



## Sensory Adapted Dental Environment: Improving Dental Visits for Children with Developmental Disabilities

Dimple Padawe<sup>1</sup>, Vilas Takate<sup>2</sup> and Kalyani Barve<sup>3</sup>

<sup>1</sup>Professor and Head, Department of Pediatric and Preventive Dentistry, Government Dental College and Hospital, Mumbai, India

<sup>2</sup>Associate Professor, Department of Pediatric and Preventive Dentistry, Government Dental College and Hospital, Mumbai, India

<sup>3</sup>Postgraduate Student, Department of Pediatric and Preventive Dentistry, Government Dental College and Hospital, Mumbai, India

**\*Corresponding Author:** Kalyani Barve, Post-Graduate Student, Department of Pediatric and Preventive Dentistry, Government Dental College and Hospital Mumbai, India.

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**Kalyani Barve., et al.**

### Abstract

Dental Anxiety is associated with general dental care, the anticipation of treatment, fear of the unknown, fear of pain and relationship with dental professionals in the dental office. Children with developmental disorders experience motor, perceptual, language, sensory, cognitive, and behavioural impairments which can create difficulties in undertaking oral hygiene measures. In the regular dental setup, disabled children are sensitive and easily invoked to sensory stimuli. A sensory adapted dental environment (SADE) has been developed, based upon the Snoezelen environment, and may potentially be suitable in reducing dental anxiety and facilitating a calming effect in the dental clinic among children. SADE has been thoroughly studied in people with DD. SADE uses a multisensory environment, a combination of mesmerising sound, good lighting, vibration, tactile sensation, and aroma. The aim of implementing these sensory adaptations is to regulate sensory responses and facilitate in the reduction of anxiety. Studies that have researched sensory adapted dental environments (SADE) have shown significant improvement in cooperation and reduction in dental anxiety and associated behaviours for this population.

**Keywords:** Dental anxiety; Developmental Disabilities; Sensory Adapted Dental Environment; SADE; Behaviour

### Introduction

Anxiety is an emotion experienced by most individuals during their lifetime and can be described as mild apprehension in response to an uncertain situation. Dental Anxiety is associated with general dental care, the anticipation of treatment, fear of the unknown, fear of pain and relationship with dental professionals in the dental office. Dental anxiety is a common issue among children and young adults. A meta-analysis by Grisolia, dos Santos reported the pooled prevalence as 23.9% globally [1]. Corresponding prevalence in pre-schoolers, schoolchildren, and adolescents respectively; 36.5%, 25.8%, and 13.3%. The presence of dental anxiety has important implications for both patients and clinicians. It can be problematic for clinicians because anxious patients can be difficult to manage and treat, or might delay or avoid their appointments. From the patient's perspective, those with dental anxiety tend to overestimate the experienced pain, report less satisfaction, have an aversion to future treatment and reduced compliance.

The Center for Disease Control and Prevention (CDC) reported that children with developmental disabilities (DD) have considerably increased in recent times [2]. Developmental disturbances also known as neuro developmental disorders are a diverse group of chronic conditions that are due to mental and/or physical impairments. Children with developmental disturbances experience challenges such as language, mobility, learning, self-help and independent living [3]. Under this broad spectrum of developmental disturbances, children may have intellectual disabilities (ID) communication disorders, autism spectrum disorder (ASD), attention deficit hyperactivity disorder (ADHD), specific learning disorders, motor disorders and other neurodevelopmental disorders [4].

Oral health is fundamental to overall psychological and physiological health, wellbeing, and quality of life. Many children with DD have poorer oral health than typically developing children and experience difficulty obtaining adequate oral health care. Children

with DD experience motor, perceptual, language, sensory, cognitive, and behavioural impairments which can create difficulties in undertaking oral hygiene measures. In the regular dental setup, disabled children are sensitive and easily invoked to sensory stimuli. In a recent survey of parents of children with special healthcare needs, approximately 50% of parents believed that sensory processing difficulties interfered with their child's oral care in the dental office [5]. Physical resistance and uncooperative behaviors during oral care are obstacles identified by caregivers of adults who have special healthcare needs [6]. Ayres developed a theoretical model in 1980, the theory of Sensory Integration (SI). This theory; based on principles from neuroscience, biology, psychology, and education, hypothesizes that some children with learning disorders experience difficulty processing and integrating sensory information and that this, in turn, affects their behavior and learning [7,8]. Ayres' work was prompted by her clinical observations of children with learning disabilities, many of whom she noted displayed perceptual, sensory, and motor difficulties. A variety of techniques and strategies may be used to help patients with ASD better deal with dental visits. First, procedures and environments can be modified to reduce sensory stimuli; second, the application of specific intervention strategies may help the patient to better handle uncomfortable sensations [9].

A sensory adapted dental environment (SADE) has been developed, based upon the Snoezelen environment, and may potentially be suitable in reducing dental anxiety and facilitating a calming effect in the dental clinic among children. SADE has been thoroughly studied in people with DD.

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### Sensory processing difficulties in dental visits

The dental environment poses many challenges to patients with ASD. It presents the patient with sensory-stimulating environment, possible discomfort, and loss of control in an unfamiliar environment. The invasive nature and extensive sensory stimulation of dental care must be taken into account to successfully treat these patients as many exhibit sensory processing difficulties. A patient with sensory defensiveness may exhibit the following be-

haviors during a dental visit related to smell, taste, sound, touch, motion and visual aspects

- **Reaction to touch:** The patient may overreact to unanticipated touch, particularly touch to the face and inside the mouth, which is an extremely sensitive area. There may be oversensitivity to dental prophylaxis and extreme dislike of the texture and grittiness of the polishing paste. The patient may exhibit unusual responses to dental tools, x ray films or sensor, or gloved fingers in the mouth. The patient may gag frequently or excessively.
- **Reaction to motion:** Extreme fear responses in these patients as the dental chair reclines may manifest as gripping the chair arms, reaching to hold the assistant or parent, or attempting to get up or turn around in the chair. Patients with defensiveness to motion will often be more sensitive to moving backward than forward
- **Reaction to visual stimuli:** Patients with developmental disabilities often have difficulty tolerating bright light. There is fear of the assistant and dentist when their faces are covered with a mask as wearing the mask highlights the eyes and covers the mouth, an area that many children with autism look at when speaking with others as they often avoid direct eye contact.
- **Reaction to sounds:** Fear responses to the sounds of the dental equipment, especially the polishing brush, suction and high-speed handpieces, fear responses to unexpected office noises such as intercoms, door alarms and beeps and aversive responses to other people talking or laughing in the dental clinic may be seen.
- **Reaction to smells and tastes:** The patient may respond to the smell of the glove materials or the taste of the glove in the mouth or refuse to allow paste to be used in the mouth due to taste or smell. Overreaction to the odors of perfumes or soaps used by staff members or other patients may be seen.

### Improving dental visit by altering the sensory experience

Multi-sensory adapted dental environment includes use of aromatherapy, calm music and warm body wraps to relax the child.

### Snoezelen environment

The term 'Snoezelen' is a contraction of two Dutch words; snuffles which means to sniff out or explore one's environment, and 'doezelen' which denotes to doze or relax. In general, the Snoezelen multisensory therapy is a well-equipped room to incorporate all of the human senses by combining a well illuminated room with good lighting, mesmerizing sound, vibration, and aroma, along with good tactile sensation [11]. The physical environment consists of

a combination of a partially lit room with special lighting effects, relaxing music, vibration and aromas. Research documenting the outcome of the Snoezelen environment reports reduction of pain, behavior facilitation and balance of heart rate [11,12].

The Snoezelen environment consists of a multisensory adapted environment coupled with “client-centered” therapy. It has been proposed to improve the quality of life of varied populations suffering from anxiety, including individuals with developmental disability.

### Sensory adapted dental environment

In 2021, advanced behaviour guidance using Sensory Adapted Dental Environment (SADE) was introduced. The SADE intervention included adaptations of the clinical setting (e.g., dimmed lighting, moving projections such as fish or bubbles on the ceiling, soothing background music, application of wrap/blanket around the child to provide deep pressure input) to produce a calming effect. According to American Academy of Pediatric Dentistry, SADE can be used in patients having autism spectrum disorder, sensory processing difficulties, other disabilities, or dental anxiety. SADE has been found to enhance relaxation and avert negative behaviour [11].

The SADE intervention is based on two theoretical models or frameworks, multisensory environments and sensory integration theory and consists of modification of the sensory environment of the dental office [13]. SADE is created by modifying visual, auditory, tactile, and somatosensory stimuli [14]. The need to merge and organize the information received from every sense into one cohesive mental picture of the natural environment can be considered as sensory integration. The sensory environment is hypothesized to cushion and protect the individual from harsh stimuli by lowering unsettling visual, auditory, and tactile intensity while enabling calming responses [15,16].

### Modifications to procedures and environment

#### Visual Aspect

Williams has stated that people who are over sensitive to visual stimuli have a problem filtering different wavelengths of light. The result is an overload of visual perception and a difficulty making sense of visual stimuli [17]. Direct fluorescent lighting has been documented as flickering and excessively disturbing. To overcome these problems, remove all direct overhead fluorescent lighting, including the regular dental overhead lamp. The adapted lighting consists of dimmed upward reflective fluorescent lighting.

Slow moving, repetitive visual color effects should be created by a “solar projector”, in the child’s visual field.

The dental hygienist should wear a head mounted LED narrow-spectrum light emitting diode source lamp.

Camouflage the instruments by covering handles of the instruments covered with toys.

#### Auditory aspect

A considerable body of knowledge has documented the negative effects of noise on infants in neonatal intensive care units, finding that higher noise levels increased due to the dental hand-piece brush or the power suction machine [18]. According to Love, dental clinics noises, such as drills, are in the range of 100dB, presenting a significant risk of noise induced hearing loss [19,20]. To camouflage the second sensory stimuli, that is noise, play soft music in the background to distract the children from the regular loud sounds of the dental equipment.

#### Use headphones.

- Provide a “white noise” machine in the room to mask the noises from adjacent areas.
- Minimize outside noises and talking of others.

#### Tactile stimulus

##### Tactile stimulus consists of regular dental x-ray vest.

A friendly immobilization wrap can be developed which is in the shape of a butterfly with a smiling face and wings that envelope and “hug” the child when wrapped around. The wrapping material should be soft and pliable, with the aim of rendering optimal comfort.

The butterfly hugs the child tightly to ensure safety and as a means of deep pressure.

#### Taste and smell: This may vary from patient to patient.

Alter the gloves used or the paste used to reduce unpleasant smells, tastes and textures. Ask staff members to refrain from wearing perfume and using shampoo with a strong smell. Choose unscented soaps, air fresheners for the office.

#### Advantages of SADE

- It cushions and protects the child.
- It focuses on positive stimuli causing an altered state.
- It relaxes the child during treatment and improves behavior.

- In children with developmental disturbances, it can be a substitute to pharmacological sedation
- The equipment cost for SADE is minimal.
- The equipment is portable and easy to set up and remove.

### The future of sensory adapted dental environment

There are 3 primary areas to investigate in future research of SADE

- First, it will be important to determine if the positive results of the adapted environment are due to the treatment package as a whole (visual, auditory, tactile) or if one or two components are sufficient to obtain positive results.
- Second the idea of combining sensory and behavioral intervention components is also worthy of future study in order to determine if the effects of a combined intervention are more beneficial than either treatment individually.
- Lastly it is essential to examine whether the SADE intervention may also be helpful for children with other disabilities as well as for typically developing children with dental fear or sensory sensitivities, as the intervention provides an environment that is less sensory aversive and reduces physiological stress and anxiety [21-25].

### Conclusion

Modifying the sensory environment is believed to 'cushion' and thus 'protect' the subject from harsh stimuli, reducing aversive visual, auditory, and tactile intensity while offering soothing visual, auditory, and tactile stimuli. The modified sensory environment results in the subject's attention being focused intently on the positive stimuli, causing an 'altered state' with a concomitant reduced awareness of discomforting or noxious stimuli [4]. Improvement of behavior is of value not only for the wellbeing of the child, but also for the confidence of the doctor in the validity and reliability of his/her examination, diagnosis and subsequent treatment. In the context of delivering dental care to both typical and the very challenging group of children with developmental disabilities, a sensory controlled environment may represent an important substitute for the commonly used alternatives of pharmacological sedation or even general anesthesia.

### Conflict of Interest

None.

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