



A Pilot Study on the Effectiveness of Snoezelen Therapy on Behavioral Patterns in Children with Autism Spectrum Disorder

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Abstract: Background: Autism Spectrum Disorder (ASD) is a neurodevelopmental disorder characterized by challenges in social communication, restricted and repetitive behaviors, and narrowed interests. **Aim:** The study aimed to assess the effectiveness of Snoezelen therapy in improving behavioral patterns among children with Autism Spectrum Disorder. **Methods:** A quasi-experimental design was applied to a sample of 20 children with ASD, divided equally into experimental and control groups. The experimental group received 48 individualized Snoezelen therapy sessions over six months, whereas the control group continued with conventional care. Behavioral changes before and after the intervention were evaluated using the Childhood Autism Rating Scale (CARS-2). **Results:** The experimental group exhibited significant improvements in several behavioral domains of the CARS-2, such as social interaction, imitation, emotional response, adaptability, and communication ($p < 0.05$). In contrast, no notable changes were observed in the control group receiving routine care. **Conclusion:** Findings indicate that Snoezelen therapy effectively enhances sensory processing and behavioral functioning in children with ASD.

Key Words: Autism Spectrum Disorder, Snoezelen Therapy, CARS Scale, Behavioral pattern

INTRODUCTION

Children with ASD may also react unusually to sensory stimuli, and the condition is commonly identified in early childhood, often before the age of three. These sensory irregularities contribute to challenges in daily functioning and social participation, which can be further aggravated by hypersensitivity or hyposensitivity to environmental stimuli

Autism Spectrum Disorder (ASD) is a developmental condition characterized by limited interests, repetitive patterns of behavior, and difficulties in social communication and interaction [1,2]. Individuals with ASD frequently display atypical sensory processing and are commonly identified before the age of three. Such sensory disturbances can hinder daily functioning and social engagement, often intensifying due to hypersensitivity or hyposensitivity to environmental stimuli [2].

One promising treatment for sensory and behavioral problems in ASD is Snoezelen therapy's Multi-Sensory Environment (MSE), which was created in the 1970s. By creating a serene, regulated environment that encourages

relaxation through pleasurable sensory experiences, snoezelen therapy seeks to lessen anxiety and behavioral issues. In [3] For people with high levels of sensory sensitivity, traditional behavioral therapies might be less helpful or even upsetting, so Snoezelen is a useful adjunctive strategy. Lancioni *et al.* (2002) state that Snoezelen therapy uses a monitored setting with cutting-edge technology to provide proprioceptive, vestibular, tactile, olfactory, visual, and auditory stimulation based on each patient's needs [4,5].

The diagnostic criteria also recognize sensory alterations, such as heightened or reduced sensitivity to sensory input, or an unusual fascination with sensory experiences. Research indicates that sensory reactivity issues influence everyday functioning and family dynamics in nearly 65% of individuals with ASD, and these challenges often persist throughout life [6,7].

In people with ASD, certain sensory impairments can cause social dysfunction and distress, impacting daily activities like eating, sleeping, and going to school. Maladaptive behaviors brought on by these difficulties may

further restrict social interaction [8]. Individualized evaluation and sensory-based interventions are therefore crucial. Snoezelen therapy aims to enhance emotional regulation and relaxation by gently engaging the senses through controlled visual, tactile, auditory, gustatory, and olfactory experiences. [9] The frequency and duration of stereotypical, self-stimulating behaviors in people with intellectual and developmental disabilities, as well as agitation, anxiety, and physiological arousal, can all be effectively reduced with Snoezelen therapy, according to empirical research. [10].

Studies utilizing Snoezelen in sensory therapy have revealed a notable decrease in stereotyped behaviors in autistic individuals. There is conflicting data, though, about how it affects social interaction [11,12]. Giving people control over sensory equipment may improve engagement and learning, according to Unwin *et al.* while Mey *et al.* (2015) reported improved sensory adaptation after sensory interventions in a small sample of autistic children. [13] The current pilot study intends to assess the effect of customized Snoezelen therapy on maladaptive sensory responses and behavioral outcomes in children with autism spectrum disorder in light of this evidence. [14]

METHODS

Study Design and Participants

This study employed a quasi-experimental design. The participants were 20 children diagnosed with autism spectrum disorder (ASD), chosen from previously collected data. Ten children received Snoezelen therapy (experimental group), while the other ten continued with routine care (control group). Routine care included physiotherapy, communication training, movement activities, social skills development, and parent-child play sessions. Participants were selected using a purposive sampling technique. The experimental group (EG) consisted of children attending on Mondays, Wednesdays, and Fridays, while the control group (CG) consisted of children attending on Tuesdays, Thursdays, and Saturdays. Each group had 10 participants, totaling 20 participants in the study. The children's therapy was individualized, considering their specific requirements, interests, and goals. A semi-structured questionnaire was used to collect baseline demographic and clinical data. Behavioral changes were assessed using the Childhood Autism Rating Scale (CARS-2) before and after the intervention.

Inclusion and Exclusion Criteria

Participants were children aged 2–18 years with intellectual disabilities, accompanied by mothers who understood Tamil or English. Children with neurological conditions (e.g., cerebral palsy, Rett's, Asperger's, mental retardation), hearing or visual impairments, severe autism, or major illness during data collection were excluded.

Intervention

The experimental group (EG) received Snoezelen therapy, conducted in a multisensory room, for a total of 48 sessions,

each lasting 30 minutes, twice a week over six months. The therapy was provided in a 1:1 ratio, with each session customized to meet the individual needs of the child. The exercises were adapted according to each child's requirements, interests, and goals, with adjustments made to the difficulty level based on their abilities.

The control group (CG) received routine care, which included physiotherapy, communication training, movement activities, social skills development, and parent-child play sessions. The routine care was tailored to meet each child's developmental and behavioral needs, with no intervention in the multisensory room.

Data Collection Procedure

Data were collected through a semi-structured questionnaire designed to capture baseline clinical and demographic information of the participants. The Childhood Autism Rating Scale (CARS-2) was used to assess behavioral changes in both groups before and after the intervention. All children received therapy sessions twice a week for six months, with each session lasting 30 minutes. The multisensory room therapy was provided to the experimental group in a 1:1 ratio, while the control group received routine care. The treatment was customized for each child's specific needs, and adjustments were made in the degree of difficulty to suit each child's abilities. Data were analyzed using SPSS version 16.0.

Ethical Clearance

The study received ethical approval from the Institutional Ethics Committee of Government Medical College and Hospital, Tiruvallur (IEC/4/2022). All procedures complied with ethical standards, ensuring autonomy, confidentiality, and informed consent. Written consent was obtained from parents or caregivers, and the study was prospectively registered with the Clinical Trials Registry of India (CTRI/REF/2025/10/115655).

Statistical Analysis

The data were analyzed using SPSS version 16.0. Baseline characteristics of participants were compared using independent sample t-tests and chi-square tests. Independent t-tests were used to compare differences between the experimental and control groups. To assess intra-group changes over time, repeated measures ANOVA was performed, followed by LSD post hoc tests. A p-value of less than 0.05 was considered statistically significant.

RESULTS AND DISCUSSION

Section A: Demographic and Clinical Characteristics of the Experimental and Control Group Patients

The study analyzed the demographic and clinical characteristics of 20 autistic children divided equally into experimental and control groups. In the control group, 40% were within a similar age range, while half of the experimental group were aged 2 to 4 years. Male participants constituted the majority in both groups (60% in the control

group and 70% in the experimental group). Regarding household education, graduates comprised the largest proportion among heads of families (60% experimental, 50% control). Most mothers were full-time caregivers (80% experimental, 90% control) and homemakers (70% experimental, 80% control).

Comparative analysis of clinical variables including maternal age at conception, conception method, pregnancy complications, maternal smoking, depression, medication use during pregnancy, folic acid intake, delivery mode, birth order, and family autism history showed no significant differences between groups ($p > 0.05$ for all variables). This

indicates equivalence between groups in terms of prenatal, perinatal, and family background factors.

The Table 1 shows baseline equivalency for study comparison by showing no significant differences in prenatal/perinatal/family clinical background or demographics between the experimental and control groups.

Table 2: The experimental group demonstrated substantial gains in a number of CARS categories following Snoezelen therapy sessions ($p < 0.05$). Snoezelen therapy successfully improved social interaction, communication, and adaptive behaviors in autistic children, as evidenced by

Table 1: Demographic and clinical Characteristics

Characteristic	Experimental Group (n=10)	Control Group (n=10)	Statistical Significance (p-value)
Age range 2-4 years	50%	40%	Not significant
Male participants	70%	60%	Not significant
Head of household education (graduates)	60%	50%	Not significant
Mothers staying full-time	80%	90%	Not significant
Mothers homemakers	70%	80%	Not significant
Maternal age at conception			
• < 21 years	10%	10%	Not significant
• 21-35 years	70%	70%	Not significant
• < 35	20%	20%	Not significant
Mode of conception			
• Spontaneous	20%	60%	Not significant
• Artificial	80%	40%	Not significant
Pregnancy complications			
• Diabetes	10%	10%	Not significant
• Abortion	20%	10%	Not significant
Maternal smoking	10%	0	Not significant
Maternal depression	10%	0%	Not significant
Medication intake during pregnancy	10%	0%	Not significant
Folic acid supplementation	100%	60%	Not significant
Mode of delivery			
• Normal vaginal delivery	40%	30%	Not significant
• LCSC	60%	70%	Not significant
Birth order			
• First	60%	60%	Not significant
• Second	40%	40%	Not significant
Family history of autism	10%	0%	Not significant

Table 2: Statistical Comparison of Clinical Scores Between Experimental and Control Groups at Baseline (n = 20)

Assessment (CARS-2)	Experimental Group (Snoezelen Therapy) Mean (Range)	Control Group (Routine Care) Mean (Range)	p-Value
TOTAL	30.8 (27.0–34.5)	39.2 (35.0–44.0)	0.012*
Relating to People (RP)	2.6 (2.0–3.0)	3.4 (2.8–3.8)	0.028*
Imitation (IM)	2.5 (2.0–3.0)	3.2 (2.7–3.8)	0.041*
Emotional Response (ER)	2.3 (1.8–2.8)	3.1 (2.5–3.7)	0.036*
Body Use (UB)	2.3 (1.9–2.7)	2.9 (2.4–3.3)	0.052
Object Use (UO)	2.2 (1.8–2.6)	2.8 (2.3–3.1)	0.061
Adaptation to Change (AC)	2.5 (2.0–2.8)	3.2 (2.7–3.6)	0.022*
Visual Response (VR)	2.3 (1.8–2.7)	2.7 (2.2–3.1)	0.087
Auditory Response (AR)	2.1 (1.7–2.6)	2.6 (2.1–3.0)	0.079
Taste, Smell, Touch (TS)	2.0 (1.6–2.5)	2.5 (2.0–2.9)	0.118
Fear or Nervousness (FA)	2.0 (1.6–2.4)	2.7 (2.2–3.1)	0.047*
Verbal Communication (VC)	2.5 (2.0–3.0)	3.4 (3.0–3.8)	0.008*
Nonverbal Communication (NVC)	2.3 (1.8–2.8)	3.2 (2.8–3.6)	0.010*
Activity Level (AL)	2.4 (2.0–2.8)	2.8 (2.4–3.3)	0.122
Level and Consistency of Intellectual Response (LIR)	2.3 (1.9–2.7)	2.9 (2.5–3.3)	0.041*
Overall Impression (OI)	2.4 (2.0–2.9)	3.1 (2.6–3.5)	0.019*

the control group getting standard care showing little change. The large effect size shows that this intervention might lead to significant functional improvements. However, more studies with larger groups and longer follow-ups are necessary to confirm and expand on these encouraging results.

Figure 1 shows Post-Intervention Total CARS mean score comparison showing significant improvement in the Snoezelen therapy group (Mean = 30.8) compared to the control group (Mean = 39.2), indicating reduced autism symptom severity.

Section C: Association of Demographic Variables with Behavioral Patterns

The relationship between selected demographic characteristics and behavioral patterns among the 20 autistic children was analyzed to assess whether these background factors influenced their behavioral responses.

Children in the 5–7-year age group displayed slightly better behavioral adaptation than those aged 2–4 years, though this difference was not statistically meaningful. Likewise, both male and female participants showed similar behavioral tendencies, suggesting that gender did not substantially affect behavioral outcomes.

Regarding caregiver education, children with graduate parents obtained marginally higher mean behavior scores, possibly due to increased parental awareness and involvement, but this trend was not statistically significant. Mothers who were homemakers reported behavioral progress comparable to employed mothers, indicating that the amount of time spent with the child did not significantly influence baseline behavior during the study.

In summary, the results demonstrate that demographic characteristics were not significantly related to behavioral patterns among autistic children. Therefore, observed behavioral changes can more confidently be attributed to the therapeutic intervention (Snoezelen therapy) rather than demographic variations across participants.

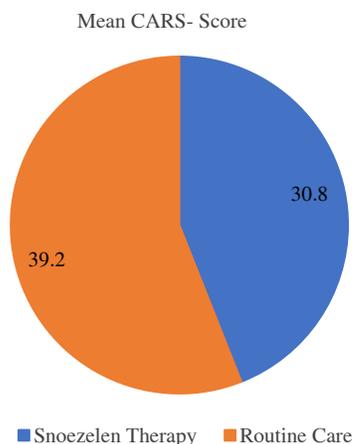


Figure 1: Illustrates The Comparison of Post-Intervention Cars Scores

DISCUSSION

The study's primary findings demonstrate significant improvements across multiple domains of the Childhood Autism Rating Scale (CARS) among children who received Snoezelen therapy compared to those who underwent routine care. Notable enhancements were observed in Relating to People, Imitation, Emotional Response, Adaptation to Change, Communication, and overall participant impressions ($p < 0.05$). These outcomes align with prior research suggesting that sensory-based and environmental interventions meaningfully influence autism symptoms, particularly in the areas of social interaction and communication.

Snoezelen therapy—an approach combining sensory stimulation with relaxation—has been supported by evidence indicating that enriched sensory environments can promote emotional and behavioral improvements in children with autism spectrum disorder (ASD). Instruments such as CARS have similarly been employed in previous studies to monitor behavioral changes following therapeutic interventions, further validating the reliability of the outcomes observed in this study [16–18]. The improvements seen in emotional regulation and nonverbal communication correspond with existing literature that underscores the importance of structured sensory environments in enhancing social skills and emotional stability [19–21].

The findings also highlight the broader importance of therapeutic modalities that engage multiple sensory systems. Beyond improvements in behavioral scores, the results suggest that children may experience a better quality of life when exposed to such sensory-rich interventions. While Snoezelen therapy is not a universal solution and its effectiveness may vary across individuals, continued research and validation remain essential. Supporting studies emphasize the promise of diverse sensory-focused treatment approaches, further reinforcing the positive outcomes documented in the present study [22].

Conversely, children in the control group who received routine care exhibited minimal progress, emphasizing the potential advantages of Snoezelen therapy. Previous research has shown that routine care often lacks individualized and multimodal approaches, which may hinder therapeutic outcomes for children with ASD [23]. This contrast between groups reinforces the need to integrate innovative sensory-based interventions like Snoezelen therapy into standard treatment practices. Although other treatments—such as dietary strategies and pharmacologic options like bumetanide—have been explored for improving specific ASD symptoms, these methods often come with limitations tied to the heterogeneity of autism presentations [24–26].

CONCLUSION

This pilot study indicates that Snoezelen therapy may have therapeutic potential for managing sensory sensitivities in children with autism. The findings highlight the need for larger studies to evaluate its effectiveness, understand the sustainability of behavioral improvements, and determine its impact on overall quality of life.

Source of funding

We did not receive any funds from any organization for this work.

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