



Sensory simulation a novel behavior management technique in reducing dental anxiety among non-cooperative children with Autism Spectrum Disorder Level -1

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Abstract

Children with Autism Spectrum Disorder (ASD) frequently exhibit heightened dental anxiety, sensory hypersensitivity, and non-cooperative behavior during dental treatment. Conventional behavior management strategies may not adequately address the sensory processing difficulties encountered by these children. Sensory simulation techniques have recently gained attention as non-pharmacological approaches to improve cooperation and reduce anxiety during dental procedures.

Keywords: Autism, familiarisation, meltdowns, sensory simulation

Introduction

Autism Spectrum Disorder (ASD) is a neurodevelopmental disorder characterized by impairments in communication, social interaction, and repetitive behavioral patterns. The global prevalence of ASD has shown a substantial increase in recent years, necessitating specialized healthcare approaches for affected children. Autism Spectrum Disorder (ASD) is an emerging public health concern in India. Available evidence indicates that the prevalence of ASD among Indian children ranges from approximately 0.15% to 1%, with pooled estimates of around 1.12–1.74 per 1,000 children. Dental treatment among children with ASD often becomes challenging because of communication barriers, heightened sensory sensitivities, fear of unfamiliar surroundings, and resistance to physical contact.

Dental anxiety is one of the major barriers preventing successful oral healthcare delivery in children with ASD. The auditory stimuli from dental instruments, bright dental operatory lights, unfamiliar smells, and tactile sensations may trigger sensory overload, leading to behavioral outbursts and non-cooperation. Consequently, dentists frequently encounter difficulties in providing routine preventive and restorative dental care.

Therefore, the present study was undertaken to evaluate the effectiveness of sensory stimulation as a novel behavior management technique in reducing dental anxiety among non-cooperative children with ASD Level-1.

Inclusion Criteria

1. Non-cooperative children
2. Children aged 7-11 years with a known diagnosis of Autism Spectrum Disorder (ASD).
3. Children who are capable of understanding with short, clear, and simple instructions.
4. A mother of a child with Autism Spectrum Disorder, who provides exact data on the child's behavior.

Exclusion Criteria

1. Children whose parents decline to give consent.
2. Children with underlying systemic conditions
3. Children with visual and hearing difficulties.

Methodology

This pilot interventional study will be conducted among children diagnosed with Autism Spectrum Disorder (ASD) Level 1 enrolled in selected special schools in Dakshina Kannada (DK) district, Karnataka. Special schools will be selected using a random sampling method. Institutional permission will be obtained from the respective schools, and written informed consent will be secured from parents or caregivers before participation.

At the first visit, each child will undergo an oral examination under a routine normal setup using a mouth mirror and probe. Baseline physiological and behavioral responses will be recorded by measuring heart rate with a portable finger pulse oximeter and anxiety using a facial image anxiety scale. Information regarding the child's preferred cartoons and characters will be obtained from parents or caregivers through a structured interview.

Following the baseline assessment, a home-based pre-appointment sensory simulation intervention will be implemented. Parents or caregivers will introduce the child to personalized sensory stimuli based on the child's favorite cartoon themes and associated visual aids or toys.

At the second visit, the same children will receive an oral examination under a sensory-adapted environment incorporating the previously identified cartoon-based sensory elements and similar toys. Heart rate and anxiety levels will again be assessed using the same instruments immediately following the examination.

Pre- and post-intervention measurements of heart rate and anxiety scores will be compared to evaluate the effectiveness of the personalized sensory simulation approach in reducing dental anxiety among children with ASD Level 1.

Results

Table 1: Age distribution among the participants of the study

| Parameter | Number (n) | Mean and standard deviation |
|----------------|------------|-----------------------------|
| Age (in years) | 11 | 8±1 |

Table 2: Comparison of Pulse rate before and after sensory stimulation among the participants of the study assessed using paired t test

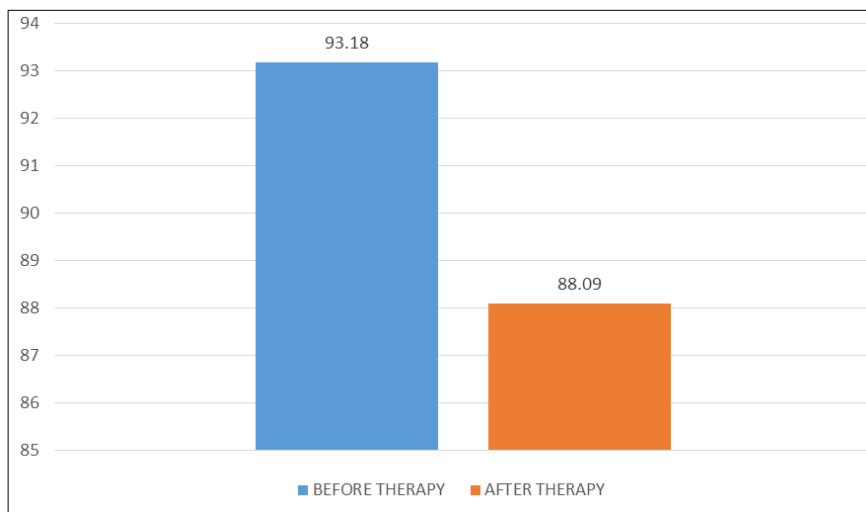
| Parameter | Pulse rate before therapy | Pulse rate after therapy | t- statistic | p-value |
|------------|---------------------------|--------------------------|--------------|--------------|
| Pulse rate | 93.18± 2.08 | 88.09±2.70 | 10.698 | 0.0000008534 |

P<0.05 is considered as statistically significant

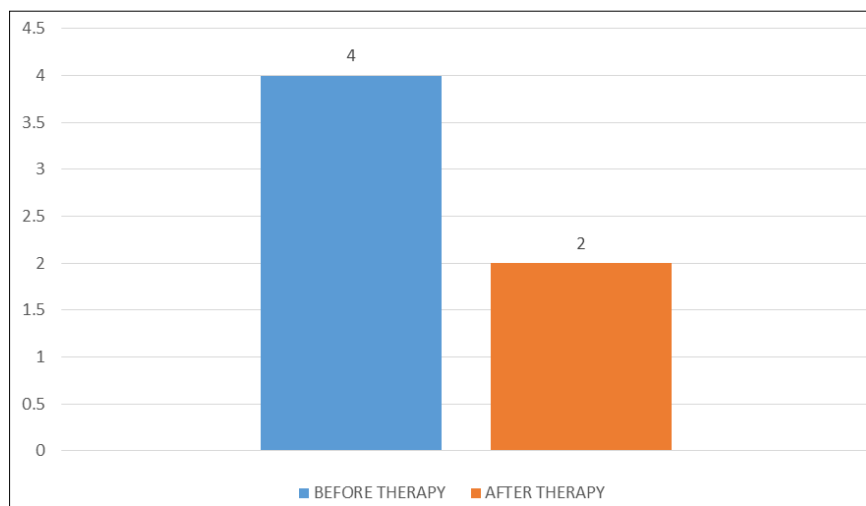
Table 3: Comparison of anxiety as assessed using facial image scale before and after sensory stimulation among the participants of the study assessed using Wilcoxon signed rank test

| Parameter | Facial image scale score before therapy | Facial image scale score after therapy | V-Statistic | p-value |
|------------------------------|---|--|-------------|----------|
| Anxiety (facial image scale) | 4.45±1.50 Median – 4, IQR - 2 | 2.18±1.32 Median - 2, IQR – 1.5 | 66 | 0.003116 |

P<0.05 is considered as statistically significant



Graph 1: Comparison of mean Pulse rate before and after sensory stimulation among the participants of the study



Graph 2: Comparison of median scores of anxiety as assessed using facial image scale before and after sensory stimulation among the participants of the study

This study evaluated the efficacy of sensory stimulation as a novel behaviour management technique for reducing dental anxiety in children diagnosed with Autism Spectrum Disorder (Level 1). The outcomes were assessed using physiological and subjective measures, including pulse rate and facial image scale scores for anxiety, recorded before and after the intervention.

Descriptive statistics were used to summarize participant characteristics. Inferential statistical analysis included a paired t-test to compare pre- and post-intervention pulse rate, and a Wilcoxon signed-rank test to compare pre- and post-intervention facial image scale anxiety scores. A p-value of less than 0.05 was considered statistically significant.



Oral examination done before simulation therapy



Sensory simulation was introduced using the child's self-selected favorite cartoon to create a familiar and comforting environment during the procedure



After sensory simulation, anxiety scores and pulse rate were re-evaluated, and oral examination revealed improved child cooperation within the familiar cartoon-themed setting

Discussion

Traditional behavior management techniques such as tell-show-do, positive reinforcement, distraction, and voice control may not always be effective in children with ASD because of their altered sensory processing patterns. Pharmacological approaches including sedation and general anesthesia are commonly employed; however, they are associated with increased cost, potential complications, and limited accessibility.

Recently, sensory-adapted dental environments and sensory simulation techniques have emerged as promising

non-pharmacological interventions. Sensory simulation aims to regulate sensory input through modifications in visual, auditory, tactile, and proprioceptive stimuli to induce relaxation and reduce anxiety.

Meltdowns in autism are characterised by overwhelming sensory or emotional experience that can be triggered by various factors such as sensory overload, changes in routine or unfamiliar environment. During a meltdown child may exhibit behaviour likes shouting, crying, rocking or self injurious action. They may not be able to communicate their needs or respond during this time.

So meltdown due to sensory overload can be reduced by sensory simulation among non cooperative children with ASD Level -1. Creating familiar cartoon based environment in dental clinic to reduce anxiety aligns closely with established sensory adaptation technique core linked to sensory integration theory developed by A. Jean Ayres. Sensory integration is the process of organizing sensation from the body and from environment.

Therefore by replicating similar environment with their preferred cartoons which gives visual familiarity can deliver calming effect reducing novelty induced stress and facilitates their engagement and cooperation during procedure. Walker reported that green possesses refreshing and calming properties, producing both mental and physical relaxation in children with Autism Spectrum Disorder by relieving tension, promoting blood flow and capillary dilation, and facilitating emotional stabilization through stimulation of the pituitary gland. Therefore, in the present study, green was incorporated into the sensory simulation environment along with the child's preferred cartoon theme to create a familiar and calming setting that could enhance emotional regulation and cooperation during the dental examination.

Conclusion

This study suggests that sensory simulation using individualized, preferred cartoon-based familiarization may be an effective non-pharmacological behavior management approach for children with Autism Spectrum Disorder (ASD) Level 1 who exhibit non-cooperative behavior during dental visits. Exposure to a familiar and visually engaging environment appeared to reduce dental anxiety and enhance cooperation during oral procedures. Incorporating a child's sensory preferences and interests into the dental setting may facilitate a more positive dental experience and improve patient management.

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