

Original Research

Sensory Response in the Behaviour of a Child in the Dental Environment to the Various Sensory Stimuli Routinely Evoked at Home

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ABSTRACT:

Introduction: The behaviour of a child in dental operatory is affected by many factors including age, temperament, previous dental experience, anxiety, fear, cognition, parenting styles. **Aim:** The aim of the study was to evaluate the cooperation of child's behaviour before and during dental examination, the correlation between the various selected sensory responses routinely stimulated at home and then in the dental office and the association between them. **Method:** A cross-sectional study was conducted on 96 healthy children aged between 4-8 years at the time of their first visit to the dental hospital. Data acquisition was done by a questionnaire given to the parents. The child's behaviour was categorized according to Frankl behaviour rating scale before the treatment and HOUPHT behaviour rating scale during the treatment. The children's reactions to the sensory stimuli of touch, noise, smell, taste, sight and vestibulocochlear sensation in dental office and that at home were noted by the dentist and parent respectively. Data analysis was performed using software SPSS Version 21.0 Chi square test and Pearson correlation test were used. **Results:** 56.58% of the children showed a positive behaviour. The results showed that the child's behaviour at home was significantly related to the child's response at the dental clinic with a significant positive correlation ($r=0.564$) ($p\text{-value}<0.05$). However, adverse reaction was significantly more among subjects with negative Frankl behaviour rating score. **Conclusion:** Children who showed a positive sensory response to various activities at home showed a positive behaviour of sensory response in the dental environment.

Keywords: Houpt behaviour rating score, Frankl behaviour rating score

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INTRODUCTION:

Guiding a child's behavior in the dental operatory is one of the foremost steps to be taken by a pediatric dentist and one who can successfully modify the behaviour can definitely pave the way for a life time comprehensive dental health care needs. Child behavior in the dental operatory is a multifactorial phenomenon depending on the age, parenting styles, cultural and social background, cognitive level, temperament, personality characteristics, anxiety and fear, reaction to strangers, past dental experiences, maternal anxiety, timing of the appointment.¹⁻³ Children differ in their sensory response to various stimuli with respect to type, intensity and affective tone displayed.⁴ The adverse reactions seen in children in the dental operatory are associated with activation of the amygdale and right prefrontal cortex and that these negative emotions may be due to tactile,

olfactory, gustatory, visual, vestibulocochlear, proprioceptive or auditory stimulation.^{5,6}

Behavioural rating scales are commonly used indices to note children's responses.⁷ The response to a particular stimulation is either sensory over responsiveness, sensory under responsiveness or sensory seeking/craving.⁴ Sensory stimuli commonly encountered in the dental office, such as flashy bright fluorescent light, touching in and around the oral cavity, taste and smell of dental care products, noxious auditory sound of the armamentarium used and various postures and movements of the dental chair, gagging while taking x rays or placement of a tray have a negative impact on child's response making it more difficult for dentists to provide proper dental treatment.

In this study, we have evaluated the children's behaviour during the dental examination and treatment, their reaction to selected sensory stimuli at home, and the

association between them. We hypothesized that children with adverse reactions to sensory stimuli at home will demonstrate more behavioral problems during the dental examination.

MATERIALS AND METHODOLOGY:

A descriptive cross sectional study was conducted on 100 eligible children screened aged between 4-8 years at Department Of Pedodontics and Preventive Dentistry at I.T.S Dental College hospital and Research centre , Greater Noida between July 2017 to August 2017 .The inclusion criteria were the childs first dental visit whose undergoing restorations and endodontic treatments and in which impression taking and fluoride application was must was mandatory and children with no developmental disabilities(like hearing impairment, visual impairment, , ADHD, cerebral palsy). The exclusion criteria was previously a very bad dental experience, a handicapped child/ impaired child, any ear disease or surgery in past or any medication related to hearing impairment.

The data collection was done through parental interview using a structured questionnaire designed for the purpose of this study as well as observation of childs behaviour using Frankl Behaviour Rating Scale at the reception and while Houpts behaviour rating scale used during treatment. The questionnaire was available in two languages : English or Hindi vernacular and parents were asked to sign the consent form to evaluate the sensory response of their child during the dental treatment.4 children failed to meet inclusion criteria leaving us with 96 children (67 boys 23 girls) aged 4 to 8 years who participated in the study.

The questionnaire was structured into two parts one for the parents before the treatment and one for the dentist during the treatment.

The parent part consisted of:

1. Vital statistics, any health problem, any history of previous hospitalization, past dental experience.
2. Childs oral sensory response to various activities at home giving a positive or aversive scoring. If the child accepted the particular stimuli, a positive/neutral response was given and if he/she doesn't ,a negative response was given.
3. Frankl score was recorded before the treatment.

The dentists part questionnaire evaluated Houpts behaviour rating scale during the treatment and sensory responses were noted as over responsiveness, under responsiveness and craving/seeking.

For tactile sense (resistance to brushing teeth, picky eater, face washing/taking a bath),for sense of smell (hyper /under response to smell of perfume/deodorant ,soap /shampoo, room freshner), for sense of sound by the reaction of the child to people talking, door bell ringing, noise of home appliances, sound of hair dryer) were scored as positive or aversive . Locating things by kid or his/hers experience to the greenery or while strolling in park were evaluated for sense of sight and whether the child is a picky chooser for sense of taste. Child vestibulocochlear response was noted while swimming, travelling in airplanes or to activities involving balancing like trekking or swing. The dentist recorded child's over responsivity or under responsivity to touch of water from air rotor or instruments during examination, gag while taking x-rays and suction and while taking an impression. The hyperresponsivity to sense of taste of gloves, alginate, APF gel and a tooth restored with glass ionomer cement was also noted. The response to the noise of drill, air rotor, suction, ultrasonic scaler, trimmer and audioanalgesia were recorded. Overresponsivity to bright lights and sight of injection or file was also noted. Reaction to raising and tilting of chair to various postures was noted for each child whether the child enjoyed it or was aversive.

STATISTICAL ANALYSIS: The observed data was send for statistical analysis where Frankl score 1 -2 were taken as negative by statistician and score 3-4 were taken as positive. Data analyses was performed using software SPSS Version 21.0.Chi square test was done .The correlation between Frankl behaviour scale, Houpts behaviour rating scale, Parents response and Dentist behavioural score was seen using Pearson Correlation test.

RESULTS:

The study involved 96 children aged 4 to 8 years amongst which 67 were boys and 23 where girls. There was no significant age or gender based differences between the groups. In the waiting room 56.58% showed positive score and 48.50% (almost half) completed their dental treatment smoothly and showed a good behaviour.21.1% of children showed negative behaviour in the dental waiting room and 10.1 % showed fair behaviour but however completed the treatment eventually(Figure 1). 48.50% showed a good response and difficultly but completed the treatment (Figure 2).The distribution was compared between subjects with positive and negative Frankl behaviour rating score using the Chi-square test.

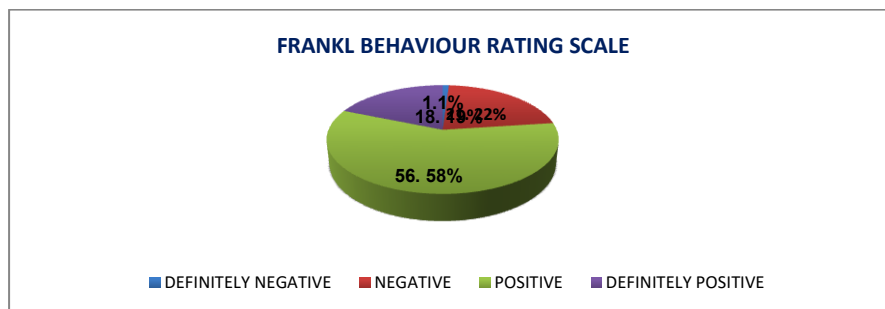


Figure 1: Frankl behaviour rating score of the child at reception

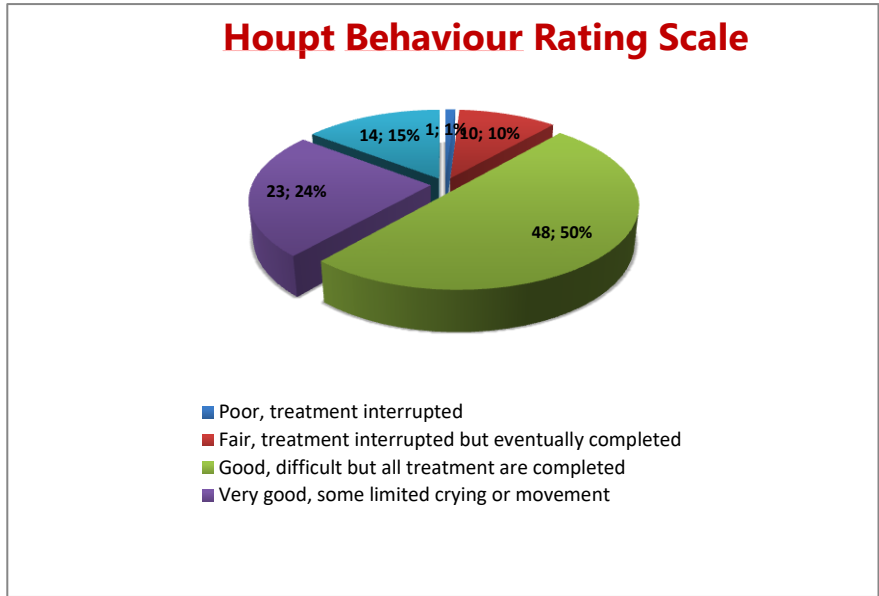


Figure 2: Houpt behaviour rating scale of the child during treatment

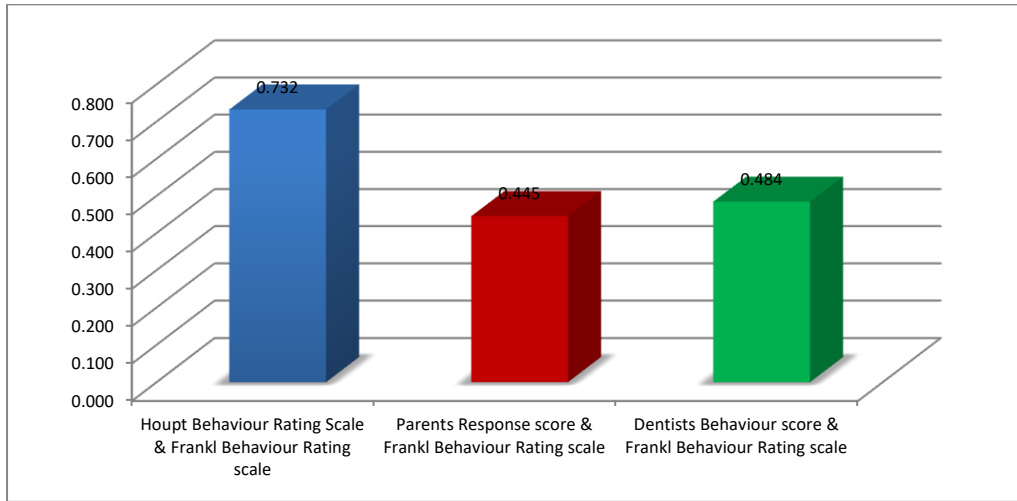


Figure 3: Comparison of the Dentist score,parent scoreand behaviour rating scales

There was a significantly positive correlation of Frankl behaviour rating scale with HBRS and Dentists Behaviour response score (Figure 3). There was a significant positive correlation of Sense of Sound, Touch, Sight, Vestibulocochlear (Parents Response score) and Over-all Parents Response score with Sense of Sound, Touch, Sight, Vestibulocochlear (Dentists Behaviour score) and Over-all Dentists Behaviour score

respectively (Table 1) (Figure 4). Adverse reaction was significantly more among subjects with negative Frankl behaviour rating score (Figure 5). HBRS had a significantly positive correlation with FRANKL BR, Parents Response and Dentists Behaviour response scale Parents Response had a significantly positive correlation with HBRS, and Dentists Behaviour response scale (Table 2).

	Number	Correlation	p-value
Sense of Sound(Parents Response score)&Sense of Sound (Dentists Behaviour score)	96	0.378	0.021*
Sense of Touch (Parents Response score) &Sense of Touch (Dentists Behaviour score)	96	0.401	0.013*
Sense of Sight (Parents Response score) &Sense of Sight(Dentists Behaviour score)	96	0.350	0.045*
Sense of Taste (Parents Response score)&Sense of Taste (Dentists Behaviour score)	96	0.303	0.048*
Sense of Vestibulocochlear(Parents Response score)&Sense of Vestibulocochlear (Dentists Behaviour score)	96	0.430	0.001*
Over-all Parents response score and Over-all Dentists Behaviour score	96	0.564	<0.001*

Table 1: Correlation of Sense of Sound, Touch, Sight, Vestibulocochlear (Parents Response score) and Over-all Parents Response score with Sense of Sound, Touch, Sight, Vestibulocochlear (Dentists Behaviour score) and Over-all Dentists Behaviour score

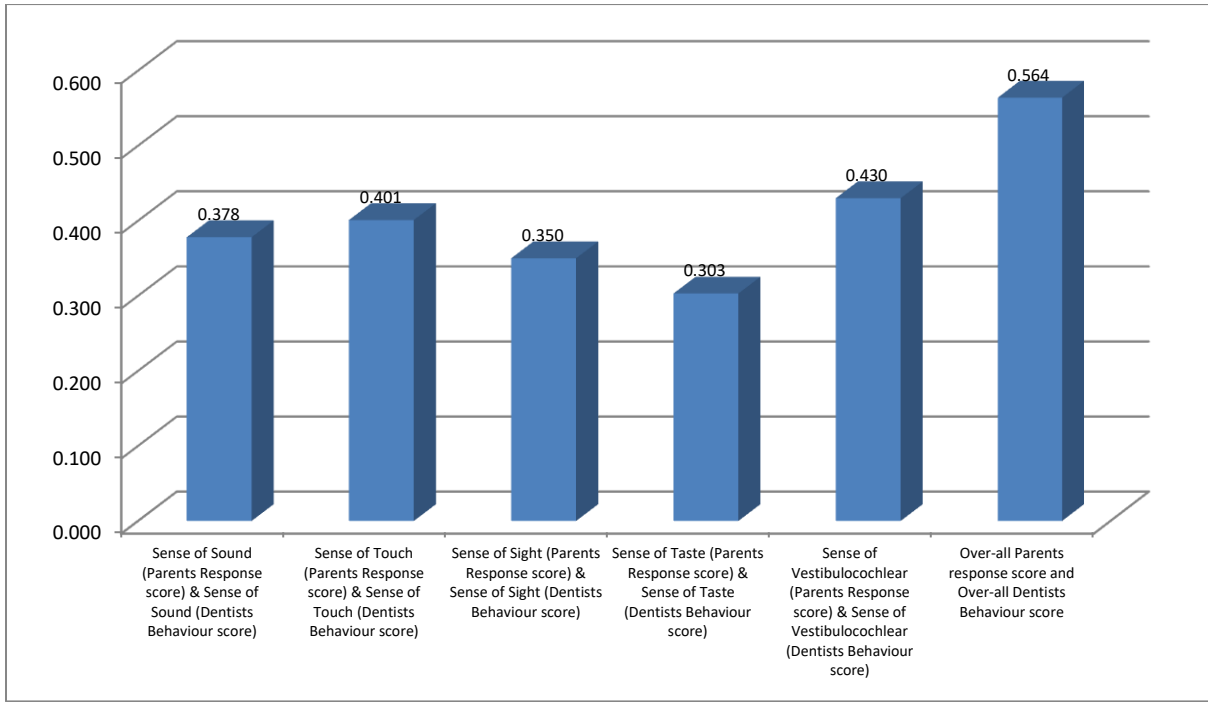


Figure 4

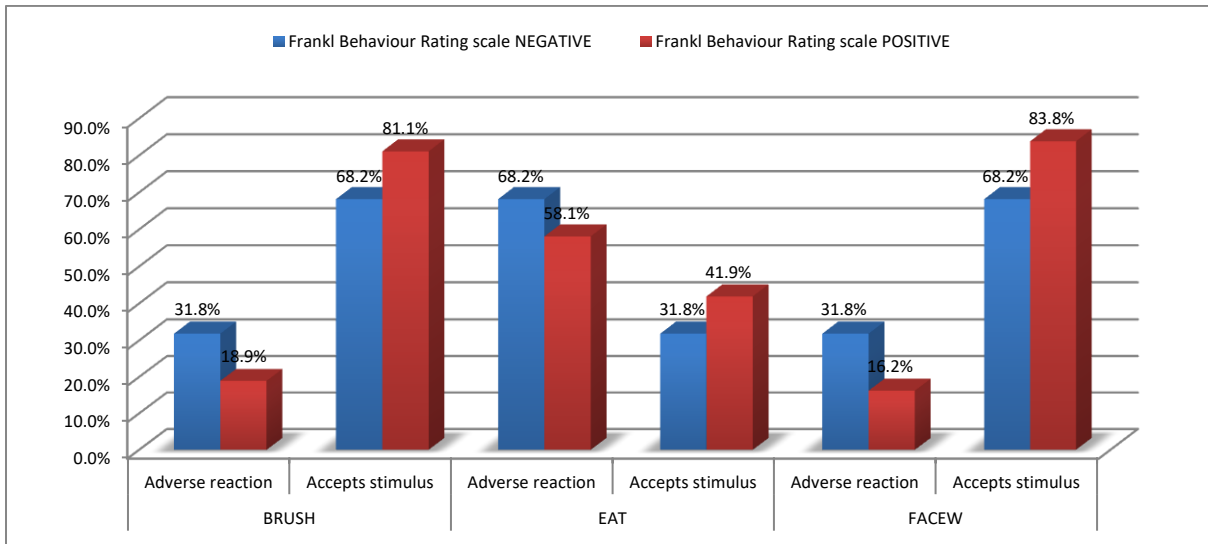


Figure 5:

Table 2: Correlation between Frankl behaviour rating ,Houpt behaviour rating scale, parents response score and dentist response score

		FRANKL BR	HBRS	Parents Response	DENTISTS BEHAVIOUR
FRANKL BR	Pearson Correlation	-	0.732	0.145	0.384
	P-value		0.001*	0.159	0.001*
HBRS	Pearson Correlation	0.732	-	0.237	0.384
	P-value	0.001*		0.020*	0.001*
Parents Response	Pearson Correlation	0.145	0.237	-	0.331
	P-value	0.159	0.020*		0.001*
Dentists Behaviour response scale	Pearson Correlation	0.384	0.384	0.331	-
	P-value	0.001*	0.001*	0.001*	

DISCUSSION :

A pedodontist plays a pivotal role in making every child's dental appointment free of negativity. The successful practice involves a good combination of technical skills and soft skills.⁸ The majority of the patients cooperated during the dental treatment.

The correlation between the child's reaction at home and to the same stimuli being stimulated at the dental operatory was the main aim of the study. Earlier very little research work has been done in the past to evaluate the sensory responses to the various dental materials and instruments and the response to the same stimuli when evoked at home. It was seen that the children showed a negative response to the same sensory stimuli when evoked at home during routine activities and then at the dental office. A child relates his experience in the dental operatory to the various experiences he has already faced at home and somehow adjusts to the dental treatment. Children who are hypersensitive can be either fearful and cautious or negative and defiant. Fearful ones are cautious, are easily upset, fragmented, have excessive fears, are anxious and may be easily distracted. This description is consistent with our proposed category of sensitivity to a sensory stimuli.

M.A. Kyritsi et al also conducted a study in Greek children stating that dental treatment is related to age, previous dental fear and experience and behaviour prediction by the parents.⁹ So parents' estimation regarding their children's fear and behaviour could be a useful predictor of a child's level of cooperation during dental treatment.

Also Nissan S et al concluded that children's behavior during dental examination is known to be affected by many factors, including age, previous experiences, anxiety and fear.⁴ 9-26 % of typically developing children demonstrate significant dental fear and anxiety.¹⁰

Amongst the various psychological theories and frameworks put forward for observing and interpreting children's behaviour in a dental operatory so far, the role of sensory processing in a dental performance is receiving immense attention. Literature quotes that 5-16 % of preschool and school aged children suffer from a condition termed SMD 'Sensory Modulation Disorder' which is a type of sensory processing disorder.^{4,11} These children have difficulty in organizing the responses to sensory input in a graded and adaptive manner thus interfering with their participation in daily activities, poor coordination and ability to cope in the external environment.¹² Two types of oral SPD, or oral defensiveness either hyposensitivity type when a child is little aware of what's going on inside their mouths or hypersensitivity in which a patient is overly sensitive to any oral stimulation and needs measures to desensitize for treatment. The dental environment with its moving chairs, loud noises, bright lights, and strangers touching faces can easily push the buttons of all areas of the disorder. Even a simple tap on the shoulder can hit, or it may not even be registered by the brain in such children. A slight movement of the dental chair is severely uncomfortable

to such a child which can be made pleasant by avoiding sudden jerky movements.

Sensory adapted dental environment as compared to regular dental environment reduces the sensory aversive characteristics of the environment thereby decreasing children's arousal, uncooperative behaviour, pain and sensory discomfort.¹³ Advocating tell show do methodology, choosing colors of rubber dam, use of sunglasses in children's sensitive to light will help to allay anxiety.

This study aimed to find an association between a child's reaction to sensory stimuli during routine and his sensory response in clinic. The majority of children in our study accepted the sensory stimuli without protest. Amongst all stimuli sense of noise and vestibulocochlear was associated with negative behaviour. In our study, we noted if a child accepts the stimuli of touch at home like brushing his teeth, eats any food, washes his face or takes a bath easily the same child had a positive behaviour in the dental appointment to the touch of mouth mirror, probe, air rotor, has reduced gag with suction or while taking radiographs and impressions.

In the busy dental settings due to various noise disturbances because of multiple operating units in the same room behavioural difficulties and aversive reactions can be invoked in children. A child showing a positive frank behaviour to the noise of drills, suction, ultrasonic scaler, trimmer, lathe, and audio analgesia advocated a calm behaviour to the noises of kitchen appliances, hair dryers, ringing door bell, people talking at home, the sound of fingernails scratching across a blackboard, and rubbing of Styrofoam. Also some children hate to be touched while some love the firm touch gesture or a warm pat as they feel secure.

Similarly a child who had an adverse reaction to the smell of perfume, soap or room freshener had an over responsiveness to the smell of zinc oxide eugenol while obturating, luting of crowns with Glass ionomer cement or to the smell of gloves.

A child having difficulty while locating things, doesn't enjoy line drawing or doesn't enjoy visiting a park shows an over responsiveness to the sight of injection, endodontic files and fluorescent flashy lights.

Children who were sensitive to different tilting movements of chair had shown an adverse reaction when experiencing a flight, or playing on swings, dancing and while trekking. A child who was a picky chooser with regard to taste, texture and smell of food at home showed an over responsiveness to the taste of alginate, glass ionomer cement, taste and smell of gloves and fluoride application gel. So a pedodontist needs to have a good understanding about a child's mind processing abilities and should be able to differentiate a normal over response in a child to a sensory processing disorder as it is highly prevalent in the school going children.

CONCLUSION:

Most children behaved positively, the proportion of which increased from the time the child entered the clinic to treatment. The child's memory to a particular stimuli at home can be correlated with any dental treatment evoking

the same response and guided accordingly. Adverse reaction to the same sensory stimuli was seen during the dental treatment to which child was sensitive during routine activities at home. Uncooperative behaviour was correlated with sensory over responsiveness in children during dental treatment to the sense of taste, smell, noise, touch, sight and vestibulocochlear.

LIMITATIONS:

In future studies needs to be done on children already diagnosed with and without SMD and sensory processing disorder with regard to their behaviour in the dental clinic and home so that proper care and sensory adapted dental environment could be given to such patients. Also the cognition level of children of age group 4 to 8 age group is different and so will be the response. We also need to examine which factor may moderate treatment efficacy.

REFERENCES:

1. Aminabadi NA, Puralibaba F, Erfanparast L, Najafpour E, Jamali Z, Adhami SE. Impact of temperament on child behavior in the dental setting. *J Dent Res Dent Clin Dent Prospects*. 2011;5(4):119-22.
2. Children's Responses to Sensory Stimuli and their Behavior in the Dental Office. Nissan S, Yochman A, Blumer S, Kharouba J, Peretz B. *J Clin Pediatr Dent*. 2017;41(1):10-17
3. Howenstein J, Kumar A, Casamassimo PS, McTigue D, Coury D, Yin H. Correlating parenting styles with child behavior and caries. *Pediatr Dent*. 2015;37(1):59-64.
4. Nissan, S., Yochman, A., Blumer, S., Kharouba, J., & Peretz, B. (2017). Children's Responses to Sensory Stimuli and their Behavior in the Dental Office. *Journal of Clinical Pediatric Dentistry*, 41(1), 10-17.
5. Yu JF, Lee KC, Hong HH, et al. Human amygdala activation by the sound produced during dental treatment: A fMRI study. *Noise Health*. 2015;17(78):337-342.
6. Blood AJ, Zatorre RJ, Bermudez P, Evans AC. Emotional responses to pleasant and unpleasant music correlate with activity in paralimbic brain regions. *Nat Neurosci*. 1999;2:382-7.
7. Shao AG, Kahabuka FK, Mbawalla HS. Children's Behaviour in the Dental Setting according to Frankl Behaviour Rating and their Influencing Factors. *J Dental Sci* 2016, 1(1)
8. Nuvvula S, Kamatham R, Challa R, Ashokan S. Reframing in dentistry: *J Indian Soc Pedod Prev Dent* .2013;31:165-8
9. Kyritsi, M.A., Dimou, G. & Lygidakis, N.A. Parental attitudes and perceptions affecting children's dental behaviour in Greek population. A clinical study. *Eur Arch Paediatr Dent* 2009;10: 29.
10. Klingberg G. Dental anxiety and behaviour management problems in paediatric dentistry – a review of background factors and diagnostics. *Eur Arch Paediatr Dent* 2008; 9: 11-5
11. Ben-Sasson A, Carter AS, Briggs-Gowan MJ. Sensory over-responsivity in elementary school: prevalence and social-emotional correlates. *J Abnorm Child Psychol*;37(5):705-716. 2009.
12. Lane SJ, Miller LJ, Hanft BE. Toward a consensus in terminology in sensory integration theory and practice: Part 2: Sensory integration patterns of function and dysfunction. *Sensory Integration Special Interest Section Quarterly*;23(2):1-3. 2000
13. Cermak SA, Stein Duker LI, Williams ME, Dawson ME, Lane CJ, Polido JC. Sensory Adapted Dental Environments

to Enhance Oral Care for Children with Autism Spectrum Disorders: A Randomized Controlled Pilot Study. *J Autism DevDisord*. 2015;45(9):2876-2888.