**RESEARCH PAPER**

# Clinical Outcomes Following Occupational Therapy Using Sensory Integration (OTSI) in Young Children With Autism Spectrum Disorder among Mizo population: A Single-Group Pretest–Posttest Pilot Study

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**Abstract**
Autism spectrum disorder (ASD) includes challenges in social communication and restricted, repetitive behaviours, which impact the ability to function fully. The effectiveness of Occupational Therapy using Sensory Integration (OT-SI) for children with ASD is well-documented; however, there is limited evidence for its short-term clinical effectiveness in the culturally contextualised Indian settings and especially Mizo children. The existing pilot research examined the effect of OT-SI on social communication and sensory processing in young children with ASD. A clinical trial of the pretest–posttest single–group design was done on 35 children aged 3–7 years diagnosed with ASD (29 males, 6 females) through convenience sampling from a paediatric clinical set up. The participants underwent a manualized therapy OT-SI intervention consisting of 24 sessions lasting eight weeks. The Childhood Autism Rating Scale–Second Edition (CARS2-ST), the Social Communication Questionnaire (SCQ), and the Short Sensory Profile-2 (SSP-2) were among the outcome measures. The analysis of data was done with descriptive statistics, paired samples t test, and repeated measure MANOVA. Analysis revealed significant decreases in parent-reported social communication difficulties (SCQ scores) from pretest ($M = 6.31$, $SD = 4.71$) to posttest ($M = 3.14$, $SD = 3.82$), $t(34) = 5.77$, $p < .001$, Cohen's $d = 0.88$. MANOVA findings showed a significant multivariate treatment effect for the SSP-2 domains, Wilks' $\Lambda = .042$, $F(6, 29) = 111.43$, $p < .001$, partial $\eta^2 = .958$. There was a significant change for the sensory seeking, avoiding, registration, sensory, and behavioral domains. The findings are preliminary evidence which may indicate that OT-SI may positively relate to improvements after intervention in the area of sensory processing and parent-reported social communication among young children with ASD. Further studies with large sample sizes and longitudinal follow-up are needed to validate the findings.
**Keywords:** Autism Spectrum Disorder, Occupational Therapy, Sensory Integration, Social Communication, Sensory Processing, OT-SI, ASD, Short Sensory Profile-2
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## INTRODUCTION

According to Buescher et al. (2014), Hayes and Watson (2013), and Lord et al., (2020), the dysfunctionality and economic cost of autism spectrum disorder is significant around the world. Autism spectrum disorder is a common and heterogeneous neurodevelopmental disorder worldwide (Masi et al., 2017; Zeidan et al., 2022).

According to the Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition (DSM-5), Autism Spectrum Disorder (ASD) is a neurodevelopmental disability that has diagnostic criteria which include impairment in social communication and social interaction and the presence of restricted, repetitive patterns of behavior, interests, or activities that may last a lifetime (American Psychiatric Association [APA], 2022).

At the onset of early development, the initial manifestations and symptoms become apparent. Research shows parents often suspect a problem before age 1, and many express concern to a pediatrician by age 18 months (Zwaigenbaum et al., 2005; Ozonoff et al., 2010). However, social and behavioral dysfunctions may not be recognized as symptoms of ASD until a child fails to meet the demands of social, educational, occupational or other important life stages (Lord et al., 2020).

ASD is a developmental condition that affects an individual's behaviour, communication and social skills. (Lord et al., 2020) The primary defining characteristic of ASD is social-emotional reciprocity, which refers to a disruption in the ability to engage in, and share, thoughts and feelings with others. Verbal and non-verbal deficiencies in social communication will depend on the age, the level of intellectual and linguistic ability, with other factors, the treatment or support rendered upon the child. Children exhibit a variety of impairments with a diverse range of issues which often results in little or no language. A child may display atypical use of eye contact (relative to culture), gestures, facial expressions, body orientation, or speech intonation in social interactions. Nonverbal communicative behaviour deficits are defined as absent, reduced, or atypical use of such behaviours. The joint attention ability is impaired in ASD, which is observed as an absence of pointing, showing, or bringing related objects in order to direct the parent's attention or having difficulty or absence of ability to follow a pointing or a gaze. Difficulties in establishing, nurturing, and comprehending relationships may be manifested by absent, reduced, or atypical social

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interest. This is manifested by rejective behaviour towards others, passivity, or exposed approaches that may be regarded as aggressive or disruptive behaviour by others (APA, 2022; Lord et al., 2020).

Tavassoli et al. (2018) state that, atypical sensory symptoms in the form of over-reactivity to sound or touch are often reported in ASD. The latest DSM-5 criteria for autism spectrum disorder (ASD) highlight sensory processing differences, including over- and under-reactivity to sensory input and sensory craving. Hyper-reactivity which is over-reactivity here is defined as an adverse response to sensory stimuli hypo-reactivity which is under-reactivity here as an indifference to sensory stimuli and sensory craving as an excessive desire for sensory input (American Psychiatric Association, 2022; Glod et al. 2017).

Most children with autism spectrum disorder struggle to process and respond to sensory input. Children have been reported to show signs of inattention, under-responsiveness, tactile defensiveness, sensory-seeking behaviour, and auditory filtering difficulties. The ASD group also performed significantly differently on 92% (35 of 38) of the individual items on the short sensory profile (Tomchek & Dunn, 2007).

Sensory processing differences are obvious between children ages 3 to 6 with and without autism spectrum disorder. Significant differences were noted in behaviours concerning sensory registration, sensory sensitivity, sensory seeking, emotional reactivity, oral sensitivity, distractibility, and other sensory based behaviours. Fifty percent of the children with autism had scores lower than those of any of the children without autism on both the Emotionally Reactive and Other factors (Watling et al., 2001).

**Effectiveness for Sensory Processing and Behaviour**

Sensory integration-related interventions could improve the attainment of personal functional goals and participation outcomes. More importantly, those interventions could reduce the severity of sensory challenges and improve adaptive behaviour (Schaaf et al., 2018; Schoen et al., 2019). According to a systematic review, Ayres Sensory Integration® delivered from a clinic leads to significant advancements on individualized functional goals and less caregiver assistance on self-care and some social skills (Schaaf et al., 2018). An alternative RCT (SenITA) involving 138 children demonstrated that there were no considerable benefits beyond conventional treatment regarding wider behaviour and quality-of-life findings, and that it was not cost effective (Randell et al., 2022).

**Social Communication and Social Responsiveness**

According to Shu and colleagues (2024), children with Autism Spectrum Disorders showed significantly less in SRS total and subcodes from involving groups in sensory integration-based approaches. Sensory integration occupational therapy can improve individualized functional goals and adaptive participation outcomes of children with ASD (Schaaf et al., 2014). The sports training using a sensory integration-based approach brought significant improvements in social response along with motor gains. (Wen and Wu, 2025). However, the large pragmatic SenITA randomized controlled trial found that sensory integration therapy did not lead to any significant improvement in several standardized behavioural, adaptive functioning and socialisation outcomes as compared with usual care (Randell et al., 2022).

**Research Gap**

Although there is a growing literature that supports the conduct of occupational therapy in the use of sensory integration for children with autism spectrum disorder (Schaaf et al., 2018) there remain several gaps which justify the present study.

First, there is a lack of overall evidence that demonstrates that such improvements in sensory processing due to OT-SI are linked to improvements in social communication. Do so within the context of a range of different social and developmental domains. This results in a conceptual and empirical gap in understanding the functional pathways through which OT-SI influences social behavior.

Secondly, a large number of related interventions in previous studies have homogenous protocols differing in their duration, frequency, and therapeutic fidelity. However, very few studies have employed structured, intensive, time-bound intervention models to test for the optimal dosage and effectiveness of its use. The current research attempts to fill this gap through a well-defined intervention schedule.

Furthermore, a large portion of the literature is derived from Western populations. This means limited Indian or similar socio-cultural and clinical contexts have been studied. Different cultures vary in sensory experience, caregiving practices, and access to therapy services, which calls for more evidence drawn from local contexts for ensuring ecological validity.

Fourth, past research has tended to look at either sensory processing outcomes or behavior change. Nonetheless, there have been fewer studies that utilized a more comprehensive assessment method covering sensory quadrants, behavioral responses, and social communication at the same time in an experiment.

The fifth gap relates to experimental rigour. With the growing number of randomized controlled trials, it is observed that many studies lack within-subject pretest–posttest designs that used robust statistical modeling of multivariate outcomes. This is particularly true of studies conducted in fairly difficult clinical settings. To determine treatment effects, the present study applies both univariate and multivariate analyses.

Sixth, the underlying mechanism of OT-SI outcomes is not well-known as well. Although theoretical frameworks argue that enhancement of sensory modulation ultimately results in better attention and engagement levels, not much research exists that takes this pathway into consideration.

To conclude, evidence shows that intensive OT-SI interventions appear to have short-term efficacy, although evidence for clinical time frames is limited and change will not occur in 8 weeks, but rather in months and/or year. Gaining an understanding of short term responsiveness helps clinical decision-making, resource allocation and intervention planning.
These gaps underscore the importance and need for the ongoing study in advancing theoretical and clinical practice in ASD intervention studies.

***Research Design***
Pretest-posttest clinical trial

**METHODS & PROCEDURE**

***Participants***
A total of 52 children diagnosed or suspected of Autism Spectrum Disorder (ASD) were screened for eligibility based on the predetermined inclusion and exclusion criteria. Fourteen participants were eliminated from the research during the screening process. In particular, there were 9 children who did not meet the diagnostic criteria of ASD, followed by 3 parents who declined and also 2 cases were excluded as they could not participate consistently in the intervention program due to scheduling issues.
After assessing eligibility, 38 children met the criteria and were eligible to participate in the study. The parents or primary caregivers of 35 children subsequently gave consent for the study. Three eligible participants refused to participate in the assessment of baseline due to the withdrawal from study process. As a result, thirty-five children with autism spectrum disorder completed the pre-test assessments to be included in the final sample. All Participants received the OT-SI intervention after which the post-test was conducted. There was no drop out during the intervention. All 35 participants remained in the study and were included in the analyses.
The study's internal validity is enhanced by not having post-enrolment dropout which minimizes threats to what was actually done and outcome data. The OT-SI intervention program is fairly feasible and acceptable in the clinical setting as demonstrated by participant flow.

• N = 35 children with ASD.
• Gender distribution: 29 males 6 females.

***Sampling method:***
Convenience sampling.

***Inclusion criteria are***
• confirmed ASD diagnosis
• ages 3-7 years
• Severity threshold of CARS2-ST
• SSP2 levels
• ability to attend sessions
• caregiver consent

***Exclusion criteria are***
• severe physical disability
• uncontrolled epilepsy
• major neurological disorder
• major sensory impairment
• recent intensive therapy changes
• medication changes during study

| Participants | | Pre- Treatment Condition | Treatment Condition | Post- Treatment Condition |
|---|---|---|---|---|
| Children with Autism Spectrum Disorders (N-35) | Screening Tests | Childhood Autism Rating Scale, Second Edition (CARS2-ST) | Occupational Therapy using Sensory Integration (OT-SI)<br><br>24 sessions<br>(1 hour each, 3 times a week for 8 weeks i.e. 2 months) | Childhood Autism Rating Scale, Second Edition (CARS2-ST) |
| | Criterion Variables | Social Communication Questionnaire (SCQ)<br><br>Short Sensory Profile-2 (SSP-2) | | Social Communication Questionnaire (SCQ)<br><br>Short Sensory Profile-2 (SSP-2) |

**Table: Design of the study.**

**Instruments**

**Childhood Autism Rating Scale–Second Edition (CARS2-ST)**
The Childhood Autism Rating Scale–Second Edition, Standard Version (CARS2-ST; Schopler, 2010) was used to confirm ASD symptom severity of participating children. The CARS2-ST is a standardized instrument that is rated by clinicians and it has 15 items. Furthermore, the items measure the severity of the different core domains associated with ASD. This includes social interaction, emotional response, communication, body use, sensory responsiveness, adaptation to change and cognitive functioning. The severity of the symptoms increases with the scores which ranges from 1 to 4 for each item. For children under 13 years, total scores between 30 and 36.5 indicate mild-to-moderate and between 37 and 60 severe autism symptoms.
Prior research showed the CARS2-ST had good psychometric properties, including high inter-rater reliability and convergent validity with DSM-based ASD diagnosis (Dawkins et al., 2016). The device has been extensively used in clinical and research for assessment and severity classification of ASD. A trained occupational therapist with an understanding of autism assessment procedure and sensory integration-

based intervention delivered CARS2-ST in this study. The procedures for administering the instrument and scoring the tests described in the instrument manual were followed.

**Social Communication Questionnaire (SCQ)**

For assessing autism-related social communication difficulties and restricted or repetitive behaviours, the Social Communication Questionnaire (SCQ; Rutter et al., 2003) was used. The SCQ is a 40-item parent-report screening instrument designed to evaluate for autism spectrum disorder (ASD). The measure adopted a yes/no response option and high scores indicate more autistic symptoms. The present study utilized the Current Form of the SCQ (Social Communication Questionnaire), which rates behaviour arising over the past three months, to measure the change in social communication after the intervention.

Earlier studies have shown the SCQ to have acceptable psychometric properties, including good criterion validity and convergent validity with ADI-R and other established ASD diagnostic instruments. Earlier research has shown that SCQ has good diagnostic validity, internal consistency, test–retest reliability, etc. for autism spectrum disorder (ASD) (Berument et al., 1999). As per the present study parents completed SCQ under guidance of researcher in the clinical setting. The administrators and PIs consistently adhered to the SCQ manual's recommended procedures.

Internal consistency reliability for the sample was relatively low, with Cronbach's alpha coefficients of .437 at pretest and .347 at posttest. The lower reliability in our study might have been due to small samples and dichotomous scoring of items, heterogeneity of autism symptoms, and variability in the caregiver interpretation of social communication behaviour.

**The Short Sensory Profile 2 (SSP-2)**

The Short Sensory Profile-2 (SSP-2; Dunn, 2014) was used to evaluate sensory processing patterns and sensory-related behavioral responses among children with ASD. The SSP-2 is a 38-item caregiver-report measure derived from the Sensory Profile that assesses sensory modulation characteristics across sensory seeking, sensory avoiding, sensory sensitivity, sensory registration, sensory processing as well as associated behaviours. A 5-point Likert-type scale is used to evaluate items where greater difficulties are associated with higher scores.

Past research has shown that the measures of sensory profile can reliably identify children with ASD as different from their neurotypical counterparts which have potentially high clinical utility (Tomchek & Dunn, 2007; Watling et al., 2001). The instrument has been widely used in autism research and occupational therapy practice to assess atypical sensory processing patterns that are relevant to functional participation and adaptive behavior.

For the current study, the primary caregivers completed the SSP-2 under the researcher's supervision in a clinical setting. Caregivers rated the frequency of sensory behaviours based on child's everyday functioning in everyday settings. The instrument manual's standard procedures for administration and scoring were used uniformly for all. In the present sample, internal consistency reliability coefficients were moderate to strong across most SSP-2 domains. The reliability coefficients were between.616 and .857 before test and .425 and .801 after tests respectively according to Cronbach's alpha. The lower reliability coefficients for some posttests may be due to their small samples, difference in caregiver reporting, greater heterogeneity of sensory symptoms and less variability of scores in the sample.

Procedure.

1. Children diagnosed with Autism Spectrum Disorder (CARS2) aged 3-7 years coming to Revive Pro clinic for consultation was conveniently selected. Both males and females will be considered participants.
2. The demographic data and consent form from both the child and the caregiver will be taken. Necessary ethical issues like consent and detailed explanation and demonstration of OT-SI.
3. The child's variables will measured prior to the commencement of the treatment. The caregiver will report on the child's variables using structured questionnaires. The Childhood Autism Rating Scale, Social Communication Questionnaire, and Short Sensory Profile (CARS2, SCQ, SSP-2).
4. The participants will receive OT-SI therapy for 3 times a week, 1 hour/session for 8 weeks as a manualized protocol drawing on Ayres (1972) sensory integration principles.
5. OT-SI Protocol for Occupational Therapy Sensory Integration.

5.1. Ten key process components will be implemented for a fidelity in rendering OT-SI (Parham et al., 2011).

i.Ensures physical safety.
ii.Presents sensory opportunities.
iii.Enables the child to reach optimal levels of alertness and maintain them.
iv. Challenges postural, ocular, oral, or bilateral motor control.
v. Challenges praxis and organization of behavior.
vi. Collaborates in activity choice.
vii. Tailors activity to present just-right challenge.
viii Ensures that activities are successful.
ix. Supports child's intrinsic motivation to play.
x. Establishes a therapeutic alliance.

5.2. OT-SI Therapeutic Intervention Activities (Bundy, Lane & Murray, 2002).

Activities that provide an enhanced sense of touch (deep pressure), proprioception, and vestibular sensation. At the end of 8 weeks of OT-SI, SCQ and SSP-2 were repeated.

5.3. The Ayres Sensory Integration® Fidelity Measure (Parham et al., 2011), which operationalizes the major structural and process components of authentic ASI intervention, was used to maintain intervention fidelity. Therapeutic sessions were supervised by an occupational therapist who was trained in sensory integration principals. Fidelity monitoring fidelity included structured session planning, adherence checklists, periodic supervisory review, and implementation of the ten core ASI fidelity elements. All intervention activities were tailored for the child's individual sensory modulation patterns, capacity for adaptive response and developmental profile, with the aim of achieving a "just-right challenge" that would elicit active engagement and adaptive responses. To ensure consistency of intervention, integrity of treatment, and replicability across sessions.

## RESULT

**Table 1** Descriptive statistics table showing Mean, SD, Cronbach alpha, Skewness and Kurtosis of the variables under study

| Variables | Pre-test | | | | | Post-test | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | *M* | *SD* | α | Skewness | Kurtosis | *M* | *SD* | Α | Skewness | Kurtosis |
| **SCQ** | 18.29 | 2.76 | .437 | 1.31 | 1.08 | 15.34 | 2.75 | .347 | -.87 | -.08 |
| **SSP Seeking** | 25.94 | 3.29 | .662 | -.04 | -.79 | 24.91 | 2.92 | .425 | .10 | -.48 |
| **SSP2 Avoiding** | 34.17 | 4.08 | .753 | -.23 | -.45 | 32.69 | 4.46 | .719 | -.37 | -.14 |
| **SSP2 Sensitivity** | 34.09 | 4.01 | .720 | -.24 | -.06 | 36.63 | 4.44 | .640 | -.21 | -.30 |
| **SSP2 Registration** | 30.09 | 3.18 | .616 | -.32 | -.54 | 29.06 | 3.10 | .454 | .27 | .36 |
| **SSP2 Sensory** | 54.14 | 5.79 | .808 | -.42 | -.23 | 52.46 | 5.07 | .643 | .15 | -.61 |
| **SSP2 Behavioral** | 74.03 | 8.28 | .857 | -.13 | .07 | 70.83 | 8.23 | .801 | -.01 | .59 |

*Note.* N= 35, *M* = Mean, SD = Standard Deviation, α = Cronbach alpha, SCQ= Social Communication Questionnaire, SSP2 = Short Sensory Profile 2

The descriptive statistics in Table 1 revealed the mean value for the participants in Social Communication, SSP2 Seeking, SSP2 Avoiding, SSP2 Sensitivity, SSP2 Registration, SSP2 Sensory, SSP2 Behavioral. The Cronbach alpha value lies below .50 in SCQ pre-test and post-test, SSP2 Seeking post-test and Registration post-test and which may reflect limited internal consistency, potentially influenced by sample characteristics and dichotomous item scoring. The skewness and kurtosis values of the scale lies between -2 and +2 indicating that the distribution is normal.

**Table 2** *Mean comparison of participants' pre-test and post-test scores on Social Communication Questionnaire (SCQ)*

| | Pre-test | | Post-test | | *t* (34) | *P* | *Cohen's d* |
|---|---|---|---|---|---|---|---|
| **Variable** | *M* | *SD* | *M* | *SD* | | | |
| SCQ | 18.29 | 2.76 | 15.80 | 2.92 | 5.77 | < .001 | 0.88 |

*Note*. N = 35. *M* = Mean, *SD* = Standard Deviation **p<.001

Table 2 revealed the mean comparison of the participants in pre-test and post-test on Social Communication Questionnaire. A paired samples t-test revealed a decrease from pre-test (M = 18.29, SD = 2.76) to post-test (M = 15.80, SD = 2.92). This indicated a significant difference in scores following intervention, $t$ (34) = 5.77, $p < .001$. The value of Cohen's d was 0.88 (> 0.80) which indicated large effect size.

**Table 3** *Multivariate analysis showing the effect of Treatment* (Pre-test vs Post-test) *on Short Sensory Profile 2 (Seeking, Avoiding, Sensitivity, Registration, Sensory, Behavioral)*

| Effect | Λ | *F (6, 29)* | *P* | *Partial* $\eta^2$ |
|---|---|---|---|---|
| *Treatment* | .042 | 111.43 | <.001 | .958 |

Note. N = 35

**Table 4** *Effects of Treatment (Pre-test vs Post-test) on dimensions of Short Sensory profile 2 i.e. Seeking, Avoiding, Sensitivity, registration, Sensory, and Behavioural*

| Variables | Pre-test | | Post-test | | *F* (1, 34) | *P* | *Partial* $\eta^2$ |
|---|---|---|---|---|---|---|---|
| | M | SD | M | SD | | | |
| Seeking | 25.94 | 3.29 | 24.91 | 2.92 | 254.84 | < .001 | .882 |
| Avoiding | 34.17 | 4.08 | 32.69 | 4.46 | 73.23 | < .001 | .683 |
| Sensitivity | 34.09 | 4.01 | 36.63 | 4.44 | 491.44 | < .001 | .935 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Registration | 30.09 | 3.18 | 29.06 | 3.10 | 199.54 | < .001 | .854 |
| Sensory | 54.14 | 5.79 | 52.46 | 5.07 | 170.303 | < .001 | .834 |
| Behavioral | 74.03 | 8.28 | 70.83 | 8.23 | 512.18 | < .001 | .938 |

Note. N = 35

A one-way multivariate analysis of variance was run to determine the effect of treatment Occupational Therapy Sensory Integration (OT-SI) on sensory processing levels. The sensory processing of the participants were tested pre-treatment and post-treatment. The analysis revealed that the difference between the pre-test and post-test scores on the combined dependent variables was statistically significant $F(6, 29) = 111.43$, $p < .001$; Wilks' $\Lambda = .042$; partial $\eta^2 = .958$. Follow-up univariate ANOVAs showed that there is statistically significant difference between pre-test scores and post-test scores on Seeking ($F(1, 34) = 254.84, p < .001$; partial $\eta^2 = .882$) Avoiding ($F(1, 34) = 73.23, p < .001$; partial $\eta^2 = .683$) Sensitivity ($F(1, 34) = 491.44, p < .001$; partial $\eta^2 = .935$) Registration ($F(1, 34) = 199.54, p < .001$; partial $\eta^2 = .854$) Sensory ($F(1, 34) = 170.303, p < .001$; partial $\eta^2 = .834$) and Behavioral ($F(1, 34) = 512.18, p < .001$; partial $\eta^2 = .938$). In seeking subscale, the participants showed statistically significant lower scores in post-test (M = 24.91, SD = 2.92) than in pre-test (M = 25.94, SD = 3.29), In avoiding sub scale, the post-test score (M = 32.69, SD = 4.46) was significantly lower than pre-tests score (M = 34.17, SD = 4.08), In sensitivity, the post-test score (M = 36.63, SD = 4.44) showed significantly higher than pre-test score ( M = 34.09, SD = 4.09), In registration, the post-test score test (M = 29.06, SD = 3.10) was significantly lower than the pre-test scores test (M = 30.09, SD = 3.18). In sensory, the post-test score test (M = 52.46, SD = 5.07) was significantly lower than the pre-test scores test (M = 54.14, SD = 5.79). In behavioral, the post-test score test (M = 70.83, SD = 8.23) was significantly lower than the pre-test scores test (M = 74.03, SD = 8.28).

## DISCUSSION

The results of this study provide preliminary within-group improvements following Occupational Therapy using Sensory Integration (OT-SI) in improving both social communication and sensory processing among children with Autism Spectrum Disorder. The following discussion interprets these findings through theoretical and empirical lenses.

### Interpretation of Findings

The result of the statistical analysis revealed that there is a significant decrease in mean score of parent-reported Social Communication Questionnaire from pre-test (M = 18.29) to post-test (M = 15.80) (d=0.88). The improvement indicates lessened social communication challenges reported by the parents, like repetitive behaviors and social interaction difficulties (Lord et al., 2020; Rutter et al., 2003). Under the theory of Ayres Sensory Integration®, these results may be interpreted with caution as potentially indicative of improved sensory modulation processes. This, in turn, may potentially support engagement with social cues (Lane et al., 2019; Kilroy et al., 2019).

The data analysis of the Short Sensory Profile 2 suggested that there was a multivariate significant effect as indicated by the Partial $\eta2 = .958$. Further this showed that there were significant changes in the scores after OT-SI. Most sub-scales, comprised of Seeking, Avoiding, and Behavioural, showed significant reduction. The results of this study show a reduction in the Behavioral score from 74.03 to 70.83 ($p < .001$). Possibly due to improved sensory modulation, the reduction in these scores may have contributed to children being adaptive and not engaging in maladaptive behaviors (Lane et al., 2010; Reynolds et al., 2011; Schaaf et al., 2014). The "Sensitivity" score increased (from M = 34.09 to 36.63) suggesting potentially increased sensitivity and/or increased registration and processing of environmental stimuli that may facilitate greater adaptive engagement/ participation/social responsiveness. The ability to modulate sensory input is closely linked with social functioning. Indeed, studies already report positive associations between outcome measures and sensory modulation abilities in children with autism (Kojovic et al., 2019; Lane et al., 2010; Reynolds et al., 2011; Schaaf et al., 2014).

### Link with Theory

According to Ayres' Sensory Integration Theory, the brain's ability to process and integrate sensory input is said to contribute to more complex behaviours and learning. This study finds theoretical support from the above claims (Kilroy et al., 2019). The substantial improvements in the SSP-2 domains indicate that the "just-right challenges" embedded in the OT-SI sessions may have facilitated a number of adaptive responses and sensory organization processes. Improvements in SSP-2 performance may reflect improvements in sensory organization and modulation processes (Ayres, 1972; Parham et al., 2011; Lane et al., 2019).

The results support Ayres Sensory Integration® theory's proposal of a "bottom-up" model of intervention from a neurodevelopmental perspective. The theory suggests that intervention directed at sensory systems that are foundational in nature, particularly vestibular, proprioceptive, and tactile processing, are theorized to support neurological processes fundamental to higher-order adaptive behaviours including social communication and participation (Ayres, 1972; Kilroy et al., 2019; Lane et al. 2019; Schaaf et al., 2014). This item is further linked to Executive Function Models, whereby improved sensory regulation may contribute to improved inhibitory control and self-regulation (Deng et al., 2023). Difficulties in sensory processing are reduced if the Avoiding and Sensory scores decrease which may enhance social engagement as outlined in theories of social communication (Kojovic et al, 2019; Schaaf et al, 2012; Schaaf et al, 2014; Shu et al, 2024).

**Comparison with Existing Literature**

The substantial effect sizes seen in the study (d = 0.88 for social communication and Partial η2 up to .938 for behavioural domains) were in accordance with recent literature calling ASI as "Manualised Evidence-Based Practice" (Schoen et al., 2019). The study by Schoen et al. (201 found that Ayres Sensory Integration interventions met the criteria for evidence-based practice for autistic children. In addition, this growth was associated with gains in individualized functional goals.

In addition, the SenITA RCT found significant cost-effectiveness issues and no clear superiority for the large-scale behavioural and adaptive outcomes (Randell et al. 2022). The marked reduction in seeking behaviors (25.94 to 24.91) is widely in line with the evidence that sensory integration training can influence executive functioning (Deng et al., 2023). The findings further highlight the clinical utility of sensory processing information in diagnosis, formulation and management in neurodevelopmental conditions as sensory processing patterns are associated with adaptive functioning, regulation of behaviours and symptoms of autism (Ben-Sasson et al, 2009; Lane et al., 2010; Marozza et al., 2025).

Finally, while the observed pretest–posttest improvements may indicate that Occupational Therapy using Sensory Integration (OT-SI) does have a positive effect, they must be interpreted with caution due to the design of the study which involved a single group pretest–posttest. In the absence of a control group, it is not possible to conclusively attribute the observed changes solely to the intervention, as alternative explanations such as developmental maturation, repeated exposure to assessment procedures, caregiver expectancy effects, and concurrent environmental or therapeutic experiences may also have contributed to the outcomes. As such, the current findings should be considered preliminary evidence in need of confirmation by larger randomized controlled trials with appropriate comparison condition and long-term follow-up assessment.

**Clinical and Practical Implications**

The present findings may have potential implications for clinical occupational therapy practice by highlighting the possible role of sensory integration–based intervention in supporting sensory processing and parent-reported social communication outcomes among young children with ASD. However, broader functional implications, including classroom participation, peer interaction, and academic engagement, were not directly assessed in the present study and therefore should be interpreted cautiously.

**Limitations and Future Directions**

Several methodological limitations should be considered when interpreting the present findings. First, the study employed a single-group pretest–posttest design without a control or comparison group, thereby limiting causal inference regarding the specific effects of OT-SI. Second, the relatively small sample size and use of convenience sampling may restrict the generalizability of the findings to broader ASD populations. Third, outcome measures such as the SCQ and SSP-2 relied primarily on caregiver report, which may have introduced subjective reporting bias and caregiver expectancy effects. In addition, neither participants nor assessors were blinded to the intervention, potentially increasing the risk of performance and detection bias. The relatively low internal consistency observed for the SCQ in the present sample also warrants cautious interpretation of social communication outcomes, as measurement reliability may have been influenced by the dichotomous response format, heterogeneity of autism symptom presentation, and variability in caregiver interpretation of behaviors. Accordingly, the findings should be regarded as preliminary and interpreted within the methodological constraints of the study.

Future research should focus on:

- **Large-scale RCTs:** Comparing OT-SI against "usual care" or other behavioral interventions to further validate its unique contributions (Randell et al., 2019).
- **Longitudinal follow-up:** Determining the sustainability of these improvements over 6–12 months.
- **Multi-center studies:** Increasing diversity and generalizability of the findings across different clinical and educational settings.
- Incorporating school-based outcome measures, observational assessments, and multi-informant evaluations is necessary to determine whether improvements in sensory processing and social communication translate into meaningful functional gains across educational and social contexts.

**Conclusion**

In conclusion, this study provides preliminary evidence that following OT-SI participation, parent-reported changes were observed in social communication and sensory processing in children with ASD. By examining associations between sensory processing outcomes and parent-reported social communication outcomes, the research reinforces the potential relevance of addressing sensory-motor processes within broader intervention approaches for children with ASD.

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