

# Effectiveness of Sensory Integration Therapy with Music Therapy on Sensory Processing and Reciprocal Activities in Children with Autism Spectrum Disorder

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## ABSTRACT

**Introduction:** The autism spectrum disorder is a range of neurodevelopmental conditions characterized by difficulty in social interactions, communication, repetitive behavior and usual responses to sensory stimuli. It is commonly referred as autism or in context of a professional diagnosis, as autism spectrum disorder (ASD). Impaired sensory processing may also be associated with poor motor control impacting on participation in daily life. Sensory integration therapy is also known as sensory based treatments or interventions, are designed to provide sensory activities or experiences to help individuals respond better to environmental stimuli. Music therapy is particularly effective tool when working with children with autism spectrum conditions, because music communicates with these children on a level where mere words cannot go.

**Method:** 40 children were approached out of which 30 children consented for assessment and intervention. Their sensory processing and reciprocal activities assessed by short sensory profile scale.

**Results:** Paired t test was used to statistically analyzed the sensory processing and reciprocal activities by sensory integration with music therapy. the test showed significant result with  $p < 0.001$ .

**Conclusion:** This study confirms that sensory integration therapy with music therapy is effective to improve sensory processing and reciprocal activities in children with autism spectrum disorder.

**Keywords:** Autism spectrum disorder, Sensory integration therapy, Music therapy.

## INTRODUCTION

The autism spectrum disorder is A range of neurodevelopmental conditions characterized by difficulty in social interactions, communication, repetitive behavior and usual responses to sensory stimuli. It is commonly referred as autism or in context of a professional diagnosis, as autism spectrum disorder (ASD). Difficulty in sensory processing are common in autism spectrum disorder with prevalence of 90 - 95%. Such difficulties relate to hyper or

hypo reactivity to sensory input and may occur due to impaired regulation of central nervous system arousal. <sup>(1)</sup>

Impaired sensory processing may also be associated with poor motor control impacting on participation in daily life. <sup>(1)</sup> It is possible that intervention targeting sensory processing difficulties could result in improvements across behavioral, social and educational dimensions. <sup>(1)</sup>

Sensory integration (SI) theory was originally developed by A. Jean ayres to

focus on the neurological processing of sensory information.<sup>(2)</sup> Sensory integration therapy is also known as sensory based treatments or interventions, are designed to provide sensory activities or experiences to help individuals respond better to environmental stimuli.<sup>(2)</sup> Sensory integration therapy is used to explain why individual behave in particular ways, plan intervention to improve particular difficulties, and predict how behavior will change as a result of intervention.<sup>(2)</sup> Sensory integration therapy is A clinic based approach that focus on therapist - child relationship and uses play-based sensory motor activities designed to improved sensory processing.<sup>(3)</sup> It is A neurological process that organizes sensation from one's own body and environment, specifically, it deals with how the brain processes multiple sensory modality inputs into usable functional output.<sup>(3)</sup>

Newer research has shown these different regions of the brain may not be solely responsible for only one sensory modality, but could multiple inputs to perceive what the body senses about the environment.<sup>(3)</sup> Sensory integration is necessary for almost every activity that be performed because the combination of multiple sensory inputs is essential for us to comprehend our surrounding.<sup>(3)</sup>

Music therapy is A particularly effective tool when working with children with autism spectrum conditions, because music communicates with these children on A level where mere words cannot go.<sup>(4)</sup> Placing particular emphasis upon sensory integration, the author (*dorita berger*) discusses contributing factors to the behavior of people on the autism spectrum, and, through the use of case studies, presents the latest approaches in music therapy that are enabling children with autism spectrum conditions to better cope with sensory integration.<sup>(4)</sup> Music is able to create an intensely pleasurable experience that can be described as "chills". Blood and zatorre (2001) used PET to measure changes in cerebral blood flow while participants

listened to music that they knew to give them the "chills" or any sort of intensely pleasant emotional response.<sup>(5)</sup> They found that as these chills increase, many changes in cerebral blood flow are seen in brain regions such as the amygdala, orbitofrontal cortex, ventral striatum, midbrain, and the ventral medial prefrontal cortex.<sup>(5)</sup>

Many of these areas appear to be linked to reward, motivation, emotion, and arousal, and are also activated in other pleasurable situations. The resulting pleasure responses enable the release dopamine, serotonin, and oxytocin. Nucleus accumbens (A part of striatum) is involved in both music related emotions, as well as rhythmic timing.<sup>(5)</sup>

According to the national institute of health, children and adults who are suffering from emotional trauma have been able to benefit from the use of music in A variety of ways. The use of music has been essential in helping children who struggle with focus, anxiety, and cognitive function by using music in therapeutic way.<sup>(5)</sup> Music therapy has also helped children cope with autism, pediatric cancer, and pain from treatments. Emotions induced by music activate similar frontal brain regions compared to emotions elicited by other stimuli.<sup>(5)</sup>

## **MATERIALS & METHODS**

An Experimental study was conducted in rehabilitation centres in and around pune city. Study was approved by the ethical committee. children from 3 to 10 years of age were randomly selected for the study. For study 3 rehabilitation centres were approached.

Once the child was selected, he/she was asked history of Any other neuro developmental disorder like cerebral palsy and Congenital anomalies or birth defects. Based on this, 10 children were excluded from the study.

The demographic data including name, age, standard and gender were noted.

Sensory integration was measured by short sensory profile scale.

For sensory processing child is examined and assessed by short sensory profile scale, which includes auditory, tactile, visual, vestibular, smell and proprioception examination.

### **Sensory Integration Therapy & Music Therapy Protocol:**

It incorporated the activities to improve sensory integration involving sensory overloaded activities. The training session was conducted for 1 hour for each child per day. 1 hour was divided into 10 minutes for each sensory component.

The protocol was started with visual component and ends with music therapy.

### **Activities To Improve Visual Component:**

- Visual memory games. (What's missing)
- Magic cup games.

### **Activities To Improve Auditory Component:**

- Incorporate music during activities.
- Play with music instruments.

### **Activities To Improve Tactile Component:**

- Play dough.
- Sand play.

### **Activities To Improve Gustatory Component:**

- Sour, salty and crunchy snacks.
- Drink cold and warm liquids.

### **Activities To Improve Olfactory Component:**

- Lotion with calming or alerting aromas.
- Scented soaps to wash hands.

### **Activities To Improve Vestibular Component:**

- Rocking chair.
- Sit & spin
- Fast, alternating movements.

### **Activities To Improve Proprioceptive Component:**

- Playground – climb, hang, run through
- Trampoline jumps
- Obstacle course

Post protocol score was measured by outcome measure- short sensory profile scale.

## **RESULT**

The present study was aimed at finding the effectiveness of sensory integration therapy and music therapy on sensory processing and reciprocal activities in children with autism spectrum disorder after 4 weeks protocol.

The data was analyzed using Microsoft excel sheet and GraphPad. Total 30 students, both male (21) and female (09) were selected according to the inclusion and exclusion criteria. Various statistical measures such as mean, standard deviation (SD) and test of significance were utilized to analyze the data. paired t test was used to statistically analyzed sensory processing and reciprocal activities by sensory integration with music therapy. the test showed significant result with  $P < 0.001$ .

There was pre value ( $121.6 \pm 1.63$ ) and post value ( $141.8 \pm 2.04$ ) for short sensory profile scale.

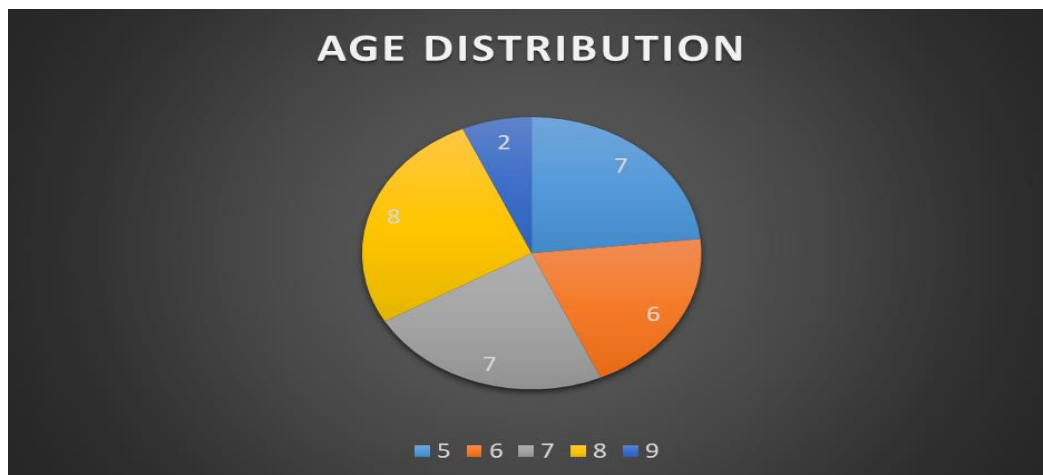
Hence, the results showed that sensory integration with music therapy was effective in improving the sensory processing and reciprocal activities in children with autism spectrum disorder after 4 weeks.

### **1.AGE DISTRIBUTION:**

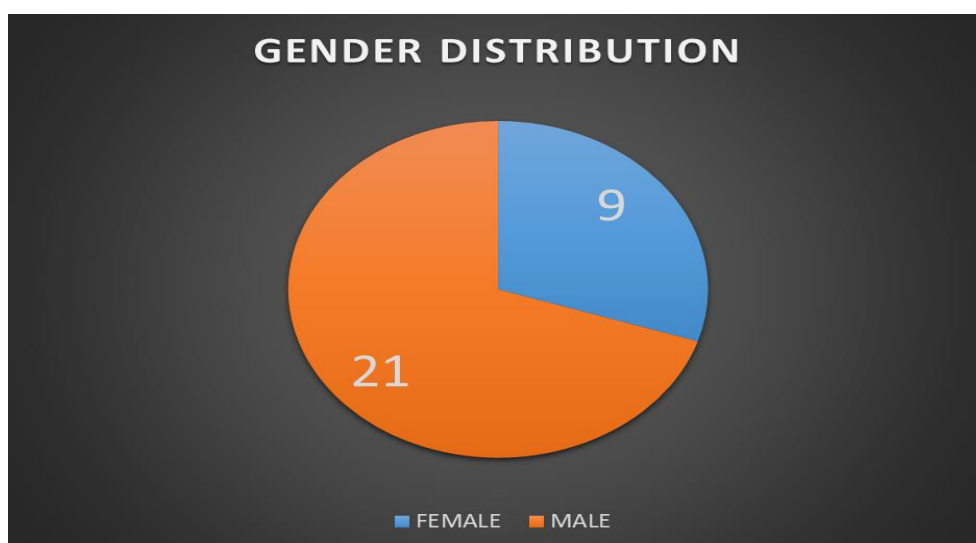
30 students from age group 3 to 10 were selected according to inclusion and exclusion criteria and data analysis was done.

### **2.GENDER DISTRIBUTION:**

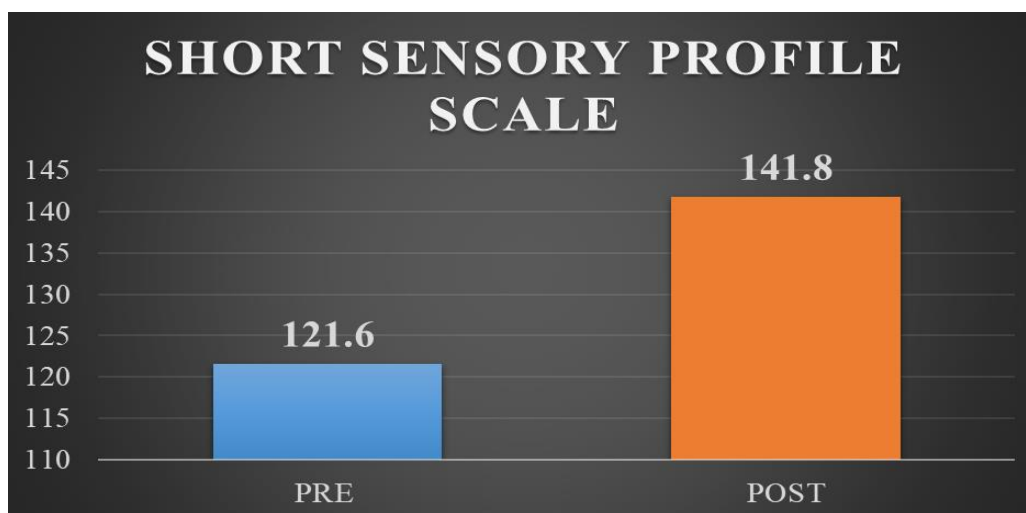
30 students, from age group 3 to 10 were selected according to inclusion and exclusion criteria and data analysis was done. In the total 30 count, 21 were males and 9 were female.



GRAPH NO 1: AGE DISTRIBUTION



GRAPH NO 2: GENDER DISTRIBUTION



GRAPH NO.3: COMPARISON OF PRE AND POST VALUES OF SHORT SENSORY PROFILE SCALE

## DISCUSSION

The present study represents potential mechanism associated with response to an intervention that incorporates sensory

integration therapy with music therapy to improve sensory processing and reciprocal activities in autistic children.

Repetitive application of sensory integration therapy with music therapy improves sensory processing and reciprocal activities in autistic child.

One outcome measure was used; short sensory profile scale to assess sensory integration, which is based on 5 responses. That 5 responses are; always, frequently, occasionally, seldom, never.

Paired t test was used to compare the values of short sensory profile scale before and after treatment, which was extremely significant ( $p: <0.0001$ ). Thus, the study concluded the effectiveness of sensory integration therapy with music therapy to improve sensory processing and reciprocal activities in children with autism.

In the present study, sensory integration therapy was implemented by giving sensory overloaded examples of visual, auditory, proprioception, tactile, gustatory, olfactory and vestibular systems. Music therapy which given to autistic child, the frequency of music should be 0.5 to 4 kHz.

The neurological structure of the autistic brain is same as any other brain, what is different about the autistic brain is how it functions with respect to its neurophysiology. In neurotypical brain, cingulate gyrus acts like automatic transmission that seamlessly switches attention back & forth between frontal lobes as required. In autistic brain, however a dysmature cingulate gyrus keep the person trapped in his/her left frontal lobe as the intellectual, analytical, problem-solving part of the brain with no ability to access the emotional or create processing of right frontal lobe which plays a central role social behavior and nonverbal ability.

The systematic application of sensory stimulation is effective in decreasing the symptoms of autism because SI uses planned, controlled sensory inputs in accordance with the child's neurological needs. <sup>(12)</sup> sensory integration therapy aims to help kids with sensory processing issues (which some people may refer to as "sensory integration disorder") by exposing them to sensory stimulation in a structured,

repetitive way. The theory behind it is that over time, the brain will adapt and allow kids to process and react to sensations more efficiently. <sup>(12)</sup>

Since, no adverse effects occurred and dropout rates for motivated reasons was none, sensory integration therapy with music therapy seemed to be feasible as well as safe and acceptable in the sample of present study.

This study confirms that sensory integration therapy with music therapy is effective to improve sensory processing and reciprocal activities in children with autism.

## CONCLUSION

The sensory integration therapy with music therapy for children with autism spectrum disorder to improve sensory processing and reciprocal activities has proven to be effective.

### Limitations:

1. Lack of long term follow up.
2. Adults with autism were not considered for the study.

### Future scope of study:

Effectiveness of SI therapy with music therapy can be assessed for treating other conditions in ASD.

The effects of SI therapy with music therapy can be studied at the molecular level or genetic level.

The role of individual sensory component on the quality of life of children with autism can be studied.

### Declaration by Authors

**Ethical Approval:** Approved

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**Conflict of Interest:** The authors declare no conflict of interest.

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