

# Effect of Sensory Integration Therapy on Self-Stimulating and Self-Injurious Behaviours in Children with Autism: A Pilot study

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**Abstract:** *The purpose of this study was to identify effectiveness of Sensory Integration (SI) therapy to reduce self-stimulating and self-injurious behaviours in children with autism. Ten children with autism were included through convenience sampling procedure. Five children included in experimental group and 5 children included in control group randomly. This study compared the effects of Occupational therapy using sensory integration therapy activities with tabletop activities. The results found that self-stimulating and self-injurious behaviours were significantly reduced by 13% one hour after SI therapy activities in comparison with the tabletop activities. There was no significant change immediately following SI intervention or tabletop activities. Further results revealed that there was positive correlation between teacher rating of children behaviour in classroom and investigators observations. These findings concluded that an SI activity is effective to reduce self-stimulating and self-injurious behaviours in children with autism.*

**Keywords:** Sensory Integration therapy, tabletop activities, Autism, Self-stimulating behaviours, Self-injurious behaviours

## 1. Introduction

Self-injurious, self-stimulating or stereotypical behaviours are commonly seen in children with developmental disabilities or Mental retardation. The most common forms of these behaviors include: head-banging, hand-biting, and excessive self-rubbing and scratching, body rocking, jumping, running etc. There are many possible reasons why a person may engage in self-injurious behavior, ranging from biochemical to the social environment. Self-injurious behaviour is more prevalent in children with severe to profound mental retardation. Two forms of self-injurious behaviours are usually seen in developmental disabilities or mental retardation. 1. destructive behaviours 2. Aggression towards others or property [1].

### 1.1. Causes of Self Injurious behaviours

Some researchers have suggested that the levels of certain neurotransmitters are associated with self-injurious behavior. Beta-endorphins are endogenous opiate-like substances in the brain, and self-injury may increase the production and/or the release of endorphins. As a result, the individual experiences an anesthesia-like effect and, ostensibly, he/she does not feel any pain while engaging in the behaviour [2]. Furthermore, the release of endorphins may provide the individual with a euphoric-like feeling. Support for this explanation comes from studies in which drugs that block the binding at opiate receptor sites (e.g., naltrexone and naloxone) can successfully reduce self-injury [3].

Research on laboratory animals as well as research on administering drugs to human subjects have indicated that low levels of serotonin or high levels of dopamine are associated with self-injury [4,5]. In a study on a heterogeneous population of mentally retarded individuals, Greenberg and Coleman [6] administered drugs, such as reserpine and chlorpromazine, to reduce serotonin levels.

These researchers observed a dramatic increase in both aggressive and self-aggressive behaviour. Drugs that elevate dopamine levels, such as amphetamines and apomorphine, have been shown to initiate self-injurious behaviour [5,7]. Interestingly, Coleman [8] studied a group of autistic children who had low levels of calcium (i.e., hypocalcemia). These individuals often exhibited eye-poking behaviour. When given calcium supplements, the eye-poking decreased substantially. In addition, language functioning improved. When self-injury is associated with a biochemical abnormality, there may be little or no relationship between the person's physical/social environment and self-injury. Thus, the behaviour may occur in various settings and around different people. However, self-injury may occur less frequently in situations in which the person's behaviour is incompatible with self-injury, such as eating, playing, and working on a task.

It has often been suggested that a person's level of arousal is associated with self-injurious behaviour. Researchers have suggested that self-injury may increase or decrease one's arousal level. The under-arousal theory states that some individuals function at a low level of arousal and engage in self-injury to increase their arousal level [9,10]. In this case, self-injury would be considered an extreme form of self-stimulation. In contrast, the over-arousal theory states that some individuals function at a very high level of arousal (e.g., tension, anxiety) and engage in self-injury to reduce their arousal level. That is, the behavior may act as a release of tension and/or anxiety. High arousal levels may be a result of an internal, physiological dysfunction and/or may be triggered by a very stimulating environment. A reduction in arousal may be positively reinforcing, and thus, the client may engage in self-injury more often when encountering arousal-producing stimuli [11].

The neurological mechanisms, which precipitate stereotypical behaviours in children with mental retardation, may involve one or more of the sensory systems [12]. Researchers found that tactile, vestibular and kinesthetic

systems are mainly involved and they reported that stereotypical behaviours decreased significantly when locomotion and manipulation of environment were increased [13]. This revealed that changes in sensory input may reduce the incidence of self-stimulating behaviour. These behaviours play a vital role in participation and independence in activities. Systematic application of sensory stimulation was effective in decreasing the self-injurious behaviour [14]. Reisman did a systematic review to identify effects of sensory integration therapy on reducing self-stimulating and self-injurious behaviours of adult with developmental disabilities [15]. He reported that a result was inconclusive. Miller [16] raised the research question "Does sensory integration therapy work? And what effects are evident for a specific group of children receiving a specifically designed intervention compared to control group intervention? Hence there was no research evidence for effect of sensory integration to reduce self-stimulating and self-injurious behaviour in autism. Therefore current study was carried out to identify effectiveness of Sensory Integration activities to reduce self-stimulating and self-injurious behaviour in children with autism.

## 2. Methodology

### 2.1 Research Design

It is a quantitative research design analysis. A longitudinal study.

### 2.2 Participants

Ten children with Autism were recruited from special schools through convenience sampling procedure in Chennai, India. Five children included in experimental group and 5 children included in control group randomly.

### 2.3. Screening Criteria

#### (i) Inclusion criteria

- Diagnosis of Autism
- Age: 4-10 years.
- Both genders.

#### (ii) Exclusion criteria

- Children with motor disabilities

### 2.4 Instrument Used

#### *Short Sensory Profile (SSP)*

Short Sensory Profile, a standardized self-report questionnaire assessing parents' perceptions of behavioural responsiveness of children to sensation. It is a 38-item parent-rated screening instrument that evaluates functional behaviours related to sensory processing disorders. The Short Sensory Profile was developed from extensive research and development of the Sensory Profile [17]. It is a 5-point scale ranging from "always" to "never". The items are categorized as typical, probably different, or definitely different. The Short Sensory Profile can be completed by the caregiver in 10 minutes and it is widely used in clinics and school-based

settings. The SSP is comprised of seven subtests, four evaluating parent perceptions of sensory over-responsivity in touch, vision/sound, taste/smell, and movement, one evaluating auditory filtering, one evaluating under-responsivity, called "low energy/weak", and one evaluating sensory seeking [18].

#### *Scoring procedure*

This frequency is determined from a 5-point Likert scale where

- 1=Always, Child Responds in the manner every time or 100% of the time.
- 2= Frequently, or at least 75% of time.
- 3=Occasionally, or 50% of time.
- 4=Seldom, or 25% of time.
- 5=Never, or 0% of time.

#### *Reliability and validity of SSP*

The reliability and validity of Short Sensory Profile tool is excellent. Internal reliability of SSP total test is  $>.95$  for a sample of children with and without disabilities (Cronbach's alpha) and subscales reliability range from .70 to .90 across three samples. Inter-scale correlation of SSP was moderate. The discriminant validity has been demonstrated by comparing children with sensory processing disorders and an age and gender matched typically developing group ( $n=38$ ). The group with sensory processing disorders scored significantly lower (more abnormal) than typically developing group. Convergent validity was determined by comparing the Short Sensory Profile scores to physiological evidence of sensory processing disorders [18,19]

### 2.5 Intervention

The purpose of the study was explained to the head of the institution. Ten subjects were included from selected special school in Chennai based on the screening criteria. Consent form was obtained from parents. Details occupational therapy evaluation was done for each child. Short sensory profile was given to each parent or caregivers. This questionnaire along with occupational therapy evaluation, provided information about the child sensory processing abilities and specific self-stimulation or self-injurious behaviour. Sensory integration therapy interventions were designed based on sensory integration theory to enhance sensation with controlled sensory input to elicit adaptive responses in an environment. These intervention programs were designed based on individual needs in order to enhance their sensory processing [20,21]. In experiment group, child engaged in sensory based treatment that included a variety of tactile, proprioceptive and vestibular input, based on their unique sensory needs. Different types of sensory input was altered or continued based on the children's response to intervention. The main purpose of the intervention was to provide the appropriate amount and type of sensory input to allow the children to be free to organize a more adaptive response. The following adaptive responses were expected from this intervention program: calming, indication of contentment or pleasure, eye contact and reduction of purposeless activity.

The control group received tabletop activities based on each child specific individualized education program goals.

Tabletop activities included one or more of the following tasks: sorting activity such as sorting objects based on colour, size and shape, colouring, tracing, writing activities, puzzles activities, and peg board activities. The experimental and control group received intervention program for 4 weeks. Intervention session was given for 5 days per week. Each session duration was 30 minutes. Each children from both group received 20 sessions.

## 2.6. Data collection procedure

Each children were videotaped performing their routine activities in special school for 30 minutes before the start of each intervention session. Then investigators took the children from classroom to the therapy room. Experimental group children received SI intervention and control group children received tabletop activities in therapy room. The children were returned to classroom after the intervention. The children were videotaped for 30 minutes immediately after returning to the classroom and again for 30 minutes 1 hour after he or she returned to classroom. The target behaviours were self-injurious or self-stimulating behaviours. It defined as repetitive, frequent, nonfunctional actions, which sometimes caused bodily harm. Behaviours were specific to each children and had identified through sensory profile and occupational therapy evaluation. Behaviours included body rocking, hand flapping, biting self, hitting self, head banking, repetitious vocal sounds, flicking objects, mouthing objects etc.

The 30 minutes videotape segments were analysed to determine the frequency of self-injurious and self-stimulating behaviours. The investigators recorded whether or not the children engaged in any sort of self-stimulating or self-injurious behaviours during continuous 15 sec intervals. School teacher for each child rated the frequency of self-stimulating and self-injurious behaviours and the frequency of repetitious vocal sound at the end of each day for 4 weeks of the study to determine if there was carryover results into the classroom environment. For each child, the teacher answered the following questions: did the child engage in self-stimulating or self-injurious behaviour? ;did the child exhibit repetitious vocal sounds? Using Likert 5 point scale.

## 2.7. Data analysis

A repeated measures analysis of variance (ANOVA) and post hoc test were used to analyse the mean differences in the percentage of self-injurious or self-stimulating behaviour for experimental and control group. Spearman rank order correlation was used to determine the relationship between teacher rating and investigator observation of self-stimulating or self-injurious behaviours.

## 3. Results

The percentage of self-stimulating and self –injurious behaviours were reduced during the 30 minutes periods before, immediately after and 1 hour after interventions either experimental group or control group. There was more difference in the percentage of self stimulating and self-

injurious behaviours 1 hour after intervention compared to before and immediately after intervention in experimental group.

Self-stimulating behaviour and self-injurious behaviours decrease by an average of  $13 \pm 4\%$  one hour after intervention in experimental group when compared to a  $4 \pm 6\%$  increase one hour after intervention in control group. Teacher rating found that self-stimulating and self-injurious behaviours were reduced in experimental group compared to control group. There was positive correlation between investigators observation of self-stimulating and self-injurious behaviour and teacher rating.

## 4. Discussion

Self-injurious and self-stimulating behaviours have a propensity to interfere with a children ability to function independently and it must be addressed before any significant increase in function is accomplished through intervention program [22]. The current study results revealed that the frequency of self-stimulating and self-injurious behaviours remained relatively the same before and after both the experimental and control group. But 1 hour after intervention both groups showed significant improvement in self-stimulating and self-injurious behaviours. Self –stimulating and self-injurious behaviours decreased by an average of 13% in experimental group and 4% for control group. These results concluded that more decline in self-stimulating behaviours in experimental group compared to control group. This study results supports the findings of several other researchers who found no change immediately following sensory integration therapy. But various researchers found that after a latency period, there was a reduction in self-stimulating and self-injurious behaviours [23,24]. Case smith and Bryan [25] found that 10 weeks of sensory integration therapy intervention is necessary to get positive results. But this study conducted only for four weeks. The results of this study suggest that further research is required to examine the long term effects of more extensive Sensory Integration therapy intervention program for children with autism.

Teacher rating and investigators observation of behaviours suggest that reduction of self-stimulatory and self-injurious behaviours is carried over into the classroom. The role of occupational therapist in school setting is to improve children behaviours in classroom and promote learning skills. The current study provide evidence that sensory integration therapy intervention was effective in school setting to reduce overall self-stimulating and self-injurious behaviours , which interfere with function and participation in classroom activities. In experimental group activities that contains vestibular,tactile and proprioceptive input and specifically designed for individual sensory processing needs. This may influence the reducing children maladaptive behaviours compared to control group. This study has following limitations: small sample size, use of a single clinical site for intervention program, duration of intervention and parent/caregiver questionnaire. Further research is recommended in this areas to identify effectiveness of sensory integration therapy intervention program on reducing self-stimulating and self-injurious behaviours and increasing



positive participation in educational and work setting of children with autism spectrum disorder.

## 5. Conclusion

The current study concluded that sensory integration therapy activities is effective to reduce self-stimulating and self-injurious behaviours in school setting for children with autism spectrum disorder and increase their participation in classroom activities.

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