

SENSORY ADAPTATIVE DENTAL ENVIRONMENT (SADE) USE IN AUTISTIC SPECTRUM DISORDER - A REVIEW

Dr. Khushboo*, Dr. Bhavya Sharma**
Dr. Subrata Saha***, Dr. Subir Sarkar***

ABSTRACT

Sensory modulation symptoms are common in persons with autism spectrum disorders (ASD); however have a heterogeneous presentation. Many studies have been done indicated a significant high difference between ASD and normal groups of children in the presence/frequency of sensory symptoms, with the greatest difference in under-responsivity, followed by over-responsivity and sensation seeking. It is important to consider these moderators and interventions addressing sensory symptoms. Multisensory environment help in reducing fear and provide important calming effect in such children.

KEY WORDS

Autism spectrum disease (ASD), Multisensory environment (MSE), sensory processing (SP), sensory adaptation

ABOUT THE AUTHORS

*Post Graduate Student, **Intern, ***Professor and P.G Guide.
Dept of Pedodontics and Preventive Dentistry
Dr. R. Ahmed Dental College and Hospital, Kolkata

CORRESPONDING AUTHOR

Dr. Bhavya Sharma
Intern
Dept of Pedodontics and Preventive Dentistry
Dr. R. Ahmed Dental College and Hospital, Kolkata

INTRODUCTION

Oral health is vital for children with psychological and physiological health¹. However despite the importance of proper oral care, dental care is most frequently cited overlooked health care need for children with special care and need, with parents frequently reporting fair or poor condition of teeth in these children².

The group of children with special health care and need that may be at specifically risk for poor oral health is children with Autism Spectrum Disease (ASD). The Maternal and child health bureau (MCHB) has defined children and adolescent with Special health care need (SHCN) as those "who have or are at the increased risk for chronic physical, developmental, behavioural or emotional condition and who also require health and related service of a type or amount beyond that required by children generally"³. SHCN includes the child who have systemic disorder (eg- leukemia or malignancies), orofacial complex disease (eg- Amelogenesis imperfecti, dentinogenesis imperfecti, cleft lip and palate, oral cancer) and also child with intellectual and development disabilities (IDD), autism spectrum disease. (ASD).⁴

Where as Autism is characterized by impairment in three main areas of development - Social relatedness, communication skills and presence of stereotyped behaviour, interest and activities^{5,6}. Stereotyped behaviour typically associated with autism includes hand flapping, finger flicking, rocking, spinning and self injury such as head banging and hand biting (American psychiatric association 2000). According to National Institute of Medical Health - Autism is known as a "spectrum disorder because there is wide variation in type and severity of symptoms people experience". One philosophy for the presence of stereotyped behaviour in autism is that dysfunction in processing sensory information characteristics of disorder results in adoption of aberrant behaviours in an attempt to make sense of and regulate stimulation from environment.⁷

However, autism itself is not a direct cause of dental deficit, it is consider as indicator of high caries risk with caries incidence linked to behaviour and exhibit difficulties with activity of daily living



Fig 1

(ADL). Thus due to lack of psychological and physiological co-ordination patient is not able to maintain oral health. Hence proper dental care is important in such patient. But unusual response to sensory stimuli, anxiety and negative reaction with exposed to standard sensory characteristics of dental operatory such as bright fluorescent light, touch in or around the mouth and taste and smell of various oral care products making it difficult for dentist to provide treatment⁹.

In such cases some of the intervention like based on Sensory integration theory¹⁰, information and multisensory environment¹⁵, sensory adaptation to dental environment with children with development disabilities is required¹³, to make such children comfortable in dental clinics. So the main aim of this article is to review the Multisensory environment (MSE) or sensory adaptative dental environment and its benefits in managing autistic child in dental office.

ALTERED RESPONSE TO STIMULI IN ASD(AUTISM SPECTRUM DISORDER).

The unusual response to stimuli in autistic child can create distraction and interrupt treatment. People with autism need consistency and can be especially sensitive to change in their environment. Abnormalities have been reported to occur across all sensory domains including tactile, vestibular auditory and visual¹¹ and in the absence of known peripheral dysfunctions such as visual or hearing loss¹⁶. Thus in such cases sensory processing is the method that can be used.

Sensory processing refer to the way that sensory information eg - visual, auditory, vestibular or proprioceptive stimuli is managed in the cerebral cortex and brainstem for purpose of enabling adaptive responses to the environment and engagement in meaningful daily life activities¹⁷. Adaptive behaviour, learning and co-ordinated moment are product of effective sensory integration^{18,19}

Unusual responses to sensory stimuli and sensory processing difficulties exhibited by individual with autism have been widely documented^{20,21}.

SENSORY INTERVENTION FOR MANAGING THE AUTISTIC CHILD.

Based on Ayre's²² sensory integration theory, sensory based treatment has been studied and utilized by occupational therapist and other health professionals in treating individual with ASD. Sensory based treatment are designed to provide individualized controlled sensory experiences to help modulate responses to environment inputs. The primary goal of sensory based treatment are to improve sensory processing and self-regulation, to increase adaptive function and to help the child participate in daily activities.

In the dental field, sensory based treatment has been studied as a novel intervention to reduce dental anxiety of children. Shapiero et al 2009^{13,14} studied 19 typically developing children aged 6-11 yrs who participated in a crossover interventional trial. Brief related to sensory adaptation, sensory system constantly adopt their responses to match the current environment. These adjustment occur at many level of system and increasing appear to calibrate even for highly abstract perceptual representation of stimulus.

Sensory system we use to monitor the world around us are not static and instead are continuously recalibrating to adjust for changes in environment (eg- lighting or temperature) or to compensate to change in the observer (eg- with aging or disease) also the aromas that lure you into a room (or warn you away) fade quickly from awareness once you enter, while your perception of colour can change dramatically, depending on colour seen previously.

This rapid sensitivity in known as adaptation (change in response property of neuron induced by recent stimulus context). After effect of adaptation can provide due as to how our senses code and represent stimulus⁸

Thus **SADE (sensory adapted dental environment)** was created by modifying visual, tactile, somatosensory and auditory stimulus²⁵. Sensory adaptation was achieved by using multisensory environment (MSE) referred to as Snoezelen (a commercial trademark name of ROMPA - Chesterfield , United Kingdom) one of the example of MSE, that is designated space or room developed to stimulate the senses (visual, auditory, tactile and olfactory) via equipment that is designed to produce a state of mind²⁶.

Snoezelen and MSE are often use interchangeably although is not entirely accurate to do so. Snoezelen (is a combination of two words – Snufflen (to seek out, sniff or explore) and dozelen (to relax) is the type of one project for creating multisensory environment. Basically the main aim of this altered environment includes following type of sensory intervention:

1. **Visual stimulation** (evoking the optic nerve to carry impulse to brain).

a) Bubble tube is one of the example (clear tube, that when plugged in, having bubbles ascending up the tube. The colour within the tube can be changed to any colour by the child, variation are available).Fig-1

b) Blackout may be placed over windows, overhead fluorescent and dental lamps turned off and the dentist have to wear a headlamp to direct light directly into the child mouth and minimize light in the child's eyes. Showing moving visual colour effect (eg- Snoezelen) shown on ceiling in child visual field²⁷.

2. **Auditory stimulation** (evoking use of auditory nerve to send impulses to brain).

- By CDs, calming, rhythmic music played throughout the visit²⁸.

3. **Tactile stimulation** (evokes the use of Pacinian corpuscles, touch receptors)

Cermack et²⁴ al use deep pressure by butterfly type wrap adapts from 14 weighted with a regular pediatric dental x ray vest , this hugging pressure provides calming effect.

4. **Stimulation of olfactory senses**

By using aromas.

This therapy was initially developed for autistic children but is currently being used for patient with dementia, palliative patient, patient with brain injuries or other behavioural conditions.

STUDIES ON SENSORY ADAPTATION DENTAL ENVIRONMENT.

Hogg, et al. (2001) offered a review of research in the use of MSE specifically with people with intellectual disabilities. At that time, there were

relatively few studies (n=6) and there were substantial concerns as to research design. Nonetheless, there were a wide range of positive outcomes for people with intellectual disabilities shown in the reviewed research.²⁷

Lotan and Gold (2009) performed a meta-analysis of the effectiveness of MSE for people with IDD. They reviewed 10 studies, and concluded, not unlike Hogg and colleagues, that rigorous research methodologies restrict our ability to confidently point to established evidence of effectiveness. Lotan and Gold conclude that MSE has a positive influence when used as an intervention tool.²⁸

Schoefield and Davis (2000) examined the use of MSE as a strategy in managing chronic pain, finding that patients who used MSE did slightly better than those who engaged in more traditional relaxation techniques.²⁹

Messbauer and Ryan (2014) describe MSE as a “treatment tool that supports therapeutic change by setting the conditions for transformative emotional, perceptual and behavioural patterns by healers as they promote this same state within their client.” This offers an excellent framework in contemplating the use of MSE in a clinical setting.³⁰

A number of studies support the use of MSE to decrease aggressive and/or self-stimulatory behaviours by Kaplan et al, Cuvo et al, Houghton et al, Singh et al^{31,32,33,34} and there is consensus across the literature of promising clinically significant effects of the use of MSE with people with ASD.

CONCLUSION

Every child should be given best treatment possible even if it comes to autistic child special consideration must be taken to make the child comfortable in the dental office. For that we think multisensory integration is the wise option. The use of this type of dental environment has the potential to not only improve dental care for children with ASD, but for children with other disabilities, and typically developing children with dental anxiety and/or sensory processing difficulties. Adopting such multisensory environment will ultimately enhance oral health care in such children.

REFERENCES

1. Casamassimo PS, Seale NS, Ruehs K. General dentists' perceptions of educational and treatment issues affecting access to care for children with special health care needs. *Journal of Dental Education*. 2004;68:23–28.
2. Child and adolescent health measurement initiative 2011 (NSCH survey)
3. Mc Pherson M. Arango Pet al 1998, A new

definition of children with special health care needs
Pediatric 102(pt1) 137-140.

4. AAPD vol -40/no-6/18-9/pg-237-242-
Management of dental patient with special health
care needs.

5. Peter Szatmari , M.D, Susan E . Bryson, Phd,
David L. Streiner, Phd., Freda Wilson, B.A, Lynda
Archer, Ph.D, and Cynthia Rysse, M.D-Two -year
outcome of preschool children with Autism or
Asperger's Syndrome. *J Autism and developmental
disorder*, Vol.49, No.11.

6. American Psychiatric association
2000:Diagnostic and statistical manual of mental
disorder ; DSH -IV-TR (4ed)Washington DC.
American Psychiatric association).

7. Baranek, G.T, Foster L.G., and Berkson, G.
(1997). Tactile defensiveness and stereotyped
behaviours, *American journal of occupational
therapy*,51,91-95.

8. Michael A Webster- Evolving concepts of
sensory adaptation F1000_Biology_Reports
4.21.10.3410/B421.

9. Stein LI, Polido J, Cermak S. Oral care and
sensory over-responsivity in children with autism
spectrum disorder. *Pediatric Dentistry*.
2013;35:230–235

10. Parham D, Mailloux Z. Sensory integration. In:
Case-Smith J, O'Brien J, editors. *Occupational
therapy for children*. 6th. Maryland Heights, MO:
Mosby; 2010.

11. Harrison, J. & Hare, D.J. *J Autism Dev Disord*
(2004) 34: 727. <https://doi.org/10.1007/s10803-004-5293-z>,

12. Shapiro M, Melmed RN, Sgan-Cohen HD, Eli I,
Parush S. Behavioural and physiological effect of
dental environment sensory adaptation on children's
dental anxiety. *European Journal of Oral Science*.
2007;115:479–483. doi: 10.1111/j.1600-
0722.2007.00490.x

13. Shapiro M, Sgan-Cohen HD, Parush S, Melmed
RN. Influence of adapted environment on the anxiety
of medically treated children with developmental
disability. *Journal of Pediatrics*. 2009a;154:546–550

14. Shapiro M, Melmed RN, Sgan-Cohen HD,
Parush S. Effect of sensory adaptation on anxiety of
children with developmental disabilities: A new
approach. *Pediatric Dentistry*. 2009b;31:222–228.

15. Shapiro M. Beit Issie Shapiro's approach to
multi-sensory environments (Snoezelen) Ra'anana,
Israel: Rotem Publishing; 2011.

16. Baranek, G.T. (2002) Efficacy of sensory and
motor interventions for children with autism. *Journal
of Autism and Developmental Disorders*, 32, 397-
422. doi:10.1023/A:1020541906063 Gibson D.
Solitudes: Exploring nature with music. 1994
Retrieved from

17. (The evaluation of sensory processing: a validity
study using contrasting groups. Johnson-Ecker CL1,
Parham LD. *Am J Occup Ther*. 2000 Sep-
Oct;54(5):494-503.

18. (Bundy et 2002 Bundy AC, Lane SL, Murray EA.
Sensory integration : Theory and practice.
Philadelphia, PA: Davis; 2002).

19. Kranowitz CS. The out-of-sync child:
Recognizing and coping with sensory processing
disorder. New York: The Berkley Publishing Group;
2005.

20. (Barenck et al 2006 Baranek GT, David FJ, Poe
MD, Stone WL, Watson LR. Sensory experiences
questionnaire: Discriminating sensory features in
young children with autism, developmental delays,
and typical development. *Journal of Child
Psychology and Psychiatry*. 2006;47:591–601.

21. Dunn W. A "sensational" way to understand and
serve children: Illustration of a sensory processing
model. In: Apps JN, Newby RF, Roberts LW, editors.
*Pediatric Neuropsychology Case Studies: From
Exceptional to Commonplace*. New York: Springer;
2009. pp. 281–294

22. Ayres AJ. Sensory integration and learning
disorders. Los Angeles: Western Psychological
Services; 1972

23. Gail Kim DMD, MSD1,2 Caroline Carrico PhD3
Carole Ivey PhD, OTR/L4 Patrice B. Wunsch DDS,
MS1Impact of sensory adapted dental environment on
children with developmental disabilities DOI:
10.1111/scd.12360

24. Cermack, S., Stein Duker, L., Williams, M.,
Dawson, M., Lane, C. & Polido, J. (2015). Sensory
adapted dental environments to enhance oral care for
children with Autism Spectrum Disorders: A
randomized controlled pilot study. *Journal of Autism
and Developmental Disorders*, 45(9), 2876-2888

25. Gibson D. Solitudes: Exploring nature with
music. 1994 Retrieved from.

26. Functional Analytic Multisensory
Environmental Therapy for People with Dementia
Jason A. Staal (International Journal of Alzheimer's
Disease Volume 2012, Article ID 294801, 7 pages

27. Hogg, J., Cavet, J., Lambe, L. & Smeddle, M.
(2001). The use of 'Snoezelen' as multisensory
stimulation with people with intellectual disabilities:
A review of the research. *Research in Developmental
Disabilities*, 22, 353-372.

28. Lotan, M. & Gold, C. (2009). Meta-analysis of
the effectiveness of individual intervention in the
controlled multisensory environment (Snoezelen®)
for individuals with intellectual disability. *Journal of
Intellectual & Developmental Disability*, 34(3), 207-
215.

29. Schofield, P. & Davis, B. (2000). Sensory
stimulation (Snoezelen) versus relaxation: A
potential strategy for the management of chronic

pain. *Disability and Rehabilitation*, 22(15), 675-682.

30. Messbauer, L. & Ryan, J. (2014). Multi-sensory environments: Combining the therapeutic benefits of Snoezelen, stimulus preference and human systems dynamics: Applications of Snoezelen-MSE to intergenerational and family work. In M. Sirkkola (Ed.), *Everyday Multisensory Environments, Wellness Technology and Snoezelen* (pp. 75-110). HAMK University of Applied Sciences, Visamäki, Finland

31. Kaplan, H., Clopton, M., Kaplan, M., Messbauer, L. & McPherson, K. (2006). Snoezelen multi-sensory environments: task engagement and generalization. *Research in Developmental Disabilities*, 27, 443-455.

32. Cuvo, May and Post, 2001 Cuvo, A., May, M. & Post, T. (2001). Effects of living room, Snoezelen room and outdoor activities on stereotypical behavior and engagement by adults with profound mental retardation. *Research in Developmental Disabilities*, 22(3), 183-204

33. Houghton, et al., 1998 Houghton, S., Douglas, G., Briggs, J., Langsford, S., Powell, L. & West, J. (1998). An empirical evaluation of the interactive multi-sensory environment for children with disability. *Journal of Intellectual and Developmental Disabilities*, 23, 267-278

34. Singh, et al., 2004 Singh, N., Lancioni, G., Winton, A., Molina, E., Sage, M., Brown, S. & Groeneweg, J. (2004). Effects of Snoezelen room, activities of daily living training, and vocational skills training on aggression and self-injury by adults with mental retardation and mental illness. *Research in Developmental Disabilities*, 25, 285-293