraid of the dentist.

Table 2.5

Relationship between the children's dental fear and the children's dental experience and attitude towards dentists

Dental experience and attitude factors	Pearson's correlation with the children's dental fear (r)	p value
First appointment to see the office	-0.16	0.011
First appointment upon referral of another doctor	0.08	0.245
First appointment because of changes in teeth	0.03	0.676
First appointment because of toothaches	0.07	0.314
Regularity of appointments	0.08	0.209
Dentist appointments annually at certain times	-0.09	0.150
Dentist appoint. when remembered	-0.15	0.023
Dentist appoint. in case of changes in teeth	0.12	0.067
Dent. appoint. in case of toothache or little disconf.	0.01	0.866
Dentist appoint. in case of lasting toothache	0.09	0.172
Never taken to the dentist	0.19	0.003
Child has had an examination, a consultation	0.00	0.967
Child has had dental hygiene	-0.24	0.000
Child has had dental filling without anaesthesia	-0.01	0.837
Child has had dental filling under local anaesthesia	-0.18	0.005
Child has had dental filling under gen. anaesthesia	0.28	0.000

Continuation of Table 2.5

Dental experience and attitude factors	Pearson's correlation with the children's dental fear (r)	p value
Child has had tooth extraction under loc.anaesthesia	- 0.02	0.797
Child has had tooth extraction under gen.anaesthesia	0.12	0.067
Child has had tooth extraction without anaesthesia	- 0.12	0.056
Child has had different treatment	0.04	0.590
Progress of treatment (how difficult)	0.68	0.000
Attends the dentist with pleasure, interest	- 0.29	0.000
Attends the dentist with neutral attitude	- 0.36	0.000
Attends the dentist alarmed, anxiously	0.10	0.115
Attends the dentist fearfully, crying	0.55	0.000
Attends the dentist actively protesting, resisting	0.30	0.000
Attends the dentist with panic, hysterical	0.34	0.000
Negative dental experience (NE)	0.30	0.000
After NE attended the hygienist	0.03	0.790
After NE attended the same dentist	0.13	0.205
After NE attended different dentist/clinic	0.16	0.143
After NE underwent dental treatment under gen.an.	0.31	0.003
After NE waited, did nothing	- 0.16	0.127
Attended the dentist before noon	0.13	0.042
Attended the dentist in the afternoon	- 0.07	0.270
Attended the dentist in the evening	- 0.08	0.214
Attended the dentist at different times	- 0.01	0.914

The children's dental fear showed no statistically significant correlation with the child's dental examination, dental filling without anaesthesia, tooth extraction under local anaesthesia, dentist appointments in case of toothaches or discomfort, the first dentist appointment due to noticed changes in the teeth, coping with the negative experience by attending a dental hygienist, as well as dentist appointments at different times of the day. Examining the differences in the children's fear levels, depending on negative experiences, the group with negative dental experience showed statistically significantly higher mean levels of fear ($M = 36.67$, $SD = 10.86$, $n = 91$) than the group without any negative dental experiences ($M = 29.93$, $SD = 10.25$, $n = 148$), ANOVA $F = 23.31$, $p < 0.001$).

2.5.4. DFA and parents and information factors

Examination of the link between the children's dental fear and parents and information factors showed a statistically significant correlation with the parents' dental fear ($r = 0.28$, $p < 0.001$), as well as the number of methods used by parents of preparation of the child before the dentist appointment, for example, by promising a prize for good behaviour at the dentist ($r = 0.25$, $p < 0.001$), by comforting the child saying that the doctor will not do anything and it will not hurt ($r = 0.22$, $p = 0.001$), by reading books to the child about dentists ($r = 0.18$, $p = 0.007$), by sharing their own dental experiences ($r = 0.15$, $p = 0.018$). Also, dental fear statistically significantly correlated with the fact that parents receive information about children's dental care from the media ($r = 0.16$, $p = 0.011$) or friends and acquaintances ($r = 0.14$, $p = 0.03$), as well as about the child's preparation for the dentist appointment was learned from friends and acquaintances ($r = 0.21$, $p = 0.001$). The children's dental fear positively correlated with the person who accompanied the child to the dentist, who the child listens to ($r = 0.14$, $p = 0.03$) and saying to the child that he or she should not worry before important events ($r = 0.17$, $p = 0.008$), hugging the child when he or she feels sad ($r = 0.16$, $p = 0.012$), and encouraging and praising him or her before important events ($r = 0.15$, $p = 0.019$) (see Table 2.6). This means that children of those parents who fear dentists and who before the appointment say that "the dentist will not do anything and it will not hurt" or "promise prizes for good behaviour", are more afraid of the dentist. Also, children have a greater fear of the dentist, when their parents have obtained information from media about oral care or the child's preparation from mass media, friends and acquaintances, rather than from dentists or dental hygienists.

Table 2.6

**Relationship between the children's dental fear and
parents and information factors**

Parents and information factors	Pearson's correlation with the children's dental fear (r)	p value
Parents' dental fear	0.28	0.000
Read aloud books about dentists	0.18	0.007
Comfort by saying that no one will do anything and that it will not hurt	0.22	0.001
Share their own dental experience	0.15	0.018
Take along to their own dental appointments	0.12	0.076
Promise a prize for good behaviour at the dentist	0.25	0.000
Carry out no special preparation	- 0.23	0.000
Accompanied by the mother	0.05	0.428
Accompanied by the father	- 0.07	0.299
Accompanied by an adult who is available	- 0.12	0.059
Accompanied by a person with no dental fear	n/a	n/a
Accomp. by an adult who the child listens to	0.14	0.030
Accompanied by any adult family member	0.08	0.242
Information about oral care is received from the family doctor	0.11	0.087
From the dentist	- 0.22	0.001
From the hygienist	- 0.17	0.007
From mass media	0.16	0.011
From friends and acquaintances	0.14	0.030
No information obtained about dental care	0.01	0.872
Information about the child's preparation received from the family doctor	0.10	0.143
From the dentist	0.04	0.577
From the hygienist	- 0.04	0.538
From mass media	0.08	0.246
From friends and acquaintances	0.21	0.001
No information obtained about the child's prep.	- 0.10	0.119
Hug when the child is nervous or afraid	0.13	0.051
Encourage not to worry when the child is nervous or afraid	- 0.04	0.499
Hug when the child is sad	0.16	0.012
Tell not to worry when the child is sad	0.01	0.937
Encourage or praise before an important event	0.15	0.019
Tell not to worry before an important event	0.17	0.008
Discuss own negative experience in front of the child	0.05	0.445
Threaten the child with the dentist	- 0.02	0.777
Have postponed the dentist appointment due to irrelevant reasons	- 0.02	0.731

A statistically significant negative correlation was found between the fear of the dentist and the answer “do not prepare in any special way” the child before the dentist appointment ($r = - 0.23$, $p < 0.001$), receiving information about dental care from the dentist ($r = - 0.22$, $p = 0.001$) or from the dental hygienist ($r = - 0.17$, $p = 0.007$) (see Table 2.6).

Table 2.7

Differences in levels of the children’s dental fear depending on the way how parents explain/prepare the child for the dentist appointment

Way of preparation	Number of respondents (n)	CFSS-DS (M)	SD	ANCOVA $F_{(1,240)}$	P value
Look and read aloud children’s books on the subject, discuss the seen and the read	Yes (n = 35)	37.09	12.11	3.44	0.065
	No (n = 205)	31.66	10.59		
Comfort by saying that the dentist will only look at the teeth, will do nothing and it will not hurt	Yes (n = 58)	36.71	11.83	8.07	0.005
	No (n = 182)	31.09	10.35		
Share their own dental experience	Yes (n = 63)	35.24	10.74	4.90	0.028
	No (n = 177)	31.46	10.91		
Take the child along when visiting their own dentists	Yes (n = 32)	35.66	13.92	3.13	0.078
	No (n = 208)	31.96	10.39		
Promise a prize for good behaviour at the dentist’s	Yes (n = 45)	38.02	11.46	10.57	0.001
	No (n = 195)	31.16	10.46		
Carry out no special preparation	Yes (n = 60)	28.03	7.71	9.03	0.003
	No (n = 180)	33.92	11.50		
Other	Yes (n = 35)	31.54	12.00	0.15	0.701

Children who were not especially prepared by parents before the dentist appointment, as well as whose parents have discussed with dental professionals about the child’s oral care habits, showed lower levels of dental fear (see Table 2.7).

Statistically significant correlations were found between the children’s dental fear and scaring the child with the dentist as a penalty method,

postponing visits to the dentist for no particular reason and discussing negative experiences of parents in the presence of the child.

2.5.5. DFA and the children’s oral care habits

A statistically significant positive correlation was found between the children’s dental fear and the fact that the child perceives dental cleaning as an obligation ($r = 0.185$, $p = 0.004$) or refuses brushing even under adult supervision ($r = 0.127$, $p = 0.049$) (see Table 2.8).

Table 2.8

Relationship between the children’s dental fear and the children's oral care habits and attitude

Children’s oral care habits and attitude	Pearson’s correlation with the children’s dental fear (r)	p value
Regularity of tooth brushing	0.05	0.470
Regard tooth brushing as self-evident	- 0.14	0.031
Regard tooth brushing as an obligation	0.19	0.004
Avoid tooth brushing	- 0.11	0.088
Refuse tooth brushing but brush their teeth under adult supervision	0.07	0.310
Refuse tooth brushing even under adult supervision	0.13	0.049
Parents check their teeth after brushing	0.07	0.315

A statistically significant negative correlation was found also between the children’s dental fear and the children’s tooth brushing as a self-evident act ($r = - 0.139$, $p = 0.031$) (see Table 2.8). This means that children who are reluctant to teeth brushing are more afraid of the dentist.

2.5.6. DFA and the children's personality factors

A statistically significant correlation was found between the children's dental fear and the child's behaviour in the dentist's office ($r = -0.69$, $p < 0.001$), as well as a statistically significant correlation with the child's general anxiety or irritability ($r = 0.50$, $p = 0.005$), emotionality ($r = 0.18$, $p = 0.005$) and ability to recompose ($r = -0.27$, $p < 0.001$) (see Table 2.9).

Table 2.9

Relationship between the children's dental fear and the children's personality and behaviour factors

Children's personality and behaviour factors	Pearson's correlation with the children's dental fear (r)	p value
Sociability	-0.02	0.758
Activity	-0.06	0.356
Impulsiveness	-0.05	0.483
Instability	0.09	0.178
Emotionality	0.18	0.005
Shyness	-0.08	0.198
Irritability (general anxiety)	0.50	0.005
Ability to calm down on his/her own	-0.27	0.000
Duration of the emotional experience	0.15	0.021
Fear of heights	-0.01	0.889
Fear of closed rooms	0.11	0.097
Fear of being left alone	0.06	0.329
Fear of spiders/insects	0.13	0.044
Fear of unknown animals	-0.01	0.881
Fear of darkness	0.05	0.452
Fear of strangers	0.02	0.731
Number of fears	0.11	0.105
Dental behaviour (Frankl scale)	-0.69	0.000

This means the more explicit was the children's dental fear, the more negative was their behaviour in the dentist's office, the child more worried in various situations outside the dentist's office, the less he/she was able to recompose and the more explicit was the child's display of emotions. There

was also a statistically significant correlation between the child's dental fear and the duration of the child's emotional experience and fear of spiders and insects. However, dental fear had no connection with the child's sociability, level of activity, instability, shyness, fear of being left alone or fear from strangers, or with the number of fears.

2.5.7. DFA and family stress factors

Neither any personal factors of the parents, nor stress in the family or at work statistically significantly correlated with the children's dental fear or oral health. The quantity (amount) of stress factors also had no such correlation.

2.6. DFA and regression analysis of psychosocial factors

At the conclusion of the study, the investment of various psychosocial factors on development of the children's dental fear was tested by linear regression.

From the socio-economic factors, the children's dental fear is the most predicted by DMF ($\beta = 0.24$, $p = 0.001$), as well as in a negative way – the number of children ($\beta = -0.15$, $p = 0.034$) and the age of the mother ($\beta = -0.15$, $p = 0.039$). That means, the more decayed, filled or extracted teeth the child has and the fewer siblings he or she has, and the younger is the mother, the greater is the chance for the child to suffer dental fear (see Table 2.10). In connection to socio-economic factors the child's age did not statistically significantly predict the child's dental fear. Overall, socio-economic factors explained 15% ($R^2 = 0.15$, $p < 0.001$) of the children's dental fear in Step 4 of the variation regression analysis.

Table 2.10

Stepwise regression analysis of socio-economic factors predicting the children's dental fear (Step 4)

Socio-economic factors	B	SE	Beta(β)	t	p value	R ²
Constant	47.66	5.36		8.89	0.000	0.15
Age	- 0.52	0.32	- 0.12	- 1.63	0.104	
DMF	0.75	0.22	0.24	3.38	0.001	
Number of children	- 2.57	1.20	- 0.15	- 2.14	0.034	
Mother's age	- 0.29	- 0.14	- 0.15	- 2.08	0.039	

From the children's medical experience factors, the children's dental fear the most predict by the child's timid ($\beta = 0.43$, $p < 0.001$) or cautious ($\beta = 0.29$, $p < 0.001$) attitude towards doctors excluding dentists, as well as DMF ($\beta = 0.17$, $p = 0.002$) and conversely – the child's age ($\beta = - 0.14$, $p = 0.012$) (see Table 2.11).

Table 2.11

Stepwise regression analysis of medical experience and attitude factors predicting the children's dental fear (Step 4)

Medical experience and attitude factors	B	SE	Beta(β)	T	p value	R ²
Constant	29.79	2.39		12.42	0.003	0.34
Age	- 0.57	0.23	- 0.14	- 2.53	0.012	
DMF	0.53	0.17	0.17	3.15	0.002	
Anxious towards doctors	16.27	2.08	0.43	7.81	0.000	
Cautious towards doctors	6.94	1.27	0.29	5.47	0.000	

This means that younger children with timid and cautious attitude towards the doctors, excluding dentists, and higher caries intensity will have greater dental fear. Overall, the child's medical experience factors explained 34% ($R^2 = 0.34$, $p < 0.001$) of the children's dental fear in Step 4 of variation regression analysis.

From the children's dental experience factors, the children's dental fear the most predict by the child's fear and crying on dental appointment ($\beta = 0.49$, $p < 0.001$) or dental treatment with difficulties ($\beta = 0.25$, $p < 0.006$), but not

DMF ($\beta = 0.13$, $p = 0.097$) and the child's age ($\beta = - 0.13$, $p = 0.105$) (see Table 2.12).

Table 2.12

Stepwise regression analysis of dental experience and attitude factors predicting the children's dental fear (Step 4)

Dental experience and attitude factors	B	SE	Beta(β)	t	p value	R ²
Constant	26.74	3.78		7.07	0.000	0.56
Age	- 0.48	0.23	- 0.13	- 1.64	0.105	
DMF	0.39	0.24	0.13	1.68	0.097	
Fear and crying on dental appointment	10.59	1.83	0.49	5.79	0.000	
Dental treatment with difficulties	2.06	0.73	0.25	2.81	0.006	

This means that children who cry and show fear during dental appointment and who's treatment runs with difficulties will have greater dental fear. Overall, the child's dental experience factors explained 56% ($R^2 = 0.56$, $p < 0.001$) of the children's dental fear in Step 4 of variation regression analysis.

From parents and information factors, the children's dental fear the most predict by DMF ($\beta = 0.20$, $p = 0.001$), parents' fear of the dentist ($\beta = 0.17$, $p = 0.003$) and parents' stories about their dental experience ($\beta = 0.18$, $p = 0.002$) (see Table 2.13). Also, the children's dental fear is largely predicted also by saying not to worry before important events ($\beta = 0.16$, $p = 0.007$), prize promises for good behaviour at the dentist ($\beta = 0.15$, $p = 0.009$) and in a negative way – information about dental care received from the dentist ($\beta = - 0.16$, $p = 0.006$) (see Table 2.13). Less than the above factors, but also statistically significantly the child's dental fear is also predictable in a negative way by the child's age ($\beta = - 0.13$, $p = 0.029$), the fact that parents receive information about dental care from a dental hygienist ($\beta = - 0.12$,

p = 0.032) and that the child is accompanied to the dentist by an individual having free time ($\beta = -0.12$, p = 0.044). To a small extent, dental fear is also predictable by the fact that the child is accompanied to the dentist by a person who the child listens to ($\beta = 0.11$, p = 0.049) (see Table 2.13).

Table 2.13

Stepwise regression analysis of parents and information factors predicting the children's dental fear (Step 4)

Parents and information factors	B	SE	Beta(β)	t	p value	R ²
Constant	29.58	3.33		8.89	0.000	0.31
Age	-0.53	0.24	-0.13	-2.19	0.029	
DMF	0.61	0.18	0.20	3.49	0.001	
Parents' dental fear	0.54	0.18	0.17	3.02	0.003	
Share their own dental experience	4.34	1.39	0.18	3.13	0.002	
Receive information from the dentist about dental care	-4.17	1.52	-0.16	-2.75	0.006	
Tell not to worry before important events	3.81	1.40	0.16	-2.72	0.007	
Accompanied by a person who has time	-2.63	1.29	-0.12	-2.03	0.044	
Promise a prize for good behaviour at the dentist's	4.21	1.61	0.15	2.62	0.009	
Receive information from the dental hygienist about dental care	-2.69	1.25	-0.12	-2.16	0.032	
Accompanied by an adult who the child listens to	9.66	4.75	0.11	2.04	0.043	

This means that those parents who are afraid of the dentist, talks about their dental experiences and say that the child should not worry, as well as promise a prize for good behaviour at the dentist, will have a child with more pronounced dental fear. By contrast, older children and those children whose parents receive information about dental care from the dentists or dental hygienists, will show lower level of dental fear. In general, parents and

information factors predict 30.8% ($R^2 = 0.31$, $p < 0.001$) of dental fear in Step 10 of the variation.

From the children's oral care habits, the children's dental fear the most is predictable by DMF ($\beta = 0.23$, $p < 0.001$) and the fact that dental cleaning is perceived as an obligation ($\beta = 0.162$, $p = 0.008$), as well as in a negative way – the child's age ($\beta = -0.19$, $p = 0.002$) (see Table 2.14).

Table 2.14

Stepwise regression analysis of oral care habits' and attitude factors predicting the children's dental fear (Step 4)

Oral care habits and attitude	B	SE	Beta(β)	t	p value	R^2
Constant	32.85	2.68		12.25	0.000	0.14
Age	-0.81	0.26	-0.19	-3.15	0.002	
DMF	0.71	0.19	0.23	3.78	0.000	
Regards tooth brushing as an obligation	3.76	1.41	0.16	2.67	0.008	

This means, the more carious, filled and extracted teeth the child has and the younger is the child, and the more he/she perceives dental cleaning as an obligation, the greater is his/her fear of the dentist. Overall, tooth brushing habits block explains 14% ($R^2 = 0.14$, $p < 0.001$) of dental fear in Step 3 of the variation.

From the child's personality and behavioural factors, the children's dental fear is the most predictable by the child's behaviour in the dental chair ($\beta = -0.56$, $p < 0.001$) and general anxiety or irritability ($\beta = -0.24$, $p < 0.001$) (negative coefficient associated with contrary assessment scale). Also, the child's dental fear is statistically significantly predictable by duration of the child's anxiety or emotional experience ($\beta = 0.11$, $p = 0.016$) and DMF ($\beta = 0.09$, $p = 0.051$), while the age in this model did not have a statistically significant effect (see Table 2.15). This means that the child who is

misbehaving in the dental chair and is more worried (also outside the dentist's office), as well as suffer longer is prone to a higher level of dental fear. In general, in this model, factors of the children's personality and behaviour explained 54% ($R^2 = 0.54$, $p < 0.001$) of dental fear in Step 5 of the variation.

Table 2.15

Stepwise regression analysis of personality and behaviour factors predicting the children's dental fear (Step 5 Model 1)

Personality and behaviour factors	B	SE	Beta(β)	t	p value	R^2
Constant	55.99	2.82		19.87	0.000	0.54
Age	0.01	0.20	0.00	0.06	0.950	
DMF	0.28	0.14	0.09	0.09	0.051	
Child's dental behaviour	- 7.44	0.69	- 0.56	- 10.67	0.000	
General anxiety	- 3.35	0.68	- 0.24	- 4.93	0.000	
Duration of anxiety	1.21	0.49	0.11	2.43	0.016	

In turn, when excluding factor “the child's behaviour in the dental chair” of the Module 1, it was found that the children's dental fear is the most predictable by the child's general anxiety or irritability ($\beta = - 0.44$, $p < 0.001$) (negative coefficient associated with the opposite grading scale). Also, the child's dental fear statistically significantly was predictable also by DMF ($\beta = 0.18$, $p = 0.002$), reversely – age ($\beta = - 0.17$, $p = 0.003$), as well as their fear of spiders/insects ($\beta = 0.12$, $p = 0.033$). This means that a younger child who is nervous also outside the dentist's office, including at the sight of spiders and/or insects, with higher caries intensity, will have greater dental fear. In general, the child's personality and behavioural factors in the Model 2 explained only 33% ($R^2 = 0.33$, $p < 0.001$) of dental fear in Step 4 of the variation (see Table 2.16).

Table 2.16

**Stepwise regression analysis of personality and behaviour factors
predicting the children's dental fear (Step 5, Model 2)**

Personality and behaviour factors	B	SE	Beta(β)	t	p	R ²
Constant	46.79	2.89		16.17	0.000	0.33
Age	- 0.71	0.23	- 0.17	- 3.05	0.003	
DMF	0.54	0.17	0.18	3.18	0.002	
General anxiety	- 6.11	0.77	- 0.44	- 8.05	0.000	
Fear of spiders/insects	2.69	1.25	0.12	2.15	0.033	

When examining the relationship between dental fear and various psychosocial factors via linear regression, it was found that the child's dental experience and treatment factors ($R^2 = 56\%$) and personal factors ($R^2 = 54\%$) explained the children's dental fear the most. Slightly less dental fear is explained by parents and information factors, and the child's medical experience and information factors (respectively $R^2 = 31\%$ and 34%). In turn, socio-economic factors and dental care habits a little explained dental fear (respectively $R^2 = 15\%$ and 14%). Family stress factors did not explain the children's dental fear (see Figure 2.1).

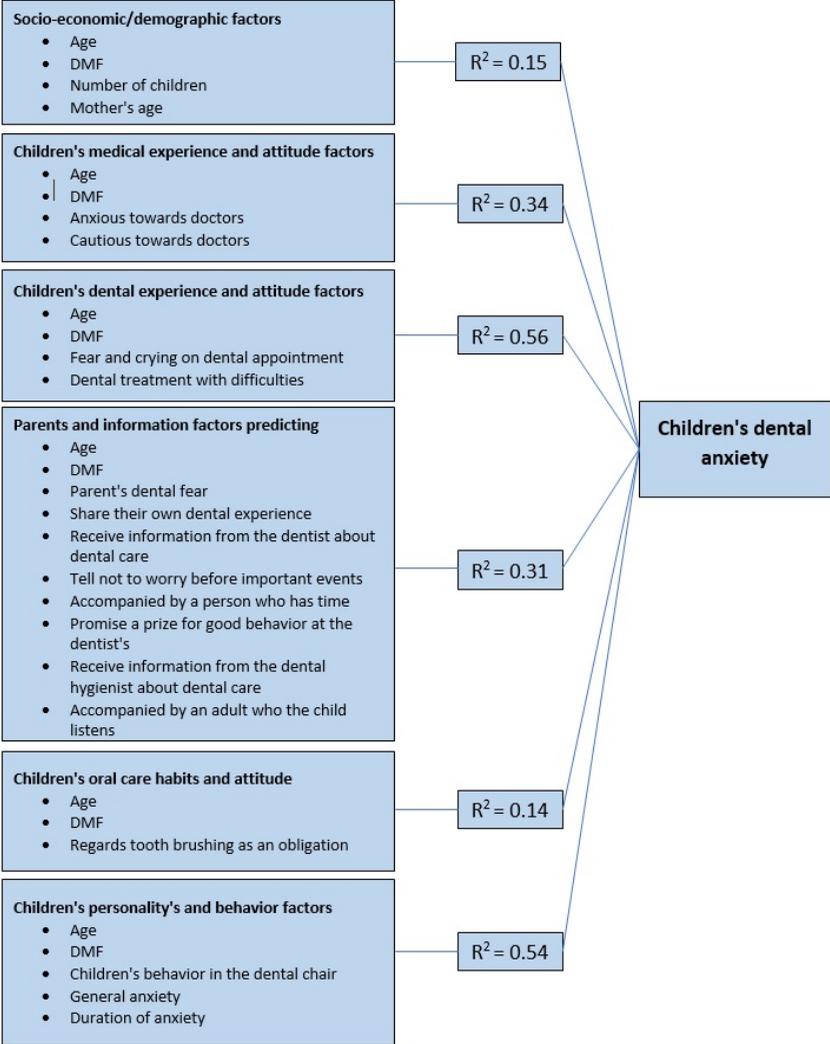


Figure. 2.1. Summary of the regression models of factors explaining variations of the children's dental fear (controlling age and DMF)

3. DISCUSSION

The discussion highlights the main results of the study and their comparative explication, marks their novelty, and covers their limitations and impact of sample selection. Dental fear is a multifactorial problem, therefore various researches and discussions still continue in regard to the importance of the origin of human internal factors (such as age, sex and temperament), as well as external factors (family attitudes, socio-economic factors and dental staff attitude). However, few studies worldwide have studied how the child's fear is affected by what the parents had said before the first dentist visit. Also linear regression studies have been carried out on contribution of various factors to explaining the dental fear, but mostly they cover a small number of variables that describe all the spectrum of factors related to the DFA. No studies on dental fear either among adults, or among children have been carried out in Latvia. Also no studies on Latvian cultural environment have been carried in relation to dental aspect thus complicating the discussion.

3.1. CFSS-DS reliability and validity

CFSS-DS showed a high level of reliability and validity in the study. CFSS-DS is survey very often used in studies for assessment dental fear in pre-school and younger school-age children which is adapted in various languages and shows high reliability (Cronbach's alpha ranged from 0.83 to 0.93) (*Alvesalo et al., 1993; Milgrom et al., 1994; ten Berge et al., 1998; ten Berge et al., 2002; Majstorovič et al., 2003; Arapostathis et al., 2008*). CFSS-DS also showed considerable convergent validity, similar to other studies (*Cuthbert & Melamed, 1982; Majstorovič et al., 2003*).

3.2. DFA and children's internal factors

The children's dental fear and its correlation with children's internal (personality and behaviour) factors – the child's age, sex, temperament (activity, emotionality and shyness), general anxiety, number of non-dental fears and dental behaviour will be discussed in this part of discussion.

3.2.1. DFA and children's age

In general, younger children had more explicit dental fear, while in older children – it was less pronounced. However, one of the lowest indicators of fear was in children 6 years of age, while one of the highest – in children 11 years of age. The correlation results were consistent with the greatest part of studies, finding that the mean level of dental fear of children in the age group of 4 to 14 years gradually reduces (*Cuthbert & Melamed, 1982; Klingberg et al., 1994; Milgrom et al., 1995; Raadal et al., 1995; Wogelius et al., 2003, Majstorovic & Veerkamp, 2005*). However, the correlation between the children's age and decline of dental fear was not always linear (*Milgrom et al., 1995; Raadal et al., 1995; Majstorovic & Veerkamp, 2005; Akbay-Oba et al., 2009*), remaining individual "peaks" in fear growth at later ages. Similar results were shown in another study where in the group of 4–11-year-olds, the highest level of fear was found in four year olds, in later age the mean DFA curve went down, but at age of 11 it again increased significantly (*Majstorovic & Veerkamp, 2005*). Decline in dental fear from 4 years of age could be associated with the child's general development and growth of his/her vocabulary (to be more precise – verbal comprehension) (*Klingberg & Broberg, 2009*), as well as psychological and emotional maturation (*Lee et al., 2008*). In turn, the said "peaks" in this study can be explained by individual

differences, as well as being in a critical age and/or individual dental experience.

3.2.2. DFA and children's gender

No statistically significant differences in DFA among boys and girls were found. This is consistent with the results of several similar studies (*Milsom et al., 2003; Akbay-Oba et al., 2009; Beena, 2013*), but differ from the most studies in which girls had higher dental fear level than boys (*Murray et al, 1989, Chellapah et al., 1990, Alvesalo et al., 1993, Raadal et al., 1995, Milgrom et al., 1995; Skaret, et al., 1998; Versloot et al., 2004; Klingberg & Broberg, 2007*).

3.2.3. DFA and the child's temperament

A positive correlation was found between the children's dental fear and the child's emotionality. This means, the more explicit was the children's dental fear, the more striking were the child's emotional manifestations according to parents. The easier the child is triggered to any emotional expression, the greater is the chance that the child will strongly show his or her dental fear. Negative emotionality was associated with behavioural disorders of children at the dentist in every case at the age 8–12 years also in a publication by *Arnrup et al.* in 2007.

However, in our study dental fear had no connection with the child's sociability, level of activity, instability or shyness (unlike the study by *Gustaffson et al., 2007*) according to parents.

3.2.4. DFA and the child's general anxiety

The more child worries in various situations also outside the dentist's office and the less he/she is able to recompose, and the more he/she suffers from unpleasant events, the more pronounced was the child's dental fear. These results tally with other studies, which have found that children with generalized anxiety disorder, including in daily situations, more often express their dental fear (*Chellappah et al.*, 1990; *Klingberg et al.*, 1994; *Klingberg et al.*, 1995; *Folayan et al.*, 2004; *Vogels et al.*, 2011; *Stenebrand et al.*, 2013). No studies were found on the link between the duration of the children's emotional experience and the ability to recompose and the level of dental fear.

3.2.5. DFA and the number of non-dental fears

Our study showed a statistically significant correlation of the child's dental fear and the child's fear of spiders and insects. Fear of spiders is one of the most common fears of people (*Kent & Blinkhorn* 1991, *Oosterink et al.*, 2009). Data of 2015 of the US *National Institute of Mental Health* show that about a third (30.5%) of Americans suffer from fear of spiders. However, in our study dental fear had no link with the fear of being left alone or from strangers, or with the number of fears. It differs from similar studies, which conclude that respondents with a higher mean level of dental fear have a statistically significantly higher number of other types of fear (*Berggren*, 1992; *Stenebrand et al.*, 2013). Perhaps the different results are related to different study designs and methodology.

3.2.6. DFA and children's dental behaviour

The study found a moderate, statistically significant correlation between the children's dental fear and the child's (negative) behaviour at the dentist, similarly to other publications (*Suprabha et al.*, 2011; *Klingberg et al.*, 1994). However Klingberg et al. noted that negative behaviour or behavioural problems in the dentist's office may not be related to the dental fear, but to the child's temperament traits, such as shyness (*Klingberg & Broberg*, 2009) or general anxiety or depression (*Gustafsson et al.*, 2010).

In turn, the study of 2004 of Folayan et al. found no link between the children's dental fear and their behaviour in the dental chair, however, the discussion referred to cultural differences, as in Nigeria, where the said study was carried out, it is not accepted to show fear in public, especially for men.

3.3. DFA and external family factors

The children's dental fear and its correlation with external family (parents and information) factors – parents' dental fear and anxiety, information and preparation of the child for the dental appointment, as well as socio-economic/socio-demographic indicators of parents will be discussed in this part of discussion.

3.3.1. The children's and the parents' DFA

Meta-analyses show that the link between levels of the parents' and children's dental fear is significant in about 80% of cases (studies), when the children are under 8 years of age (*Themessl-Huber et al.*, 2010, *Lahti & Luoto*, 2010). Such results could be related to a transfer of the parents' anxiety

mechanisms to children (*Fisak & Grill-Taquechel, 2007*) and an impact of parenting styles on the child's behaviour in the dentist's office (*Aminabadi et al., 2015*) and repetition of parents' personal negative dental experience in practice on the "children" (*Smith & Freeman, 2010*). Children of mothers with elevated anxiety also have higher anxiety levels, and possibly they perceive dental situation as dangerous (as a threat and penalty) (*Freeman, 2007*), therefore they experience fear. While, *Versloot et al.* has found that the child's ability to cope with dental treatment depends not only on the child's psychological and cognitive maturity, but also on absence of the parents' dental fear (*Versloot et al., 2004*). Of course, the older children get, the more important becomes the role of their own rather than their parents' dental experience together with their increasing independence (*Kent & Blinkhorn, 1991*).

3.3.2. DFA and information transferred from parents

The study did not find any statistically significant correlation between the children's dental fear and the number of the children preparation methods used by parents before a dentist appointment. Children who are afraid of the dentist have parents who are afraid of the dentist, who instead of explaining what will be done during the visit say that the dentist will not anything and it will hurt, encourage the child not to worry, or simply promise a prize for good behaviour. Anticipatory anxiety significantly affects the child's behaviour, since it narrows the patient's cognitive processes such as attention, memory and thinking (*Jaakkola et al., 2014*). Also, parents who "talk about their own experiences with the dentist" "disservice" their children and unconsciously scare them if their own experience had been negative. In case of a neutral trigger, a special role in the transfer of anxiety is played by the parents' and the

emotional attitude, which is transferred by parents as individuals important to the child (*Field & Lawson, 2003*). The child's fear and anxiety increases not only by the way the information is transferred, but by the combination of information and the parents' impetuous behaviour, as well as the age at which the negative information was presented (*Fisak & Grill-Taquechel, 2007*).

Our study showed that children who were not specifically prepared by parents before the dental appointment, as well as discussed the child's oral care habits with the dental professionals, had lower levels of dental fear. While, children of those parents drew information on oral care or children preparation from media, friends and acquaintances, rather than from dentists or dental hygienists, had a higher level of DFA. More than a half of adult Americans have used the Internet to find information on health issues (*Fox, 2011*). Information about the child's (first) appointment to the dentist was found easily on the Internet, but not always it was accurate (*Yeap & Slack-Smith, 2013*), especially in mutual support forums of professionals (dentists) and even more – non-professionals (parents) (*Yeap & Slack-Smith, 2013*). Parents with greater fear of the dentists show lower knowledge of oral health, as well as poorer oral health of the children, possibly because those parents do not understand information about the child's diagnosis and treatment plan (*Shin et al., 2014*). So, not always information published by media or on the internet, can be trusted, therefore it is important to make publicly accessible and visually attractive information on oral health and DFA prevention, for it would be easily accessible and readable.

3.3.3. DFA and socio-economic indicators

The study found negative correlation between the children's dental fear and socio-demographic factors, such as the number of family members, the

number of household members, the number of children in the family, as well as the father's education, but did not find any correlation with the income, the parents' age, the employment, and the marital status. Perhaps larger families are more accustomed to taking care of each other, acquiring greater experience from brothers and sisters. Another article linked it to teaching greater patience, tolerance and collaboration (*Pai et al.*, 2015). Our study did not cover the matter whether the children were the oldest or the only children in their families, therefore this cannot be compared with similar results in other studies. Concerning father's education, children perceive fathers as sources of basic information, thus leading to conclusions on whether dental treatment is dangerous or not (*Lara et al.*, 2012). However, in general, the link between the father's education and the children's DFA is quite difficult to explain. In the study by Peretz et al. in which children and parents were in a similar age range (children 6–14 years old, parents 30–52 years old), parents' education did not correlate with the children's dental fear and the age of parents (*Peretz et al.*, 2004). However, in the said study, the children's dental fear did not correlate also with the number of children, unlike in the study conducted in Latvia. Also, fear did not correlate with low socio-economic status or income level, unlike in several other studies (*Klingberg et al.*, 1994; *Arnrup et al.*, 2002, *Gustafsson et al.*, 2007; *Armfield et al.*, 2007; *Rantavuori et al.*, 2009; *Shin et al.* 2014). In general it can be said that correlation between the children's dental fear and socio-economic or demographic factors showed conflicting results in various studies (as opposed to fairly homogeneous results in relation to the child's age or parent's fear).

3.4. DFA and different external dental factors

The children's dental fear and its correlation with external dental factors – the child's age at the first dental examination, as well as during the first dental treatment, previous negative experiences in dental situations and traumatic medical experiences (such as in-patient treatment and/or chronic illnesses) will be discussed in this part of discussion.

3.4.1. DFA and the child's first dental visit

Those children who had (according to the information given by the parents) visited the dentist at an earlier age, in reality are less afraid of the dentist. However, this negative correlation between dental fear and the child's age at the first appointment stated by the parents should be treated with caution, because no correlation between DFA and the child's age at the time of the first dentist appointment verifiable only documentarily was found (the children's dental fear did not statistically significantly correlated with the child's dental examination).

More than half of the respondents noted that their children's first dentist appointment was for preventive reasons. This is different Scandinavia, where all children are invited to preventive examination in mother-child centres (*Poulsen, 2003*). However, it is also different from studies conducted in Taiwan, Bulgaria and India, where about a half of the children's first dentist appointments was caused by caries or ache (*Lee et al., 2008; Mileva & Kondeva, 2010; Meera et al., 2008*). Of course, one of the reason may be memory error, especially in regard to older children groups. If data in regard to the child's first restoration and extraction are easy obtainable from their outpatient records, the first appointment and the reasons for it is more difficult

to determine from the entries. No statistically significant correlation was also found between the children's dental fear and the child's dentist appointment in a case of a slight tooth-ache or discomfort and the first dental appointment due to notice of changes in teeth.

3.4.2. DFA and previous negative experiences

The correlation between dental fear and extractions (*Milsom et al.*, 2003) or dental treatment without anaesthesia (*Klingberg et al.*, 1994) described in the theoretical part was not proved in this study. This may be due to, for example, the small number of respondents, whose outpatient records enabled precise determination of the first filled and extracted teeth.

Our study identified several strong statistically significant correlations with the child's emotional attitude towards dentist appointment. This means that children with greater dental fear more often show their fear and cry or actively protest or panic or become hysterical during their dentist appointment, they more often have had a negative dental experience, dental treatment has always or almost always progressed with great difficulty, and their teeth have been treated under general anaesthesia. This precisely agree with another study, which finds that those children whose parents have noted previous dental experience as negative, more often have shown non-cooperative behaviour in subsequent dentist appointments (*Pai et al.*, 2015). Although the questionnaire of our study did not sort exact causes of the child's previous negative experiences (pain or unpleasant attitude), studies have shown that pain is one of the important reasons for dental fear (*Versloot et al.*, 2004). If a child has once felt pain, it promoted formation of lasting dental fear (*Freeman*, 2007; *Harman et al.*, 2005). Another study also shows that not only pain affects

dental fear, but also a reverse process takes place – dental fear affects the child's pain levels (*Lee et al.*, 2008).

In our study, children who have undergone dental hygiene and treatment under anaesthesia and have a positive or neutral attitude towards the dentist, are less afraid of the dentist. These results are consistent with other studies that the more examination appointments the children have had before dental treatments, the lower are their dental fear levels (*Davey*, 1989; *Rantavuori et al.*, 2009), that those children who had undergone dental treatment under local anaesthesia have lower level of dental fear (*Klingberg et al.*, 1994). Also, one should bear in mind that the patient's criticism, coercion, humiliation and holding by dental personnel increased dental fear in youngsters (*Zhou et al.*, 2012), and that children and adolescents with DFA are more sensitive to behaviour and attitudes of dental staff and more often perceive it as rude or careless (*Jaakkola et al.*, 2014).

3.4.3. DFA and traumatic medical experience

Children who have suffered from a serious injury at a younger age and children who have a history of more frequent illnesses and doctor appointments were more cautious and timid towards the doctors in general, including dentists. These results are partly consistent with the results of other studies showing that dental fear may be related to medical fears, if children have or have had a chronic, frequent or serious illness (*Karjalainen et al.*, 2003; *Wogelius et al.*, 2003) or often have to see a doctor or stay in a hospital (*Davey*, 1989; *Hollis et al.*, 2015), as well as if they have had a traumatic medical experience, such as invasive treatment or medical manipulation carried out by force (*Mayo & Smith*, 1997; *Karjalainen et al.*, 2003; *de Jongh et al.*, 2006). Also, dental fear may occur in connection with some everyday somatic or

psychological trauma (*de Jongh et al., 2006*). DFA negatively correlated with the age when the child experienced his/her first trauma, but not with the age of the first traumatic experience with the doctors, then it could be assumed that the smaller the child, the lower is the likelihood that he/she will be able to process consequences of the trauma (fear, pain, subsequent emergency medical care and treatment) cognitively. In this case, dental fear could be a part of post-traumatic stress disorder.

The study shows a link with the frequency of illnesses and frequent doctor appointments, as well as traumatic experiences with doctors, but not with children's chronic illnesses. Not all treatment for chronic diseases is traumatic (e.g., bronchial asthma), unlike cancerous or bone deformation diseases. Thus, a positive correlation between DFA and cautious and timid attitude, and negative correlation with friendly and neutral attitude towards the doctors is indirectly confirmed by Armfield's cognitive vulnerability theory that an attitude towards doctors is more important than the direct negative experience (*Armfield, 2006*). Is also confirmed by hypothesis of another study that emotional quality of previous appointments is more important than the number of appointments (*Suprabha et al., 2011*) and children who perceive their previous medical experience as positive will also cooperate in a dental clinic (*Wright, 2000*). This may explain the fact that in a number of studies no link between the child's dental fear and frequent or chronic illnesses was found (*Wogelius et al., 2009; Suprabha et al., 2011; Paryab & Hosseinbor, 2013; Dogan et al. 2013*).

3.5. DFA and oral health

The study found statistically significant positive correlation between the children's DFA and both the number of carious teeth (deciduous and

permanent teeth) and the total DMF (DMF + df) and df. The study results are consistent with the results of the study carried out in Estonia, where dmf/DMF and the number of decayed teeth of 8- to 11-year-old children was statistically significantly linked with the children's (general) dental fear (*Saag & Olak, 2014*). Several studies have noted that patients with higher level of dental fear have higher df, dmf, df/DMF and/or DMF indicators in children (*Milsom et al., 2003; Akbay-Oba et al., 2009; Beena, 2013*), adolescents (*Bedi et al., 1992; Kruger et al., 1998*) and adult samples (*Cohen, 1985; Armfield et al., 2009*). However, there are studies in which the higher was the level of DFA, the less were filled teeth (*Klingberg et al., 1995; Cohen, 1985*), or the number of filled teeth does not differ in groups with high and low DFA showings (*Eitner et al., 2006*), or had even more filled teeth (*Bedi et al., 1992*). Perhaps fluctuating results are influenced by another phenomenon, namely, the link between dental fear and filled teeth is an inverse U-shaped, that is, if the respondents are a little scared, then the number of filled tooth is growing, while in case of further growth of fear level, the number of filled tooth substantially reduces (*Armfield et al., 2009*).

Other studies have shown that the extractions are important factors in the aetiology of dental fear (*Bedi et al., 1992; Thomson et al., 2000; Milsom et al., 2003*). In our study, no statistically significant correlation was found between the number of filled teeth (deciduous and permanent teeth), or with the number of extracted teeth. Perhaps the results would have been different if premature primary teeth extractions would be taken into account. However, according to the study methodology adopted, primary teeth extractions were not recorded, while the number of extracted permanent teeth was too small ($n = 10$) to draw conclusions on the correlation.

In some studies no correlation between DFA and DMF (*Taani et al.*, 2005; *Samorodnitzky & Levin*, 2005; *Yuzugullu et al.*, 2014) or the number of carious teeth (*Vignehsa et al.*, 1990) was found.

3.6. Regression analysis of DFA-explaining factors

Overall, no publications were found examining contribution of all of the above factors to the aetiology of the child's dental fear. A regression analysis of the study by *Majstorovic et al.* previous traumatic medical experience explained roughly 33–43% of the variations of dental fear (*Majstorovic, et al.*, 2001), which nicely agrees with the results of our study. In the study by *Lee et al.* the mother's dental fear, non-cooperation during the first appointment, the age until 4 years, severe pain during the first appointment and visits to various dental clinics were the factors that explained 36.2% of dental fear variations (*Lee et al.*, 2008).

3.7. Study limitations

The study generally showed high reliability and validity. The measurements were made by reliable instruments – Cronbach's alpha of CFSS-DS or its reliability was 0.91, while in case of MDAS = 0.85. The reliability of the Frankl's scale for assessment of the child's behaviour was limited (as the assessment was only in one scale), but it has been used in many similar studies.

CFSS-DS is a survey very often used in studies for assessment dental fear in pre-school and younger school-age children (*Alvesalo et al.*, 1993; *Milgrom et al.*, 1994; *ten Berge et al.*, 1998; *ten Berge et al.*, 2002; *Majstorovič et al.*, 2003, *Arapostathis et al.*, 2008). However, it is not possible to ensure a quality comparison of Latvian children data with the results of other studies

due to differences in the study age groups and backgrounds. The original study covered survey of children from 5 to 13 years of age (*Cuthbert & Melamed, 1982*), while later studies cover a wide range of age groups, for example, 4–14 years old (*Klingberg, 1994*), 5–15 years old (*Majstorovič et al., 2003*), 4–12 years old (*ten Berge et al., 1998; Arapostathis et al., 2008*) or 5–8 years old children (*Chellappah et al., 1990*), but *Alvesalo et al.* did not specify age in their study at all, only noting that the mean age of the children was 13 years (*Alvesalo et al., 1993*). This questionnaire was applied in both children and parents groups and has been used in studies in the clinical environment (*Arapostathis et al., 2008*), outside it (at schools) (*Chellappah et al., 1990*), frontally (*Alvesalo et al., 1993*) and remotely (via letters) (*Cuthbert & Melamed, 1982; Klingberg, 1994*). Unfortunately, none of the published studies could be used to compare the results with those obtained in our study – either the surveyed age groups were different, or the children’s DFA differences at different ages were not specified or data acquisition environment and respondent types were different. Therefore, results on the children’s dental fear and anxiety obtained in Latvia within our study were not reliably comparable with results obtained in other countries.

MDAS is predominantly used in interviewing adults about their fear and anxiety in dentistry (*Humphris et al., 1995*). In our study we left the original (Corah Dental Anxiety Scale, *Corah, 1969*) answers from 1 (feel free) to 5 (sweat or feel physical nausea), since these formulations allowed respondents to better understand and assess their own feelings about the dentist appointment.

The survey on the child's attitude towards the dentist was designed from scratch. The author developed the questions, based on the literature, as well as on their own experience and observations obtained working in the field of paediatric dentistry. Overall, questions about psychosocial factors in

7 blocks and the offered answers were sufficiently wide. However, the number of dentist appointments, sex and place of residence (Riga, smaller towns or rural area) of the parents was not recorded. The question of the child's negative experience with a dentist and avoiding the experience with the dentist could be ascertained precisely, while questions about the mother's response to the child's stress – less nuanced. The survey did not cover the matter whether the child of pre-school age attends a pre-school institution, as surveyed were parents of 4 to 12 years old children, and thus for the majority of respondents in this question would be irrelevant.

The WHO's questionnaire made it possible to easily distinguish between deciduous and permanent teeth status, and to register both carious and filled teeth. However, it was not possible to note when the teeth were defective or filled because of trauma and because of caries. Similarly, it was not possible to note when a milk tooth was extracted, and when it was fallen out naturally (and permanent tooth had not been erupted yet). Similarly, difficulties arose in a situation where a deciduous tooth root persisted in the mouth and at the same time a permanent tooth had already erupted.

Frankl scale is one of the two most common methods used to assess the child's behaviour in the dentist's office. It is still used in scientific studies, although it was elaborated more than 50 years ago (*Frankl et al.*, 1962). Although Venham Scale (*Venham et al.*, 1980) gives a more nuanced description of the child's behaviour in the dentist's office, according to the author, it is more appropriate for assessment of clinical situations and possible treatment methods rather than studies.

In order to obtain comparable results on children of different ages, all the questionnaires in this study were completed by parents. Although older children, such as 10, 11 or 12 years old would be capable of answering most of the questions about their feelings in the dentist's office, for the younger

children (4, 5 or 6 years old) it would be impossible to deliver answer to these questions. At the same time, this aspect significantly limits the study, as questions of the children's feelings were given by their parents. This limitation could affect the results in relation to the child's subjective assessment, such as the child's dental fear, the child's negative experiences with doctors or dentists, and the child's attitude towards any procedure. However, involvement of parents could not affect the results of objective matters, such as how often the child visits the doctor or is ill, how regularly he/she cleans his/her teeth, who takes the children to the dentist most often, and suchlike.

The second limitation concerns those matters that were filled by memory. If, for a dental condition, for example, were used only data which could be confirmed by an entry in an out-patient record card, then with regard to medical procedures, number of hospitalizations and the child's age, errors could be easily made (similarly to cases when parents often slipped trying to remember the child's age at the first treatment).

Perhaps the study results on personality traits would be more accurate if standardized questionnaire were used. On the other hand, extending the study, completion of the study questionnaire would be also extended by about one third, thus greatly hampering the respondents' attraction. Parents were reluctant to answer questions relating to the child's psychological development and personality.

Speaking of the results obtained, they mostly address the child's response (fear and crying) rather than an objective trauma (negative experiences). However, the results are consistent with Armfield's theory of cognitive vulnerability - that importance lies not as much in the event itself, but in an individual's attitudes to it, namely, what he thinks about this event.

The study sample generally was sufficiently large ($n = 240$), the age and sex distribution was also controlled. Such a sample yielded valid data and a

picture of a wide range of psychosocial factors. However, the study sample was obtained from respondents who attended one certain dental institution and mostly one dentist. Selection may not be sufficiently representative of the socio-economic situation of respondents, need for dental treatment, as well as the prevalence of dental fear. Therefore the mean values of DMF/df and DFA in this study should be interpreted with caution.

The author would like to continue with cross-sectional studies on prevalence of dental fear in different age groups. Also worthy of interest would be a randomized controlled trial on the child's age at his/her first dental treatment (filling or extraction) time. There are several studies on link between dental fear and behavioral disorders and depression, which may be associated with fear and anxiety in dentistry.

CONCLUSIONS

1. CFSS-DS (Dental Subscale of the Children's Fear Survey Schedule) Latvian version is a reliable and valid survey for evaluation of children's dental fear.
2. The children's dental fear is correlated with children's internal (personality and behaviour) factors:
 - 2.1. the children's dental fear is negatively correlated with child's age – in general, younger children have greater fear and anxiety than older children;
 - 2.2. the study finds no differences between girls and boys in regard to dental fear;
 - 2.3. the children's dental fear is correlated to the children's emotionality, but not to children's activity and shyness – more emotional children have greater dental fear and anxiety;
 - 2.4. the children's general anxiety is correlated with children's dental fear – children with higher general anxiety have higher children's dental fear;
 - 2.5. the children's dental fear is not correlated with number of other, non-dental fears;
 - 2.6. the children's dental fear is associated with the child's (negative) behaviour at the dentist – the higher is the children's dental fear, the more negative is the child's dental behaviour.
3. The children's dental fear is correlated with external family (parents and information) factors:
 - 3.1. the children's dental fear is correlated with the parents' dental fear – parents with higher level of dental fear have children with greater dental fear;

- 3.2. those children whose parents before the dentist appointment “promise a prize for good behaviour at the dentist”, “reassure that nothing will be done and it will not hurt” and ”talk about their own dental experiences” are more afraid of the dentist than those children whose parents do not use methods alike; children of those parents who do not prepare specifically before dental visits, as well as discuss the child’s oral care habits with dental professionals, have lower levels of dental fear; those children whose parents draw information about oral care or child’s preparation from media, friends and acquaintances, show higher level of DFA;
- 3.3. the children’s dental fear has negative correlation with the number of family members, the number of members in the household, the number of children in the family, as well as the father's education, but not with the income, the age of the parents, their employment, and their marital status. Children with a greater number of family/household members/number of children in the family, as well as children whose fathers has higher education showed lower fear of the dentist.
4. The children's dental fear is correlated with external dental factors:
 - 4.1. the children’s dental fear has negative correlation with child’s age (in months) at his/her first dental visit stated by parents – children who have (according to the information given by the parents) visited the dentist at an earlier age, have lower dental fear level; the children’s fear has no correlation with the child’s dental examination, tooth restoration without anaesthesia and tooth extraction under local anaesthesia;
 - 4.2. the children’s dental fear is correlated with previous negative experiences with the dentist – those children who have had a

previous negative experience in dental situations were more afraid of the dentist;

- 4.3. the children's dental fear is not associated with chronic illnesses or frequent ailments of the child, but is related to the frequency of the children's doctor appointments, traumatic experiences with doctors and the child's age at the time of physical injury – those children who visit the doctor more than 4 times a year and who have had a traumatic experience with doctors, as well as a history of physical injuries at an earlier age, show higher level of dental fear.
5. Higher level of the children's dental fear is associated with a higher total of DMF (DMF + df) and df, as well as a higher number of decayed teeth (D + d, d, D) in all types of bite, but is not associated with the number of filled or extracted teeth.
6. Following the models of the regression analysis within psychosocial blocks the children's dental fear is the most explained by the child's dental experiences and attitudes (fear and crying on dental appointment plus dental treatment with difficulties), as well as personality and behaviour factors (higher general anxiety, worse dental behaviour, longer duration of anxiety together with higher DMF). To a lesser extent it is explained by the parents/information factors (higher level of parental anxiety, inappropriate comforting methods, younger age of the children and higher DMF), as well as the child's medical experience and attitude factors (anxious or cautious attitude towards doctors as well as younger age of the children and higher DMF). Family socio-economic factors (mother's age, number of children in the family and higher DMF) and dental care habits (older age of the children, higher DMF and teeth brushing as an obligation) explain dental fear of to a very small extent, while the stress in the family show no effect on the children's dental fear.

PRACTICAL RECOMMENDATIONS

1. To inform family doctors, pregnant women and new mothers on the matter, and to encourage the child's first dentist appointment in accordance with the guidelines of many developed countries – from eruption of the child's first tooth until 1 year of age, given that early appointments (examinations) are associated with lower levels of the children's dental fear.
2. To provide parents with easily accessible information via the Internet (for example, sites www.stomatologijasinstitutus.lv, www.tirizobi.lv, www.facebook.com/mantirizobi, www.mammamunteti.lv) and via organization of direct contact courses or the so-called “parents' schools” at RSU Institute of Dentistry on the children's age group perception specifics in relation to the dentist, the child's positive preparation for dentist appointments and ways how the child should be prepared for dentist appointments.
3. To provide training of new specialists to work with children in a psychologically non-traumatic manner (training course for students of the program of Dentistry and Dental Hygienists of the Faculty of Dentistry “Interacting with paediatric patients in dentistry”, post-graduate courses for dentists “The child in the dentist's office. Age-related specifics. Dental fear management techniques”).

PUBLICATIONS AND PRESENTATIONS

International publications

1. Kronina, L., Rascevska, M., Care, R. Reliability and Validity of Children's Fear Survey Schedule–Dental Subscale (CFSS-DS) Latvian Version. *Baltic Journal of Psychology*. 2014, 15, 64–72.
2. Kronina, L., Care, R., Rascevska, M. Factors correlated with children's dental anxiety in Latvia. *Stomatologija. Baltic Dental and Maxillofacial Journal*. (submitted).

Publications in Latvian peer-reviewed scientific journals

3. Kroniņa, L., Care, R., Raščevska, M. Bailes no zobārsta un to saistība ar pirmās vizītes iemesliem un bērna sagatavošanas veidu zobārsta apmeklējumam. *Zinātniskie raksti: 2014. gada medicīnas nozares pētnieciskā darba publikācijas. Rīgas Stradiņa universitāte*. – Rīga: Rīgas Stradiņa universitāte, 2015, 345.–351. lpp.
4. Kroniņa, L., Care, R., Raščevska, M. Četru līdz divpadsmit gadu vecu bērnu bailes no zobārsta un to saistība ar mutes dobuma stāvokli un dažādiem ģimenes faktoriem. *Zinātniskie raksti: 2013. gada medicīnas nozares pētnieciskā darba publikācijas. Rīgas Stradiņa universitāte*. – Rīga: Rīgas Stradiņa universitāte, 2014, 403.–410. lpp.
5. Kroniņa, L., Care, R., Raščevska, M. Bērna vecums pirmās ārstēšanas laikā, tā saistība ar bailēm no zobārsta un negatīvu pieredzi. *Zinātniskie raksti: 2012. gada medicīnas nozares pētnieciskā darba publikācijas. Rīgas Stradiņa universitāte. 1.sēj.* – Rīga: Rīgas Stradiņa universitāte, 2013, 279.–284. lpp.

Presentations in international scientific conferences

1. Kronina, L., Care, R., Rascevska, M. "Factors correlated with children's dental anxiety in Latvia", IAPD Congress, Glasgow, United Kingdom; poster presentation 2015.
2. Kronina, L., Care, R., Rascevska, M. „Dental anxiety related to reasons for child's first dental visit and parent's explanations", EAPD Congress, Sopot, Poland; oral presentation, 2014.

3. Kronina, L., Care, R., Rascevska, M. „Dental anxiety related to DMFt and other parents' and children's factors in age 4–12 in Latvia”, IAPD Congress, Seoul, South Korea; poster presentation, 2013.
4. Kroniņa, L., Raščevska, M., Care, R. „Baiļu no zobārsta saistība ar mutes veselību un ģimenes faktoriem bērniem 4–12 gadu vecumā” – international conference „Psiholoģija veselības aprūpē”/”Psychology in Health Care”, Riga, Latvia; oral presentation, 2013.
5. Kronina, L., Care, R., Rascevska, M. „Dental anxiety related to first dental visit and negative experience in 4–12 years old children in Latvia”, EAPD Congress, Strasbourg, France; oral presentation, 2012.
6. Kronina, L., Care, R., Rascevska, M. „Pilot study of different factors related to dental anxiety in 4–12 years old children in Latvia”, IAPD Congress, Athens, Greece; poster presentation, 2011.
7. Kronina, L., Care, R., Rascevska, M. „Pilot study of different factors related to dental anxiety in 4–12 years old children in Latvia”, European Conference of Psychological Assessment, Riga, Latvia; thesis and poster presentation, 2011.

Presentations in scientific conferences in Latvia

1. Kroniņa, L., Care, R., Raščevska, M. „Faktori, kas saistīti ar bērnu bailēm un mutes veselību Latvijā”. RSU Scientific Conference, oral presentation, 2015.
2. Kroniņa, L. „Bailes – paudžu mantojums”, oral presentation at LAS sitting on 7 February.
3. Kroniņa, L., Care, R., Raščevska, M. „Baiļu no zobārsta saistība ar bērna vecumu pirmās vizītes laikā, pirmās vizītes iemesliem un bērna sagatavošanas veidu”, RSU Scientific Conference, thesis and oral presentation, 2014.
4. Kroniņa, L. „Bērnu un vecāku bailes no zobārsta: cēloņi, sekas un risinājumi”, oral presentation at Oral Health Conference „Pašvaldības atbalsts mutes veselības saglabāšanā”/”Municipal support in oral health preservation”, 28 March 2014.
5. Kroniņa, L. „Bērnu un vecāku bailes no zobārsta”, oral presentation at LZHA sitting, 8 March 2014.
6. Kroniņa, L., Care, R., Raščevska, M. „Baiļu no zobārsta saistība ar mutes veselību un ģimenes faktoriem bērniem 4–12 gadu vecumā”, RSU Scientific Conference, thesis and oral presentation, 2013.
7. Kroniņa, L., Care, R., Raščevska, M. „Bērna vecums pirmās ārstēšanas laikā, tā saistība ar bailēm no zobārsta un negatīvu pieredzi”, RSU Scientific Conference, thesis and oral presentation, 2012.

8. Kroniņa, L. „Bērna pirmā vizīte pie zobārsta, bailes no zobārsta, zobārstu izmantotās metodes – vadlīnijas un realitāte”, oral presentation at LAS sitting, 6 April 2013.
9. Kroniņa, L., Care, R., Raščevska, M. „Pilotpētījums par faktoriem, kas saistīti ar bērnu bailēm no zobārsta 4–12 gadus veciem bērniem Latvijā”, RSU Scientific Conference, thesis and oral presentation, 2011.

Thesis in scientific conferences in Latvia

1. Kroniņa, L., Care, R., Raščevska, M. „Faktori, kas saistīti ar bērnu bailēm un mutes veselību Latvijā”. RSU Scientific conference, 2015.
2. Kroniņa, L., Care, R., Raščevska, M. „Baiļu no zobārsta saistība ar bērna vecumu pirmās vizītes laikā, pirmās vizītes iemesliem un bērna sagatavošanas veidu”, RSU Scientific Conference, thesis and oral presentation, 2014.
3. Kroniņa, L., Care, R., Raščevska, M. „Baiļu no zobārsta saistība ar mutes veselību un ģimenes faktoriem bērniem 4–12 gadu vecumā”, RSU Scientific Conference, thesis and oral presentation, 2013.
4. Kroniņa, L., Care, R., Raščevska, M. „Bērna vecums pirmās ārstēšanas laikā, tā saistība ar bailēm no zobārsta un negatīvu pieredzi”, RSU Scientific Conference, thesis and oral presentation, 2012.
5. Kroniņa, L., Care, R., Raščevska, M. „Pilotpētījums par faktoriem, kas saistīti ar bērnu bailēm no zobārsta 4–12 gadus veciem bērniem Latvijā”, RSU Scientific Conference, thesis and oral presentation, 2011.

AKNOWLEDGEMENTS

I would like to express my sincerest gratitude and appreciation to my supervisors Professor Rūta Care and Professor Malgožata Raščevska for their help and support in accomplishment of this study. I would like to recognize Professor R. Care for direction in the profession – the paediatric dentistry, and Professor M. Raščevska for her great care and accuracy in the completion of the research, as well as for educating in the field of statistics.

I would like to extend my gratitude to my colleagues at the Department of Operative Dentistry and Oral Health and Professor Anda Brinkmane for her support when I needed it.

A special thanks is also extended to Professor Egita Senakola and the colleagues at the Academic School of Dental Hygienists for their great support and giving perspective to my work.

Appreciation is extended also to Professor Ilga Urtāne for the given opportunity to elaborate my study, as well as to colleagues at the Paediatric Department of the Institute of Stomatology for assistance in the completion of my work. Thanks also to my colleagues at the dental clinic Akribija.

My gratitude is also extended to Professor Ingrīda Čēma for moral support.

My appreciation also goes to reviewers of my doctoral dissertation Professor Ilze Akota, Assistant Professor Daiga Kviļūna and Assistant Professor Inga Skreitule-Pikše for their time.

Finally, special recognition goes to my parents for education provided and for desire to keep studying and to learn something new. To my sister, who provided constant encouragement and practical support.

And a special thanks to my husband Ivo for his love, patience and support throughout the entire schooling process.

BIBLIOGRAPHY

1. Akbay-Oba, A., Dulgergil, C. T., Sonmez, I. S. Prevalence of dental anxiety in 7- to 11-year-old children and its relationship to dental caries. *Medical Principles and Practice*. 2009, 18, 453–457.
2. Alfayad, D. W., Al-Hadithy, E. M. R. Dental anxiety and its relation to serum cortisol level before dental surgical treatment. *Anbar Medicine Journal*. 2012, 10(1), 35–40.
3. Alvesalo, I., Murtomaa, H., Milgrom, P., Honkanen, A., Karjalainen, M., Tay, K. M. The Dental Fear Survey Schedule: a study with Finnish children. *International Journal of Paediatric Dentistry*. 1993, 3, 193–198.
4. Aminabadi, N. A., Deljavan, A. S., Jamali, Z., Azar, F. P., Oskouel, S. G. The influence of parenting style and child temperament on child–parent–dentist interactions. *Pediatric Dentistry*. 2015, 37(4), 342–347.
5. Armfield, J. M. Cognitive vulnerability: a model of the etiology of fear. *Clinical Psychology Review*. 2006, 26, 746–768.
6. Armfield, J. M., Stewart, J. F., Spencer, A. J. The vicious cycle of dental fear: exploring the interplay between oral health, service utilization and dental fear. *BMC Oral Health*. 2007, 7, 1.
7. Armfield, J. M. A preliminary investigation of the relationship of dental fear to other specific fears, general fearfulness, disgust sensitivity and harm sensitivity. *Community Dentistry and Oral Epidemiology*. 2008, 36, 128–136.
8. Armfield, J. M., Slade, G. D., Spencer, A. J. Cognitive vulnerability and dental fear. *BMC Oral Health*. 2008, 8(2), 1–11.
9. Armfield, J. M., Slade, G. D., Spencer, A. J. Dental fear and adult oral health in Australia. *Community Dentistry and Oral Epidemiology*. 2009, 37, 220–230.
10. Arnrup, K., Broberg, A., Berggren, U., Bodin, L. Lack of cooperation in pediatric dentistry – the role of child personality characteristics. *Pediatric Dentistry*. 2002, 24(2), 119–128.
11. Arnrup, K., Broberg, A., Berggren, U., Bodin, L. Temperamental reactivity and negative emotionality in uncooperative children referred to specialized paediatric dentistry compared to children in ordinary dental care. *International Journal of Paediatric Dentistry*. 2007, 17, 419–429.
12. Beaton, L., Freeman, R., Humphris, G. Why are people afraid of the dentist? Observations and explanations. *Medical Principles and Practice*. 2014, 23(4), 295–301.
13. Bedi, R., Sutcliffe, P., Donnan, P., Barrett, N., McConachie, J. Dental caries experience and prevalence of children afraid of dental treatment. *Community Dentistry and Oral Epidemiology*. 1992, 20, 368–371.
14. Beena, J. P. Dental subscale of children’s fear survey Schedule and dental caries prevalence. *European Journal of Dentistry*. 2013, 7, 181–185.
15. Berggren, U., Meynert, G. Dental fear and avoidance: causes, symptoms, and consequences. *Journal of American Dental Association*. 1984, 109(2), 247–251.

16. Berggren, U. General and specific fears in referred and self-referred adult patients with extreme dental anxiety. *Behavior Research and and Therapy*. 1992, 30, 395–401.
17. Bērziņa, S. *Kariesa un periodonta patoloģiju izplatība bērniem un pusaudžiem Latvijā: promocijas darba kopsavilkums, medicīnas nozares zobārstniecības specialitātē*. Rīga: Rīgas Stradiņa universitāte, 2004.
18. Carrillo-Diaz, M., Crego, A., Armfield, J. M., Romero-Maroto, M. Treatment experience, frequency of dental visits, and children's dental fear: a cognitive approach. *European Journal of Oral Sciences*. 2012, 120, 75–81.
19. Chellappah, N. K., Vignehsa, H., Milgrom, P., Lo, G. L. Prevalence of dental anxiety and fear in children in Singapore. *Community Dentistry and Oral Epidemiology*. 1990, 18, 269–271.
20. Cohen, M. E. Dental anxiety and DMFS status: associations within a US naval population versus differences between groups. *Community Dentistry and Oral Epidemiology*. 1985, 13, 75–78.
21. Cuthbert, M. I., Melamed, B. G. A screening device: children at risk for dental fears and management problems. *Journal of Dentistry for Children*. 1982, 49, 432–436.
22. Davey, G. C. L.. Dental phobias and anxieties: evidence for conditioning processes in the acquisition and modulation of a learned fear. *Behaviour Research and Therapy*. 1989, 27, 51–58.
23. de Jongh, A., Fransen, J., Oosterink-Wubbe, F., Aartman, I. Psychological trauma exposure and trauma symptoms among individuals with high and low levels of dental anxiety. *European Journal of Oral Sciences*. 2006, 114, 286–292.
24. Dogan, M. C., Yazicioglu, I, Antmen, B. Anxiety and pain during dental treatment among children with haemophilia. *European Journal of Paediatric Dentistry*. 2013, 14(4), 284–288.
25. Eitner, S., Wichmann, M., Paulsen, A., Holst, S. Dental anxiety – an epidemiological study on its clinical correlation and effects on oral health. *Journal of Oral Rehabilitation*. 2006, 33, 588–593.
26. Field, A. P., Lawson, J. Fear information and the development of fears during childhood: effects on implicit fear responses and behavioural avoidance. *Behaviour Research and Therapy*. 2003, 41(11), 1277–1293.
27. Fisak, Jr. B., Grills-Taquechel, A. E. Parental modeling, reinforcement, and information transfer: risk factors in the development of child anxiety? *Clinical Child and Family Psychology*. 2007, 10(3), 213–231.
28. Folayan, M. O., Adekoya-Sofowora, C. A., Otuyemi, O. D., Ufomata, D. Parental anxiety as a possible predisposing factor to child dental anxiety in patients seen in a suburban dental hospital in Nigeria. *International Journal of Pediatric Dentistry*. 2002, 12(4), 255–259.
29. Folayan, M. O., Idehen, E. E., Ojo, O. O. The modulating effect of culture on the expression of dental anxiety in children: a literature review. *International Journal of Pediatric Dentistry*. 2004, 14, 241–245.
30. Folayan, M. O., Idehen, E. E., Ojo, O. O. Dental anxiety in a subpopulation of African children: parents ability to predict and its relation to general anxiety and behaviour in the dental chair. *European Journal of Paediatric Dentistry*. 2004, 1, 19–23.

31. Folayan, M. O., Idehen, E. E. Effect of information on dental anxiety and behaviour ratings in children. *European Journal of Paediatric Dentistry*. 2004, 3, 147–150.
32. Folayan, M. O., Idehen, E. E., Ojo, O. O. Identified factors in child–dentist relationship important for the management of dental anxiety in Nigerian children. *European Journal of Paediatric Dentistry*. 2004, 4, 225–232.
33. Fox, S. *The social life of health information*. PewResearchCenter, 2011.
34. Frankl, S. N., Schiere, F. R., Fogels, H. R. Should the parent remain with the child in the dental operatory? *Journal of Dentistry for Children*. 1962, 29, 150–163.
35. Freeman, R. A fearful child attends: a psychoanalytic explanation of children’s responses to dental treatment. *International Journal of Pediatric Dentistry*. 2007, 17, 407–418.
36. Fuentes, D., Gorenstein, C., Hu, L. W. Dental anxiety and trait anxiety: an investigation of their relationship. *British Dental Journal*. 2009, 206, E17.
37. Gustafsson, A., Arnrup, K., Broberg, A., Bodin, L. Psychosocial concomitants to dental fear and behaviour management problems. *International Journal of Pediatric Dentistry*. 2007, 17, 449–459.
38. Gustafsson, A., Broberg, A., Bodin, L., Berggren, U., Arnrup, K. Dental behaviour management problems: the role of child personal characteristics. *International Journal of Pediatric Dentistry*. 2010, 20, 242–253.
39. Halonen, H., Salo, T., Hakko, H., Rasanen, P. Association of dental anxiety to personality traits in a general population sample of Finnish university students. *Acta Odontologica Scandinavica*. 2012, 70, 96–100.
40. Harman, K., Lindsey, S., Adewami, A., Smith, P. An investigation of language used by children to describe discomfort expected and experienced during dental treatment. *International Journal of Pediatric Dentistry*. 2005, 15, 319–326.
41. Hittner, J. B., Hemmo, R. Psychosocial predictors of dental anxiety. *Journal of Health Psychology*. 2009, 14(1), 53–59.
42. Hollis, A., Willcoxson, F., Smith, A., Balmer, R. An investigation into dental anxiety amongst paediatric cardiology patients. *International Journal of Pediatric Dentistry*. 2015, 25, 183–190.
43. Humphris, G., Morrison, T., Lindsay, S. The Modified Dental Anxiety Scale: validation and United Kingdom norms. *Community Dental Health*. 1995, 12, 143–150.
44. Humphris, G., King, K. The prevalence of dental anxiety across previous distressing experiences. *Journal of Anxiety Disorders*. 2011, 25, 232–236.
45. Ismail, A. I., Sohn, W., Tellez, M., Amaya, A., Sen, A., Hasson, H., et al.. The International Caries Detection and Assessment System (ICDAS): an integrated system for measuring dental caries. *Community Dentistry and Oral Epidemiology*. 2007, 35, 170–178.
46. Jaakkola, S., Lahti, S., Raiha, H., Saarinen, M., Tolvanen, M., Aromaa, M., et al. Dental fear affects adolescent perception of interaction with dental staff. *European Journal of Oral Sciences*. 2014, 122, 339–345.
47. Jafarzadeh, M., Keshani, F., Ghazavi, Z., Keshani, F. Reviewing the parental standpoint about origin of the dental fear in children referred to dentistry centers of Isfahan University of Medical Sciences. *Iranian Journal of Nursery and Midwifery Research*. 2011, 16(1), 133–139.

48. Karjalainen, S., Olak, J., Söderling, E., Pienihäkkinen, K., Simell, O. Frequent exposure to invasive medical care in early childhood and operative dental treatment associated with dental apprehension of children at 9 years of age. *European Journal of Paediatric Dentistry*. 2003, 4, 186–190.
49. Kent, G. Memory of dental pain. *Pain*. 1985, 21(2), 187–194.
50. Kent, G. G., Blinkhorn, A. S. *The psychology of dental care*. 2nd ed. Oxford: Wright, 1991.
51. Klaassen, M. A., Veerkamp, J. S. J., Hoogstraten, J. Dental fear, communication, and behavioural management problems in children referred for dental problems. *International Journal of Paediatric Dentistry*. 2007, 17, 469–477.
52. Klingberg, G. Reliability and validity of the Swedish version of the Dental Subscale of the Children's Fear Survey Schedule, CFSS-DS. *Acta Odontologica Scandinavica*. 1994, 52, 255–256.
53. Klingberg, G., Berggren, U., Noren, J. G. Dental fear in an urban Swedish child population: prevalence and concomitant factors. *Community Dental Health*. 1994, 11, 208–214.
54. Klingberg, G., Berggren, U., Carlsson, S. G., Noren, J. G. Child dental fear: cause-related factors and clinical effects. *European Journal of Oral Sciences*. 1995, 103, 405–412.
55. Klingberg, G., Broberg, A. Dental fear/anxiety and dental behaviour management problems in children and adolescents: a review of prevalence and concomitant psychological factors. *International Journal of Pediatric Dentistry*. 2007, 17, 391–406.
56. Klingberg, G., Raadal, M., Arnrup, K. Dental fear and behavior management problems. In: *Paediatric dentistry: a clinical approach*. 2nd ed. Goran Koch, Sven Poulsen, eds. Oxford: Blackwell Publishing, 2009.
57. Krikken, J. B., Van Wijk, A. J., ten Cate, J. M., Veerkamp, J. S. J. Child dental anxiety, parental rearing style and referral status of children. *Community Dental Health*. 2012, 29, 289–292.
58. Kruger, E., Thompson, W. M., Poulton, R., Davies, S., Brown, R. H., Silva, P.A. Dental caries and changes in dental anxiety in late adolescence. *Community Dentistry and Oral Epidemiology*. 1998, 26, 355–359.
59. Lahti, S., Luoto, A. Significant relationship between parental and child dental fear. *Evidence Based Dentistry*. 2010, 11(3), 77.
60. Lara, A., Crego, A., Romero-Maroto, M. Emotional contagion of dental fear to children: the fathers' mediating role in parental transfer of fear. *International Journal of Paediatric Dentistry*. 2012, 22, 324–330.
61. Lee, C. Y., Chang, Y. Y., Huang, S. T. The clinically related predictors of dental fear in Taiwanese children. *International Journal of Pediatric Dentistry*. 2008, 18, 415–422.
62. Locker, D., Shapiro, D., Liddell, A. Negative dental experiences and their relationship to dental anxiety. *Community Dental Health*. 1996, 13(2), 86–92.
63. Locker, D., Liddell, A., Dempster, L., Shapiro, D. Age of onset of dental anxiety. *Journal of Dental Research*. 1999, 78(3), 790–796.
64. Majstorovic, M., Skrinjaric, I., Glavina, D., Szivovicza, L. Factors Predicting a Child's Dental Fear. *Collegium Antropologicum*. 2001, 25(2), 493–500.

65. Majstorovic, M., Veerkamp, J. S. J., Skrinjaric, I. Reliability and validity of measures used in assessing dental anxiety in 5- to 15-year-old Croatian children. *European Journal of Paediatric Dentistry*. 2003, 4, 197–202.
66. Majstorovic, M., Veerkamp, J. S. J. Developmental changes in dental anxiety in a normative population of Dutch children. *European Journal of Paediatric Dentistry*. 2005, 1, 30–34.
67. Mayou, R. A., Smith, K. A. Posttraumatic symptoms following medical illness and treatment. *Journal of Psychosomatic Research*. 1997, 43(2), 121–123.
68. McNeil, D. W., Helfer, A. J., Weaver, B. D., Graves, R. W., Kyle, B. N., Davis, A. M. Memory of pain and anxiety associated with tooth extraction. *Journal of Dental Research*. 2011, 90(2), 220–224.
69. Meera, R., Muthu, M. S., Phanibabu, M., Rathnaprabhu, V. First dental visit of a child. *Journal of the Indian Society of Pedodontics and Preventive Dentistry*. 2008, 68–71.
70. Mehrstedt, M., Tonnies, S., Eisentraut, I. Dental fears, health status, and quality of life. *Anesthesia Progress*. 2004, 51, 90–94.
71. Mileva, S. P., Kondeva, V. K. Age et and reasons for the first dental visit. *Folia Medica*. 2010, 52(4), 56–61.
72. Milgrom, P., Mancl, L., King, B., Weinstein, P. Origins of childhood dental fear. *Behavior Research and Therapy*. 1995, 33(3), 313–319.
73. Milsom, K. M., Tickle, M., Humphris, G. M., Blinckhorn, A. S. The relationship between anxiety and dental treatment experience in 5-year-old children. *British Dental Journal*. 2003, 194, 503–506.
74. Murray, P., Liddell, A., Donohue, J. A longitudinal study of the contribution of dental experience to dental anxiety in children between 9 and 12 years of age. *Journal of Behavioral Medicine*. 1989, 12(3), 309–320.
75. Oosterink, F. M. D., de Jongh, A., Hoogstraten, J. Prevalence of dental fear and phobia relative to other fear and phobia subtypes. *European Journal of Oral Sciences*. 2009, 117, 135–143.
76. Oosterink, F. M. D., de Jongh, A., Aartman, I. H. A. Negative events and their potential risk of precipitating pathological forms of dental anxiety. *Journal of Anxiety Disorders*. 2009, 23, 451–457.
77. Pai, R., Mandroli, P., Benni, D., Pujar, P. Prospective analysis of factors associated with dental behavior management problems, in children aged 7–11 years. *Journal of Indian Society of Pedodontics and Preventive Dentistry*. 2015, 33, 312–318.
78. Paryab, M., Hosseinbor, M. Dental fear and behavioral problems: a study of prevalence and related factors among a group of Iranian children aged 6–12. *Journal of Indian Society of Pedodontic and Preventive Dentistry*. 2013, 31, 82–86.
79. Peretz, B., Nazarian, Y., Bimstein, E. Dental anxiety in a students' paediatric dental clinic: children, parents and students. *International Journal of Paediatric Dentistry*. 2004, 14, 192–198.
80. Pohjola, V., Lahti, S., Vehkalahti, M.M., Tolvanen, M., Hausen, H. Association between dental fear and dental attendance among adults in Finland. *Acta Odontologica Scandinavica*. 2007, 65(4), 224–230.
81. Pohjola, V., Rekola, A., Kunttu, K., Virtanen, J. Association between dental fear and oral habits and treatment need among university students in Finland: a national study. *BMC Oral Health*. 2016, 16, 26.

82. Raadal, M., Milgrom, P., Weinstein, P., Mancl, L., Cauce, A. M. The prevalence of dental anxiety in children from low-income families and its relationship to personality traits. *Journal of Dental Research*. 1995, 74, 1439–1443.
83. Raadal, M., Strand, G. V., Amarante, E. C., Kvale G. Relationship between caries prevalence at 5 years of age and dental anxiety at 10. *European Journal of Paediatric Dentistry*. 2002, 1, 22–26.
84. Rachman, S. The conditioning theory of fear-acquisition: a critical examination. *Behaviour Research & Therapy*. 1977, 15, 375–387.
85. Rantavuori, K., Zerman, N., Ferro, R., Lahti, S. Relationship between children's first dental visit and their dental anxiety in the Veneto Region of Italy. *Acta Odontologica Scandinavica*. 2002, 60, 297–300.
86. Rantavuori K., Tolvanen M., Hausen H., Lahti S., Seppä L.. Factors associated with different measures of dental fear among children at different ages. *Journal of Dentistry for Children*. 2009, 76(1), 13–19.
87. Ray, J., Wide Boman, U., Bodin, L., Berggren, U., Lichtenstein, P., Broberg, A. Heritability of dental fear. *Journal of Dental Research*. 2010, 89(3), 297–301.
88. Saag, M., Olak, J. Impact of mothers' health attitudes on dental health of their children. *EPMA Journal*. 2014, 5(1), A111.
89. Samorodnitzky, G., Levin, L. Self-assessed dental status, oral behavior, DMF, and dental anxiety. *Journal of Dental Education*. 2005, 69(12), 1385–1389.
90. Schuur, A. H. B., Duivenvoorden, H. J., Thoden van Velzen, S. K., Verhage, F., Makkes, P. C., Eijkman, M. A. J. Psychological correlates of dental anxiety. *Community Dentistry and Oral Epidemiology*. 1986, 14, 69–72
91. Shin, W. K., Braun, T. M., Inglehart, M. R. Parents' dental anxiety and oral health literacy: effects on parents' and children's oral health-related experiences. *Journal of Public Health Dentistry*. 2014, 74, 195–201.
92. Skaret, E., Raadal, M., Berg, E., Kvale, G. Dental anxiety among 18-year-olds in Norway. Prevalence and related factors. *European Journal of Oral Sciences*. 1998, 106, 835–843.
93. Smith, P. A., Freeman, R. Remembering and repeating childhood dental treatment experiences: parents, their children, and barriers to dental care. *International Journal of Paediatric Dentistry*. 2010, 20, 50–58.
94. Stenebrand, A., Wide Boman, U., Hakeberg, M. General fearfulness, attitudes to dental care, and dental anxiety in adolescents. *European Journal of Oral Sciences*. 2013, 121, 252–257.
95. Suprabha, B. S., Rao, A., Choudhary, S., Shenoy, R. Child dental fear and behavior: The role of environmental factors in a hospital cohort. *Journal of Indian Society of Pedodontics and Preventive Dentistry*. 2011, 29, 95–101.
96. Taani, D. Q., El-Qaderi, S. S., Abu Alhaija, E. S. Dental anxiety in children and its relationship to dental caries and gingival condition. *International Journal of Dental Hygiene*. 2005, 3(2), 83–87.
97. Themessl-Huber, M., Freeman, R., Humphris, G., MacGillivray, S., Terzi, N. Empirical evidence of the relationship between parental and child dental fear: a structured review and meta-analysis. *International Journal of Paediatric Dentistry*. 2010, 20, 83–101.

98. Thomson, W., Locker, D., Poulton, R. Incidence of dental anxiety in young adults in relation to dental treatment experience. *Community Dentistry and Oral Epidemiology*. 2000, 28, 289–294.
99. Thomson, W. M., Broadbent, J. M., Locker, D., Poulton, R. Trajectories of dental anxiety in a birth cohort. *Community Dentistry and Oral Epidemiology*. 2009, 37(3), 209.
100. Tuma, C.F. How to help your child to be a good dental patient: an open letter to parents. *Journal of Dentistry for Children*. 1954, 21, 81–84.
101. US National Institute of Mental Health Fear/Phobia Statistics. <http://www.statisticbrain.com/fear-phobia-statistics/>, sk. 23.05.2016.
102. Versloot, J., Veerkamp, J. S. J., Hoogstraten, J., Martens, L. Children's coping with pain during dental care. *Community Dentistry and Oral Epidemiology*. 2004, 32, 456–461.
103. Vignehsa, H., Chellapah, N. K., Milgrom, P., Going, R., Teo, C. S. A clinical evaluation of high- and low-fear children in Singapore. *Journal of Dentistry for Children*. 1990, 57, 224–229.
104. Vogels, W. E. J. C., Aartman, I. H. A., Veerkamp, J. S. J. Dental fear in children with a cleft lip and/or cleft palate. *The Cleft Palate–Craniofacial Journal*. 2011, 48(6), 736–740.
105. Wogelius, P., Poulsen, S., Sorensen, H. T. Asthma, ear problems, and dental anxiety among 6- to 8-yr-olds in Denmark: a population-based cross-sectional study. *European Journal of Oral Sciences*. 2003, 111, 472–476.
106. Wogelius, P., Rosthoj, S., Dahllof, G., Poulsen, S. Dental anxiety among survivors of childhood cancer: a cross-sectional study. *International Journal of Paediatric Dentistry*. 2009, 19, 121–126.
107. Wright, G. Z. *Psychological management of children's behaviour*. In: *Dentistry for the child and adolescent*. 6th ed. R. E. McDonald, D. R. Avery, eds. St Louis: Mosby, 2000.
108. Yeap, C. K., Slack-Smith, L. M. Internet information on child dental health and the first dental visit. *Australian Dental Journal*. 2013, 58, 276–282.
109. Yuzugullu, B., Gulsahi, A., Celik, C., Bulut, S. Dental anxiety and fear: relationship with oral health behavior in a Turkish population. *International Journal of Prosthodontics*. 2014, 27(1), 50–53.
110. Zhou, Y., Cameron, E., Forbes, G., Humphris, G. Systematic review of the effect of dental staff behaviour on child dental patient anxiety and behaviour. *Patient Education and Counseling*. 2011, 85, 4–13.