

EFFECTIVENESS OF MOTHER MEDIATED MULTI SENSORY STIMULATION ON SLEEP QUALITY IN CHILDREN WITH AUTISM SPECTRUM DISORDER.

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ABSTRACT

Background: Autism Spectrum Disorder (ASD) is a neurodevelopmental disorder associated with social communication deficits, repetitive behaviors, sensory processing difficulties, and frequent sleep disturbances. Poor sleep can adversely affect learning, behavior, emotional regulation, and daily functioning. Mother-mediated multisensory stimulation has emerged as a promising non-pharmacological approach to improve sleep quality in children with ASD. **Aim:** To determine the effectiveness of mother-mediated multisensory stimulation in improving sleep quality among children with ASD. **Materials and Methods:** A pre-test and post-test experimental design was used. Sixty children with ASD aged 7–12 years were randomly assigned to an experimental group (n = 30) or a control group (n = 30). Sleep quality was assessed using the Children's Sleep Habits Questionnaire (CSHQ). The experimental group received mother-mediated multisensory stimulation for 30 minutes per session, three times weekly, for eight weeks, while the control group received routine care. Post-test assessment was conducted after the intervention period. **Results:** The control group showed minimal change in CSHQ scores (54.30 ± 1.70 to 54.56 ± 2.64). In contrast, the experimental group demonstrated significant improvement, with scores decreasing from 55.60 ± 1.73 to 40.00 ± 1.67 . Post-test comparisons revealed significantly better sleep quality in the experimental group. **Conclusion:** Mother-mediated multisensory stimulation was effective in improving sleep quality and reducing sleep disturbances in children with ASD. The findings support its use as a home-based occupational therapy intervention for managing sleep-related difficulties.

Keywords:

Autism Spectrum Disorder, Sleep Quality, Multisensory Stimulation, Mother-Mediated Intervention.

1. INTRODUCTION

ASD is a developmental condition that affects brain marked by ongoing difficulties such as interactive skills, two- way social interaction These core features significantly affects child capacity to participate in everyday activities, impacting social participation, communication skills, and overall functioning (Hodges. H et al., 2020 & Campisi et al., 2018). Risk of ASD has been associated with a range of prenatal and perinatal conditions. These include increased age of mother and father during pregnancy, low weight during birth, variations in pregnancy duration and perinatal complications such as hypoxia during childbirth, all of which may influence neurodevelopmental outcomes. (Frank-Briggs et al., 2012) Autism Spectrum Disorder (ASD) has shown a significant increase in prevalence worldwide over recent decades. Current estimates indicate that approximately 1 in 127 individuals globally and 1 in 31 children aged 8 years in the United States are affected by ASD, with males being diagnosed more frequently than females. Variations in prevalence rates may be influenced by differences in awareness, diagnostic practices, and access to healthcare services (World Health Organization, 2021; Centers for Disease Control and Prevention, 2025). Disturbances during sleep are prevalent amidst typically developing children; however, their occurrence is markedly higher in individuals with autism spectrum disorder. Evidence suggests that sleep disorders affect up to 80% of children with ASD and approximately 50% of adults on the ASD (Hirata et al., 2023). and also some studies have found connections between specific repetitive behaviors and sleep difficulties in individuals with Autism. For example, Schreck et al. (2004) found that the young individuals that exhibited more stereotyped behaviors were more likely to scream at night and have shorter sleep durations. Furthermore, the children with ASD who were more sensitive to the sensory aspects of their nighttime environment, tended to have more communication delays and more frequent atypical behaviours (Hundley. R et al., 2016). Sleep problems have also been associated with increased aggression, hyperactivity, and social difficulties in children with ASD, which could be indicative of more global

problems related to mental health. (Devnani, P et al.,2015) Multiple studies have suggested that problems during sleep in individuals with ASD could possibly be associated with, or even result from, heightened sensory sensitivities. Furthermore, evidence suggests that such sensory differences can adversely affect the involvement in daily tasks among young individuals with ASD. (Tzischinsky.O et al.,2018). Jean Ayres (1972) described sensory integration as the brain's way of organizing information that comes from the body and the surrounding environment so that a person can move and act effectively within their surroundings. (Ayres,A. J 1972) Sensory stimulation can be categorized into single-sensory and multisensory approaches. It generally consists of a variety of interventions including light therapy, aromatherapy, music therapy and massage using visual stimuli, soothing scents, sounds and tactile input to stimulate one or more of the sensory systems including vision, olfaction, hearing, touch and taste. (Sun X et al., 2025). Multisensory stimulation has been more and more investigated as a non-pharmacological method to improve sleep, with the provision of structured sensory inputs that promote relaxation and regulation (de Niet et al., 2009). These inputs can promote the release of calming neurochemicals such as serotonin, and thus, help to improve sleep onset and continuity (Chen et al., 2013). Mother mediated therapy is a method where mothers are trained to deliver therapeutic strategies to their children at home.(McConnell et al., 2015). This method promotes consistent intervention by integrating therapy into daily routines and natural settings (Jurek et al., 2022). Among children with ASD, this approach has resulted in enhancing several aspects such as communication, behavior and the coping techniques through repeated practice and reinforcement (Padmanabha et al., 2019). It also enhances parent-child interaction and provides emotional support during intervention (McConnell et al., 2015). Additionally, mother-mediated therapy is cost-effective and feasible, especially in home-based settings, and helps improve parental confidence in managing the child's needs (Jurek et al., 2022).

2. Aim and Objectives:

Aim:

To study the Effectiveness of Mother Mediated Multi-Sensory Stimulation on Sleep Quality among children with ASD.

Objectives:

1. To study demographical variables
2. To determine pretest values of Control group using CSHQ
3. To determine pretest values of experimental group using CSHQ
4. To determine posttest values of control group using CSHQ
5. To determine posttest values of experimental group using CSHQ
6. To compare pretest and posttest value between the control and experimental group by using CSHQ

3. Methodology:

Research Design

Study was conducted using Randomised Control Trial (RCT)

Study Setting

The study was conducted in chettinad hospital, in and around therapy centers in chengalpattu Tamil Nadu, India. The intervention was implemented in a home-based environment under the supervision of the investigator.

Participants

A total of 60 children pre diagnosed with Autism Spectrum Disorder were recruited for the study. The participants were randomly assigned into two groups: an Experimental Group (n = 30) and a Control Group (n = 30).

Inclusion Criteria

- Children previously diagnosed with ASD by a qualified physician/clinical psychologist.
- Children aged 7–12 years both male and female.
- Children with sleep disturbances as identified through parental reports.

Exclusion Criteria

- Children below 7 years or above 10 years of age.
- Children with severe visual, hearing, or physical impairments.
- Parents unwilling to participate in the intervention program.

Outcome Measure

Sleep quality was assessed using the Children's Sleep Habits Questionnaire (CSHQ), a standardized parent-reported questionnaire widely used to evaluate sleep disturbances in children. The CSHQ consists of 33 items covering domains such as bedtime resistance, sleep onset delay, sleep duration, sleep anxiety, night wakings, parasomnias, sleep-disordered breathing, and daytime sleepiness. Higher scores indicate greater sleep disturbance.

4. Intervention Procedure

Children in the Experimental Group received a mother-mediated multisensory stimulation program administered by their mothers at home. The intervention was provided three times per week for a period of eight weeks, preferably during the evening hours before bedtime.

Each session lasted 30 minutes and consisted of two phases:

Phase I: Sensory Warm-up Activities (10 minutes)

The warm-up phase included tactile and proprioceptive activities such as deep-pressure stroking, tactile play using different textures, dough and clay activities, bubble popping, and light joint compressions to promote sensory regulation and engagement.

Phase II: Multisensory stimulation

The multisensory stimulation phase consisted of:

- Tactile stimulation through neutral warmth using a warm towel or blanket.
- Visual stimulation using soft dim coloured lights.
- Auditory stimulation through calming nature and animal sounds.
- Proprioceptive stimulation through rhythmic deep-pressure input using pillows or therapy balls.

The Control Group received routine care without any additional sensory intervention.

Data Collection Procedure

Baseline assessment of sleep quality was conducted for both groups using the Children's Sleep Habits Questionnaire (CSHQ). Following completion of the eight-week intervention period, post-test assessment was carried out using the same outcome measure.

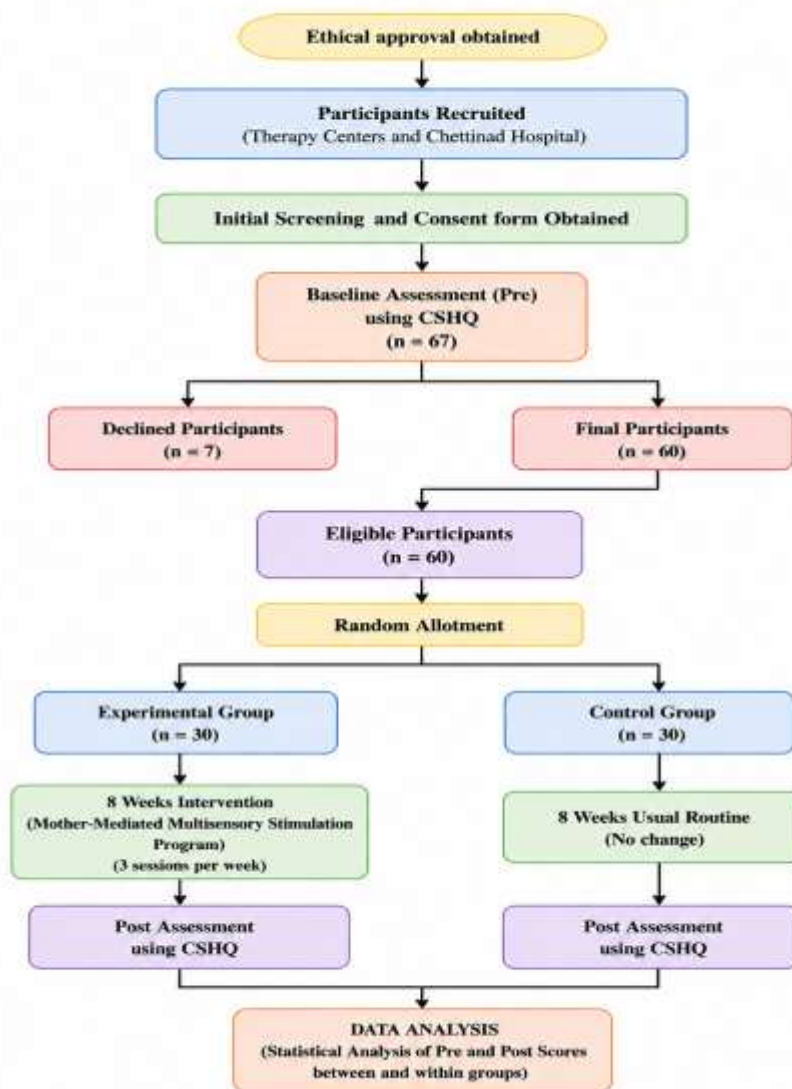
Statistical Analysis

The collected data were analyzed using descriptive and inferential statistics. Mean and standard deviation were used to describe demographic and outcome variables. Paired t-test was used to compare pre-test and post-test scores within groups, while independent t-test was used to compare scores between the Experimental and Control groups.

Ethical Considerations

Ethical approval was obtained from the Institutional Ethics Committee prior to the commencement of the study. Written informed consent was obtained from the parents of all participants. Confidentiality and anonymity of participant information were maintained throughout the study.

FLOW CHART OF THE STUDY



5. Result :

The interpretation of the data used to assess how multisensory stimulation covered in this section. CSHQ used in pre-test and post-test analyses that produced this data, which was then statistically examined. The data collected from the study has been analysed to compare the results within each group as well as between the two groups after the intervention was put into place. While the Control group carried on with their regular treatments, the Experimental group underwent a Multisensory Stimulation..

1. Analysis of Demographical Variables

Table .1 Distribution of Demographical Variables Among Control and Experimental Groups

Group	N	Mean S.D
Control	30	8.36 ± 1.15
Experimental	30	8.66 ± 1.12

The above table presents the comparison of the mean age between the control and experimental groups. Mean age of children in the control group was **8.36 ± 1.15 years**, while mean age of children in experimental group was **8.66 ± 1.12 years**.

Figure 1 Age distribution between control and experimental groups

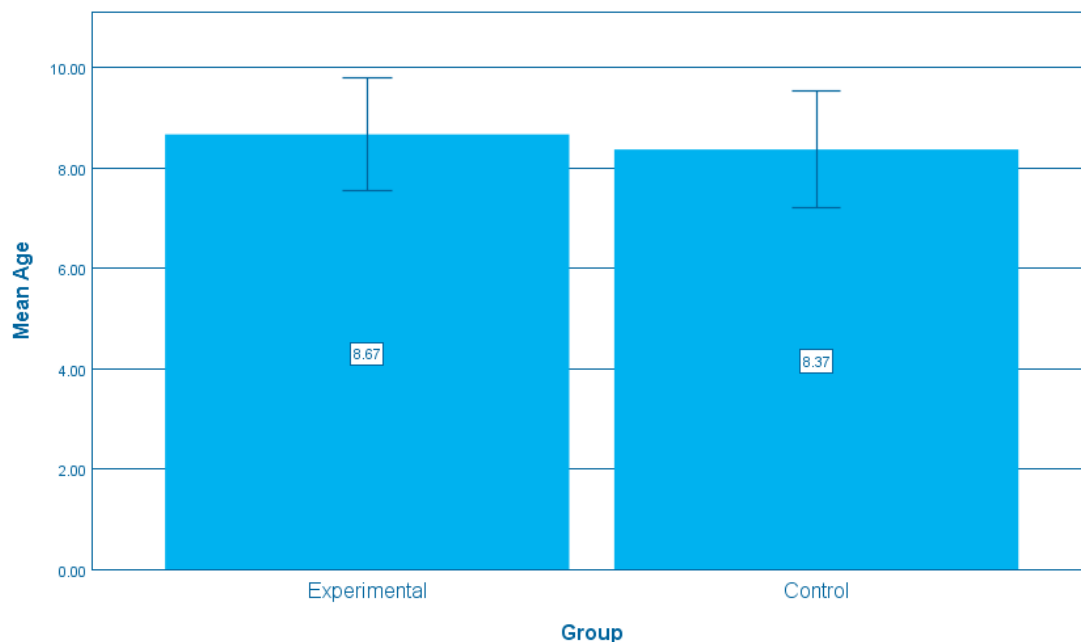


Fig 1 shows the mean value of age between control and experimental group. The mean value of experimental group is 8.66 and the mean value of control group is 8.36

Table 2 Distribution of gender among Control and Experimental Groups

Gender	Experimental		Control	Total
	Male	18	20	38
	Female	12	10	22
Total	30		30	60

Table 2 shows distribution of participants according to gender in the experimental and control groups. Among the total 60 participants, 38 were males and 22 were females. In the Experimental group, 18 were males and 12 were females, whereas in the Control group, 20 were males and 10 were females.

Figure 2 Gender distribution Between Control and Experimental Groups

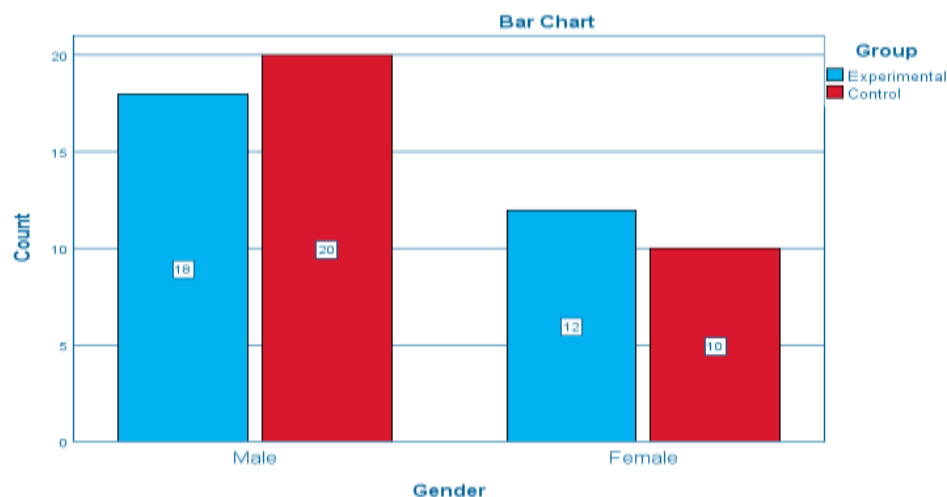


Figure 5.2 shows the gender distribution Between experimental and control groups. Among the total 60 participants, 38 were males and 22 were females. In the Experimental group, 18 were males and 12 were females, whereas in the Control group, 20 were males and 10 were females.

Table 3 Comparison of Pre-Test and Post-Test CSHQ Scores of Control and Experimental Groups

Group	Pre-test Mean $\pm$ SD	Post-test Mean $\pm$ SD	Mean Difference
Control Group (n=30)	54.30 $\pm$ 1.70	54.56 $\pm$ 2.64	-0.26
Experimental Group (n=30)	55.60 $\pm$ 1.73	40.00 $\pm$ 1.67	15.6

Table 3 presents the comparison of pre-test and post-test CSHQ scores between the Experimental and Control groups. The Experimental Group showed a marked reduction in mean CSHQ scores from 55.60 ± 1.73 to 40.00 ± 1.67 , indicating improved sleep quality. In contrast, the Control Group showed minimal change, with scores ranging from 54.30 ± 1.70 to 54.56 ± 2.64 .

Figure 3 Comparison of Pre Test and Post Test scores of CSHQ Scores Between Control and Experimental Groups

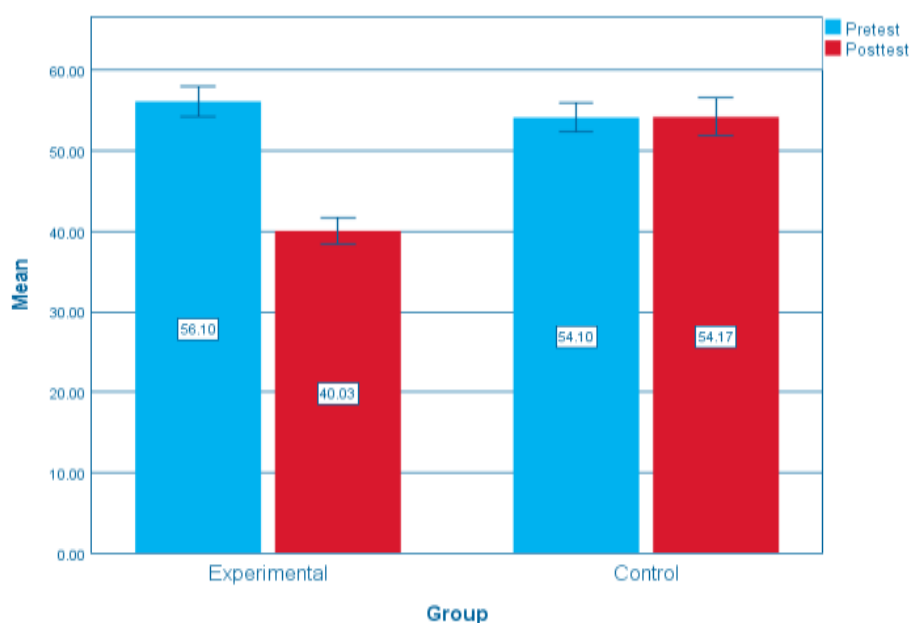


Figure 3 shows that both groups had similar pre-test CSHQ scores. After the intervention, the Experimental Group demonstrated a marked reduction in CSHQ scores, whereas the Control Group showed minimal change, indicating the effectiveness of multisensory stimulation in improving sleep quality.

6. Discussion:

The present study evaluated the effectiveness of mother-mediated multisensory stimulation on sleep quality among children with ASD. The intervention incorporated proprioceptive, tactile, auditory, and visual sensory strategies and demonstrated significant improvements in sleep quality compared to routine care. The demographic profile showed a predominance of male participants (63.3%), which is consistent with the higher prevalence of ASD reported among boys (Maenner et al., 2023).

Baseline CSHQ scores were comparable between the Control Group (54.30 ± 1.70) and Experimental Group (55.60 ± 1.73), indicating homogeneity before intervention (Malow et al., 2014). Following the intervention, the Control Group showed minimal change in sleep quality (54.30 ± 1.70 to 54.56 ± 2.64), whereas the Experimental Group demonstrated a substantial reduction in CSHQ scores (55.60 ± 1.73 to 40.00 ± 1.67), indicating marked improvement

in sleep quality and sleep-related behaviors. These findings are consistent with previous studies linking sensory processing difficulties with sleep disturbances in children with ASD (Mazurek & Petroski, 2015; Souders et al., 2009).

The observed improvements may be attributed to the combined effects of deep-pressure proprioceptive input, neutral warmth, calming auditory stimulation, and dim-light visual regulation. Previous studies have reported that deep-pressure interventions promote relaxation and reduce physiological arousal (Grandin, 1992; Edelson et al., 1999), tactile input supports emotional regulation (Field, 2010), calming music enhances sleep quality (Jespersen et al., 2015), and reduced evening light exposure facilitates sleep initiation (Czeisler et al., 2011).

Post-test comparisons demonstrated significantly better outcomes in the Experimental Group than in the Control Group, supporting the effectiveness of mother-mediated multisensory stimulation. Similar findings were reported by Spira and Fischel (2005), who found improvements in sleep behaviors and sensory processing following sensory-based interventions. Furthermore, parent-mediated interventions promote consistency within natural environments and enhance family participation, contributing to improved functional outcomes for children with ASD (Oono et al., 2013; Case-Smith et al., 2015).

The findings also support Ayres' Sensory Integration Theory, which emphasizes the role of sensory processing in adaptive behavior and daily functioning. Overall, the study suggests that mother-mediated multisensory stimulation is an effective, feasible, and family-centered occupational therapy intervention for improving sleep quality among children with ASD, supporting previous evidence on sensory modulation approaches for sleep management (Ayres, 1972; Schaaf et al., 2014; Lane et al., 2022).

7. Conclusion:

The present study concluded that mother-mediated multisensory stimulation was effective in enhancing quality of sleep among autistic kids. Those children who were given intervention showed a significant reduction in CSHQ, which means that there were less sleep disturbances and better sleep habits. Children in the Control Group, on the other hand, showed only small changes after the study.

The results show that sensory-based strategies using proprioceptive, tactile, auditory, and visual stimulation can be effective in supporting sleep regulation in children with ASD. The involvement of mothers in implementing the intervention enhanced the practicality and sustainability of the program within the home environment. Therefore, mother-mediated multisensory stimulation may be considered a useful occupational therapy treatment for children with autism spectrum disorder who have trouble sleeping.

8. Limitation and recommendation:

The present study was limited by a relatively small sample size, short intervention duration, reliance on parental reports through the CSHQ, and the absence of objective sleep assessment measures such as actigraphy or polysomnography. In addition, environmental factors, variations in ASD severity, and sensory processing differences among participants were not fully controlled. Future studies should include larger samples, longer follow-up periods, objective sleep measures, and comparative intervention designs. Further research is also recommended to examine the effects of multisensory stimulation across different ASD severity levels and on outcomes such as sensory regulation, daytime behavior, academic participation, and caregiver stress.

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