SHORT REPORT

Effects of Ayres sensory integration therapy versus conservative treatment in autism spectrum disorder

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Abstract

The study was conducted to evaluate the effects of Ayres sensory integration therapy versus conservative treatment in autism spectrum disorder. In a prospective randomised controlled trial, we assessed pre- and post-intervention scores of both the intervention group (A) that took ASI and the control group (B) that received conservative treatment—only behaviour therapy, speech therapy, and educational activities of children with Autism Spectrum Disorder (ASD) —using sensory profile from Jan 2024 to July 2024. Thirty diagnosed ASD cases, age range 2–8 years, were randomly enrolled in both groups (n=15/group) at the RICCER Institute of Faisalabad. The intervention group (A) was noted to be significantly better in mean change as compared with the control group (B). Independent and paired t-test results showed significant relationship between ASI intervention group (A) and sensory integration dysfunction, while non-significant relationship between sensory integration dysfunction and conservative group (B) treatment ($p > 0.05$). Ayres Sensory Integration, an Occupational Therapy Approach, was significantly effective in developing socialisation, self-care, and aim accomplishment in comparison to conservative treatment in ASD.

Keywords: Ayres Sensory Integration, Autism Spectrum Disorder, Conservative treatment, Behaviour therapy, Sensory Integration Dysfunction.

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Introduction

In Autism Spectrum Disorder (ASD), which is a neuro-developmental disease, the individual has difficulty in communication, learning, behaviour, and interaction with other people. The prevalence of ASD in Asia is 0.36%. East Asia has relatively higher prevalence (0.51%) as compared to west Asia (0.35%) and south Asia (0.36%). In multiple domains over 96% children with ASD has hypo or hyper sensitivities.[1] The foundation of sensory processing in ASD is neurophysiological reaction to the stimulus, including all types of sensory processing auditory, tactile, and visual stimuli.[2]

Sensory Integration (an innate neurobiological process), as invented by A. Jean Ayres, describes how individuals process and regulate sensory information from within their body and the environment. ASI therapy should be delivered in sensory rich environment by specialised therapist, mostly occupational therapist.[3]

Currently, only few options are available for core symptoms of ASD, such as psycho-social therapy and applied behaviour analysis. Only associated behavioural symptoms can be treated with medications in an effective way.[4] The three primary systems for sensory integration are tactile, vestibular, and proprioceptive senses.[5]

There is no evidence-based intervention protocol to treat sensory integration dysfunction in autism. This study will help to deduce the best possible therapeutic option to treat sensory integration dysfunction in ASD, thus improving occupational and community mobilisation of patients with autism spectrum disorder using occupational therapy protocols.

Methods and Results

This is a prospective randomised controlled trial, that relate pre/post intervention scores of two coordinated groups of children with autism spectrum disorder. Ethical approval certificate was issued by the Superior University Lahore's Institutional review board with reference no. IRB/FAHS/DPTRS/2/24/MS/RS-3367, registration No. su92-f22-msrsw-039, and study RCT registry no. NCT06373770 with the university's research ethics committee (study duration of six months January 2024 to July 2024).

The inclusion criteria were as follows: diagnosed cases of ASD, diagnosis based according to DSM 5; age two years to eight years 11 months at the time of acceptance; sign of sensory integration problems, demarcated as definite difference in more than three subscale score on the Sensory Profile; all the patients fulfilling the above-mentioned inclusion criteria were to be assessed and evaluated by occupational therapist for sensory integration dysfunction. Children who were born pre-term <36 weeks

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or birth weight <2.5 kg, and past medical history were excluded. Parents were instructed against starting any new interventions during the study period if randomly included in intervention group. Four assessors conducted tests on the children. All of them were blinded to group assignment. A total of 30 participants were enrolled in the study using purposive sampling based on predefined inclusion and exclusion criteria, 15 in each group; the sample size was calculated by Epitool epidemiological calculators (Ausvet Pty Ltd), assuming a two-tailed test, 95% confidence level, 80% power, variance of 2 and mean difference between groups of 1.45.[6] The calculated sample size was 15 participants per group (total n=30).[7] Informed consent was obtained from all parents prior to enrolment. Parents were provided with detailed information regarding the study protocol and were instructed that, upon inclusion in the trial, no additional therapies or interventions should be administered at home apart from the study intervention. This was done to minimise the potential confounding factors and to ensure fidelity of the intervention under investigation.

It is clarified that the intervention used in this study was Ayres Sensory Integration, which is an established, evidence-based, and widely practiced therapeutic approach. Therefore, no new or experimental intervention was introduced. All parents provided written informed consent after being fully informed about the purpose, safety, and procedures of the study. Parents, as the primary decision makers, retained full liberty to accept or decline participation at any stage without consequence. The instruction to refrain from additional therapies during the study period was only to minimise confounding variables and ensure the fidelity of the intervention outcomes, without compromising parental autonomy in any way.

The sensory profile is validated for children. Internal reliability for the subscales varies from 0.47 to 0.91 and construct validity is described to be moderate.[8]

Baseline SP evaluation, conducted to authenticate that all participants have significant dysfunction in sensory integration, took place at RICCER Institute, Faisalabad. Randomisation of participants for intervention and control group was done using lottery method.

The Intervention Group (A) obtained occupational therapy using manualised ASI intervention, planned and provided by one occupational therapist—the first author—who has over 11 years of experience and advance training in ASI. Three sessions, three times a week for 10 weeks were planned, i.e. a total of 30 hours of intervention was received by the participants. In both the groups usual care was given (usual care is defined as how the child is enrolled in educational and other therapeutic services). Usual care was similar in type and amount of service in both the groups, except that ASI Intervention (occupational therapy sessions) was given to intervention group. There were no other considerable differences as a risk to internal validity. Data was analysed using SPSS 21.0. with $p>0.05$ considered significant.

Thirty participants were randomly assigned to the intervention and control groups (15 per group). The comparison of demographic and clinical characteristics between Group A and Group B revealed minor differences in several variables, although most of these differences were small. The mean age of children in Group A was 5.4 ±1.45 years, slightly years older than the 5.1±1.80 years observed in Group B. Group A had a higher proportion of males 13 (86.7%) compared to females 2 (13.3%), while Group B had an even higher percentage of males 14

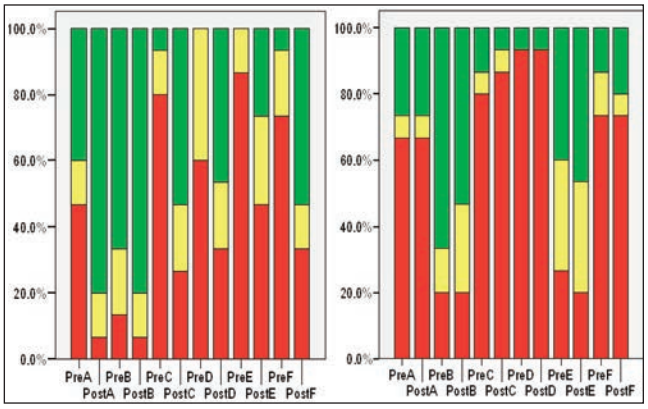

Figure-1: Percentages of SID in Group(A) & B Pre and Post Intervention A-F

Sensory Processing A to F (A=Auditory Processing, B=Visual Processing, C=Vestibular Processing, D=Touch Processing, E=Multisensory Processing, F=Oral Sensory Processing). Group A results are on right side and Group B on the left side, while green colour is for Typical Performance, yellow is Probable difference, and red is for Definite Difference.

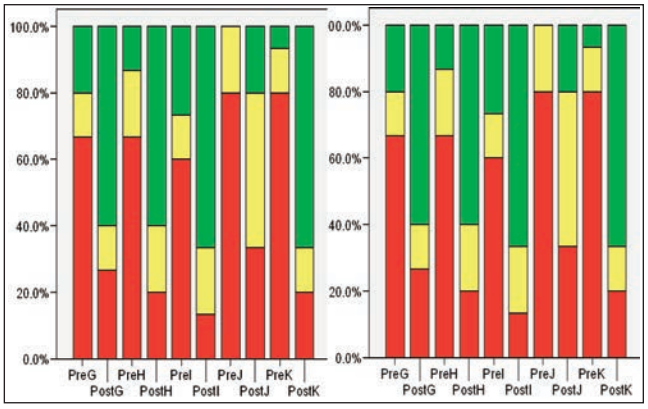

Figure-2: Percentages of SID in Group(A) & B Pre and Post Intervention G-K.

Modulation G to K (G=Sensory Processing related to endurance/tone, H=Modulation related to body position and movement, I= modulation of movement affecting activity level, J=Modulation of sensory input affecting emotional responses, K=Modulation of visual input affecting emotional responses and activity level)

Group(A) results are on right side and Group(B) on left side, while green colour is Typical Performance, yellow is Probable Difference, red is Definite Difference.

(93.3%) and a smaller proportion of females 1 (6.7%). Thus, both groups had a predominance of male participants. The mean birth weight in Group A was 3,051±353 grams, while Group B had a slightly higher mean birth weight of 3,184±661 grams. The mean gestational age was similar between the two groups. Group A had a mean gestational age of 38.6±1.9 weeks, and Group B had a slightly higher average of 38.9±1.9 weeks. The mean maternal age was 25.7±4.6 years in Group A and 25.9±5.2 years in Group B. The mean paternal age was slightly older in Group B, with a mean of 33.4±3.0 years, compared to 32.9±5.5 years in Group A. On the sensory profile scoring, the intervention group showed significantly improved scores as compared with the control group. Participants showed significant improvement in typical performance area as compared to control group who received conservative treatment (Figure 1 & 2). The intervention group (A) had significantly better mean change as compared with the control group (B) that indicated insignificant mean change. Paired and independent t-test results showed significant relationship between ASI intervention Group (A) and sensory integration dysfunction in ASD (p>0.05) and non-significant relationship between sensory integration dysfunction and control Group (B) (Table).

Table: Sensory Profile Scores Mean, SD, M.D, paired t-test and independent t-test scores in both groups A&B

	Pre	Post	wilcoxon	Mann witny u	
	$\bar{x}$± SD	$\bar{x}$± SD	*p*-value	*r*-value	Post
Auditory processing					
Group(A)	26.1±7.0	34.7±4.2	0.000	0.079	0.000
Group(B)	22.1±4.7	23.0±5.5	0.46		
M.D	4.0	11.7			
Visual Processing,					
Group(A)	32.8±6.3	39.9±4.7	0.000	0.81	0.008
Group(B)	32.2±8.6	32.8±8.3	0.167		
M.D	0.66	7.13			
Vestibular Processing					
Group(A)	37.0±6.3	48.0±6.1	0.000	0.15	0.000
Group(B)	32.6±9.8	31.6±8.6	0.507		
M.D	4.4	16.4			
Touch Processing					
Group(A)	53.6±12.7	70.9±21	0.001	0.295	0.003
Group(B)	48.5±13.2	49.2±13.8	0.371		
M.D	5.0	21.7			
Multisensory Processing,					
Group(A)	11.9±1.8	24.8±4.1	0.000	0.604	0.000
Group(B)	24.4±6.1	23.8± 5.9	0.515		
M.D	1.0	12.7			
Oral Sensory Processing					
Group(A)	27.1±10.8	39.4±13.6	0.001	0.204	0.043
Group(B)	34.3±7.4	34.2±7.3	0.653		
M.D	5.2	7.2			
SP related to endurance/tone					
Group(A)	25.5±7.9	38.0±5.5	0.001	0.081	0.005
Group(B)	33.6±5.8	34.1±6.1	0.264		
M.D	-7.8	3.8			
Modulation related to body position and movement					
Group(A)	29.8±5.8	42.7±5.2	0.000	0.183	0.00
Group(B)	33.2±7.4	31.8±6.9	0.264		
M.D	-3.3	10.9			
Modulation of Movement affecting activity level					
Group(A)	14.3±6.5	25.8±4.6	0.000	0.521	0.001
Group(B)	25.4±8.8	34.3±7.8	0.195		
M.D	-11.1	2.84			
Modulation of sensory input affecting emotional responses					
Group(A)	8.2±4.14	13.8±1.5	0.000	0.063	0.00
Group(B)	10.6±2.6	10.4±2.6	0.082		
M.D	2.36	1.27			
Modulation of visual input affecting emotional responses and activity level					
Group(A)	8.8±2.3	15.1±2.7	0.000	0.001	0.000
Group(B)	13.2±3.6	11.6±2.0	0.086		
M.D	3.4	-4.4			
Emotional and social responses					
Group(A)	51.0±13.8	62±10	0.002	0.480	0.019
Group(B)	54.5±13.1	50.8±14	0.065		
M.D	3.5	11.13			
Behavioural outcomes of sensory processing					
Group(A)	15.2±5.7	21.2±4.9	0.000	0.790	0.000
Group(B)	14.6±5.0	14.2±4.9	0.029		
M.D	0.0533	7.06			
Items indicating thresholds for response					
Group(A)	7.4±2.5	13.6±1.9	0.000	0.023	0.000

Discussion

In the present study, greater gains in self-care, socialisation and parent-identified goal achievement were seen in the children in group A as compared to group B. Heather M et al. 2023 study findings are consistent with the current study i.e. the intervention group made advances in socialisation and play. Findings propose that ASI intervention may modify a child's patterns of play, although ASI intervention was not directly involved in socialisation and play.[9]

As per Citra et al. 2022 study, Sensory Integration occupational therapy based on Ayres theory delivered as 60 minutes, twice a week for 12 weeks, improved positive behaviours in ASD. The present study gives preliminary evidence that improvement in self-care independence leading to later independent life can be seen using ASI-based occupational therapy.[10]

Omairi in 2022 observed similar outcomes measure in the data-driven decision-making (DDDM) process.[7] Thus, this study supports ASI tenet and associative change in sensorimotor factors to improve occupational-based outcomes.

Similar results were described in the study of Lauren Andelin et al. in 2021. The participants improved towards typical performance area in intervention Group (A) as compared to control group (B).[11]

The results of Ghorban Hemati Alamdarloo & Hasan Mradi 2020 study showed that sensory integration intervention recovers emotional-behavioural difficulties and its subscales in children with ASD. The current study

has relevance with Ghorban Hemati's study.[12]

The parents could not be blinded because they provided informed consent and were required to know their child's group assignment; however, they were instructed not to seek or enrol in any other intervention during the study. Their role was limited to reporting outcomes as per the protocol. The assessors conducting the evaluations were blinded to group assignment to reduce bias in outcome measurement. Only sensory profile was used to assess sensory symptoms for eligibility criteria. Future studies should consider other tools, like Sensory Integration and Praxis Tests (SIPT), to evaluate performance-based data to see sensory integration abilities.[13] This study should be replicated in countries other than Pakistan to check fidelity of occupational therapy using ASI.

Conclusion

This study concluded that occupational therapy using ASI is an efficient evidence-based intervention to integrate sensory integration dysfunction ultimately developing self-care, socialisation, and goal achievement in children in intervention group as compared to conservative treatment (control group) children with ASD. Additional duplication studies are required to authenticate this intervention in a diversity of nations and cultures.

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Author Contribution:
RI: Concept, design, collected and analysed the data, writing and final approval.
SS: Data collection, analysis, review and final approval.
MSU: Expertise in research, data interpretation, editing and final approval.
TT & HA: Drafting, revision and final approval.