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Original Research Article

Sensory profiling in children with attention deficit hyperactivity disorder aged 7-12 years from a tertiary care centre in South Kerala

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ABSTRACT

Background: Sensory processing abnormalities are increasingly recognized in children with attention deficit hyperactivity disorder (ADHD) and may contribute to academic, behavioural, and social difficulties. This study assessed the prevalence, domain-specific sensory patterns, and associations with ADHD subtypes among children aged 7–12 years attending a tertiary care centre in South Kerala.

Methods: A cross-sectional study was conducted among 56 children with DSM-5 diagnosed ADHD. Sensory processing was evaluated using the short sensory profile (SSP). ADHD subtypes were classified as inattentive (ADHD-I), hyperactive-impulsive (ADHD-HI), and combined (ADHD-C). Associations between sensory domains and ADHD subtypes were analyzed using Chi-square testing.

Results: The majority were males (85.7%), and ADHD-C was the most common subtype (64.3%). Sensory processing abnormalities were present in 98.2% of participants. Tactile sensitivity (76.8% definite difference), vestibular/movement sensitivity (100% abnormal), and low energy/weak endurance (89.3%) were the most affected domains. Under-responsiveness/sensation-seeking behaviour was observed in 66.1%, while auditory filtering difficulties were present in 50%. Visual/auditory and taste/smell sensitivities were largely preserved. Vestibular sensitivity was the only sensory domain significantly associated with ADHD subtype ($p=0.044$), with greater dysfunction observed in the combined subtype.

Conclusions: Sensory processing disorders are highly prevalent in children with ADHD, particularly involving tactile and vestibular domains. Routine sensory profiling may facilitate early identification of sensory challenges and support targeted interventions to improve functional outcomes.

Keywords: Autism, ADHD, Sensory challenges

INTRODUCTION

Attention deficit hyperactivity disorder (ADHD) is a neurodevelopmental condition characterized by persistent inattention, hyperactivity, and impulsivity inconsistent with a child's age and developmental level, significantly impairing daily functioning. Globally, ADHD affects approximately 5–7% of children, with a landmark meta-analysis estimating a pooled prevalence of 5.3%.[1] In India, prevalence estimates vary from 2% to 17%, with a systematic review reporting a pooled rate of 7.1% among children aged 3–18 years.[2] ADHD is classified into three subtypes — predominantly inattentive (ADHD-I), predominantly hyperactive-impulsive (ADHD-HI), and combined (ADHD-C) — each presenting distinct challenges that evolve with age.[3]

Beyond core behavioural symptoms, ADHD frequently co-occurs with sensory processing difficulties that exacerbate its impact across academic, social, and emotional domains.[4] Sensory processing — the brain's capacity to receive, interpret, and respond to sensory stimuli including sound, sight, touch, movement, and taste — is increasingly recognized as a critical yet understudied dimension of ADHD. Research indicates that 40–60% of children with ADHD exhibit atypical sensory responses, such as overreacting to noise or underreacting to touch, which may intensify behavioural challenges.[5] These anomalies are not merely secondary effects but may stem from neurobiological differences, including altered connectivity in the prefrontal cortex and cerebellum — regions implicated in both ADHD and sensory integration.[6,7]

The short sensory profile (SSP) is a validated 38-item parent-report questionnaire derived from the sensory profile (Dunn, 1999) that assesses sensory processing across seven modulation domains in children.[6] While sensory profiling data from Western and North Indian populations are available, comprehensive data from South Indian children with ADHD — particularly from South Kerala — remain limited. The present study was designed to estimate the proportion of sensory processing disorders among children with ADHD aged 7–12 years attending a tertiary care centre in South Kerala, to characterize domain-specific sensory profiles, and to examine associations between sensory domains and ADHD subtypes.

METHODS

Study design and setting

A cross-sectional observational study was conducted at the Child Development Centre of Pushpagiri Institute of Medical Sciences and Research Centre, Thiruvalla, a tertiary referral institution in South Kerala, over a period of 12 months following Institutional Ethics Committee approval.

The participants were children aged 7–12 years diagnosed with ADHD presenting to the Child Development Centre during the study period were enrolled consecutively. Inclusion was restricted to children meeting DSM-5 diagnostic criteria for ADHD. Children with developmental delay, seizure disorder, cerebral palsy, or other comorbid neurobehavioral disorders including autism spectrum disorder were excluded.

Study tool and data collection

The SSP, a 38-item validated caregiver-report questionnaire, was administered to parents by the principal investigator. The SSP evaluates seven sensory modulation domains: tactile sensitivity, taste/smell sensitivity, movement sensitivity (vestibular), under-responsive/seeks sensation, auditory filtering, low energy/weak, and visual/auditory sensitivity. Each item is rated on a five-point Likert scale (1=always to 5=never). The total raw score ranges from 38 to 190, with scores of 155–190 indicating typical performance, 142–154 indicating probable difference, and 38–141 indicating definite difference. Domain-specific cut-off scores were applied for individual domain classification. Additionally, a structured proforma collected demographic data, birth history, NICU admission history, family history, scholastic performance, peer interaction, and teacher feedback.

ADHD subtype determination

ADHD subtype was classified by the attending developmental paediatrician using DSM-5 criteria: predominantly inattentive (ADHD-I), predominantly hyperactive-impulsive (ADHD-HI), or combined presentation (ADHD-C).

Statistical analysis

Data were compiled in Microsoft Excel and analyzed using IBM statistical package for the social sciences (SPSS) statistics (version 20.0). Categorical variables are presented as frequency and percentage. The Chi-square test of independence was used to assess associations between sensory processing domain categories and ADHD subtypes. A two-tailed p value <0.05 was considered statistically significant.

RESULTS

Baseline demographic and clinical characteristics

A total of 56 children were enrolled. Males constituted 85.7% (n=48) and females 14.3% (n=8), yielding an approximate male-to-female ratio of 6:1. The majority of participants (69.6%; n=39) were in the 7–9 years 11 months age group and 30.4% (n=17) in the 10–12 years group (Table 1 and Figure 5). BMI was normal in 75.0%, risk of overweight in 21.4%, and overtly overweight in 3.6%. Birth history was term in 98.2%. Neonatal intensive care unit (NICU) admission was documented in 17.9% of participants. A positive family history of ADHD or related neurodevelopmental conditions was reported in 5.4%.

Behavioural and functional characteristics

Poor scholastic performance was documented in 92.9% (n=52) of children, and 69.6% (n=39) exhibited poor peer group interaction. Teacher-reported behavioral complaints were present in 71.4% (n=40). These findings highlight the pervasive functional impairment across academic and social domains in this cohort.

ADHD subtype distribution

The combined subtype (ADHD-C) was the most prevalent (64.3%; n=36), followed by the inattentive subtype (28.6%; n=16) and the hyperactive-impulsive subtype (7.1%; n=4)

Overall sensory processing profile

Nearly all participants (98.2%; n=55) demonstrated sensory processing abnormalities on the SSP total score: 44.6% (n=25) showed definite differences and 53.6% (***Domain-specific sensory processing findings***

Table 3 present the domain-wise sensory processing findings. Tactile sensitivity (76.8% definite difference) and low energy/weak endurance (89.3% with differences combining probable and definite) were the most affected domains. Movement/vestibular sensitivity showed definite differences in 57.1% with all remaining 42.9% exhibiting probable differences, meaning 100% of children demonstrated vestibular processing abnormalities. Under-responsiveness/sensation seeking was observed in 66.1% (probable and definite combined). Auditory filtering difficulties were present in 50% (37.5% probable + 12.5% definite). Conversely, 80.4% showed typical visual/auditory sensitivity and 82.1% showed typical taste/smell sensitivity — confirming that these modalities are the least affected.

n=30) showed probable differences. Only one child (1.8%) scored within the typical performance range (Table 2 and Figure 3).

Association between ADHD subtypes and sensory processing domains

Chi-square analysis was performed to examine associations between each sensory domain and ADHD subtype. Table 4 presents the comprehensive results of subtype-wise cross-tabulation and statistical testing.

The ADHD-C subtype showed the highest proportion of definite vestibular differences (75.0%), compared with ADHD-I (31.3%) and ADHD-HI (75.0%). Probable vestibular differences predominated in the ADHD-I group (68.8%), suggesting a pattern of under-responsiveness in inattentive children. No statistically significant associations were found between ADHD subtype and any other sensory domain (all p>0.05).

Table 1: Baseline demographic and clinical characteristics (n=56).

Variables	N	Percentage (%)
Sex		
Male	48	85.7
Female	8	14.3
Age group		
7–9 years 11 months	39	69.6
10–12 years	17	30.4
BMI		
Normal	42	75.0
Risk of overweight	12	21.4
Overweight	2	3.6
Birth history		
Term	55	98.2
Preterm	1	1.8
NICU admission		
No	46	82.1
Yes	10	17.9
Family history		
Negative	53	94.6
Positive	3	5.4

Table 2: Total short sensory profile score distribution (n=56).

Category	Score range	Frequency (N)	Percentage (%)
Typical performance	155–190	1	1.8
Probable difference	142–154	30	53.6
Definite difference	38–141	25	44.6

Table 3: Domain-wise SSP sensory processing classification (n=56).

Sensory domain	Definite difference, N (%)	Probable difference, N (%)	Typical performance, N (%)
Tactile sensitivity	43 (76.8)	11 (19.6)	2 (3.6)
Movement/vestibular	32 (57.1)	24 (42.9)	0 (0)
Low energy/weak	15 (26.8)	35 (62.5)	6 (10.7)
Under-resp./seeks sensation	9 (16.1)	28 (50.0)	19 (33.9)
Auditory filtering	7 (12.5)	21 (37.5)	28 (50.0)
Visual/auditory sensitivity	1 (1.8)	10 (17.9)	45 (80.4)
Taste/smell sensitivity	2 (3.6)	8 (14.3)	46 (82.1)

Table 4: Association between ADHD subtypes and sensory processing domains — Chi-square analysis.

Sensory domain	ADHD-I (n=16)	ADHD-HI (n=4)	ADHD-C (n=36)	χ^2	P value
Tactile sensitivity	Def: 12 (27.9%)	Def: 4 (9.3%)	Def: 27 (62.8%)	1.744	0.783
	Prob: 3 (27.3%)	Prob: 0	Prob: 8 (72.7%)		
	Typ: 1 (50%)	Typ: 0	Typ: 1 (50%)		
Taste/smell sensitivity	Def: 1	Def: 0	Def: 1	1.807	0.771
	Prob: 1	Prob: 1	Prob: 6		
	Typ: 14	Typ: 3	Typ: 29		

Continued.

Sensory domain	ADHD-I (n=16)	ADHD-HI (n=4)	ADHD-C (n=36)	χ²	P value
Movement sensitivity	Prob: 11 (45.8%)	Prob: 1 (4.2%)	Prob: 12 (50.0%)	6.234	0.044
	Def: 5 (15.6%)	Def: 3 (9.4%)	Def: 24 (75.0%)		
Under-resp./seeks sensation	9 (32.1%)	2 (7.1%)	17 (60.7%)	4.931	0.294
	2 (22.2%)	2 (22.2%)	5 (55.6%)		
	5 (26.3%)	0 (0%)	14 (73.7%)		
Auditory filtering	3 (42.9%)	1	3	1.866	0.760
	6 (28.6%)	1	14		
	7 (25%)	2	19		
Low energy/weak	6	1	8	2.246	0.691
	9	3	23		
	1	0	5		
Visual/auditory sensitivity	1	0	0	5.803	0.214
	3	2	5		
	12	2	31		

NS=Not significant; *p<0.05; Def=definite difference; Prob=probable difference; Typ=typical performance

DISCUSSION

Prevalence of sensory processing disorders

The near-universal prevalence of sensory processing differences (98.2%) in this cohort substantially exceeds global study of 40–60% reported in Western studies and the 75% documented in Anand et al's South Indian pilot.[5,8] However, it aligns closely with the 96% reported by Shimizu et al in a North Indian tertiary care sample, suggesting that clinical populations with more severe or complex ADHD presentations demonstrate higher sensory dysfunction rates.[9] The high prevalence in the present study likely reflects tertiary care referral bias, wherein children with more pronounced behavioural and sensory manifestations are preferentially investigated.

A critical proportion of children (44.6%) demonstrated definite differences, signifying clinically significant sensory processing impairment rather than borderline variation. This aligns with findings from Ghanizadeh who in a systematic review established sensory processing abnormalities as a consistent neurobehavioral correlate of ADHD.[10] The data collectively validate sensory dysfunction as an intrinsic and clinically meaningful component of the ADHD phenotype, particularly in tertiary care settings.

Tactile and vestibular sensitivity

Tactile sensitivity was the most severely affected domain, with definite differences in 76.8% of participants consistent with Yochman et al who demonstrated heightened tactile defensiveness in ADHD children versus controls.[11]

The neurobiological basis for this finding is supported by Puts et al who identified reduced GABAergic inhibition in the somatosensory cortex of ADHD children, correlating directly with tactile hypersensitivity.[12]

Vestibular sensitivity was uniformly abnormal across all 56 participants (100% combined probable and definite differences. This finding parallels Mostofsky et al who demonstrated smaller cerebellar volumes in ADHD children associated with motor coordination difficulties and sensory-seeking behaviors.[13] The differential vestibular profile across ADHD subtypes in the present study — with ADHD-C showing the greatest definite differences — supports the hypothesis that greater cerebellar and basal ganglia involvement in the combined phenotype drives vestibular dysfunction, echoing the neuroanatomical framework proposed by Bush et al and Faraone et al.[3,14]

Low energy/weak endurance and under-responsiveness

Low energy and weak endurance affected nearly 90% of participants, an underreported finding in existing literature. This domain may reflect dysregulated proprioceptive feedback or neuromuscular coordination deficits secondary to cerebellar dysfunction, consistent with the broader sensory-motor integration impairment observed in ADHD.[13] Under- responsiveness/sensation-seeking behaviour was present in 66.1%, supporting Miller et al's observation of a complex mix of sensory seeking and avoidance in ADHD that distinguishes it from pure sensory modulation disorder.[15] In India, where ambient sensory stimulation is inherently high, sensation-seeking behaviours may be under-recognized as pathological, underscoring the need for structured sensory assessment tools.

Auditory and visual sensitivities

Auditory filtering difficulties were present in 50% of participants, lower than North Indian estimates (96% by Shimizu et al) but consistent with global averages (40–60% by Pfeiffer et al).[5,9] This relative sparing of auditory and visual sensitivities in comparison to tactile and vestibular modalities supports the findings of Little et al who observed minimal visual domain impairment in

ADHD relative to tactile modalities.[16] The comparatively lower auditory hypersensitivity may reflect an adaptive habituatory response to South Kerala's consistently high ambient noise levels a pattern anticipated by Nair et al when emphasizing the importance of locally contextualized sensory norms.[17]

Subtype distribution and functional impact

The predominance of ADHD-C (64.3%) is consistent with Indian and international data indicating that the combined subtype constitutes 50–70% of clinical presentations.[3,18] The high rates of poor scholastic performance (92.9%) and poor peer interaction (69.6%) in this cohort corroborate Carter et al finding that sensory over-responsivity significantly correlates with reduced academic performance and social impairment.[19] The substantial proportion of teacher complaints (71.4%) further substantiates that sensory-driven behavioural manifestations are highly visible in the school environment a critical domain in South Kerala's academically rigorous setting.

CONCLUSION

This cross-sectional study of children aged 7–12 years with ADHD attending a tertiary care centre in South Kerala establishes that sensory processing disorders are near-universally prevalent (98.2%), with tactile sensitivity, vestibular/movement sensitivity, and low energy/weak endurance as the most prominently affected domains. The statistically significant association between vestibular sensitivity and ADHD subtype (p=0.044) underscores the vestibular system's differential role across ADHD phenotypes, with the combined subtype demonstrating the greatest vestibular dysfunction. Taste/smell and visual/auditory sensitivities were largely spared. These findings support the integration of structured sensory profiling — using validated tools such as the SSP — into the routine comprehensive assessment of children with ADHD. Early identification of domain-specific sensory challenges enables individualised sensory-based therapeutic planning, including occupational therapy, sensory integration therapy, and environmental modifications, which may meaningfully improve functional outcomes in affected children.

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REFERENCES

1. Polanczyk G, de Lima MS, Horta BL, Biederman J, Rohde LA. The worldwide prevalence of ADHD: a systematic review and metaregression analysis. Am J Psychiatry. 2007;164(6):942-8.
2. Venkata JA, Panicker AS. Prevalence of attention deficit hyperactivity disorder in India: a systematic review and meta-analysis. Indian J Psychiatry. 2019;61(Suppl 4):S723-9.
3. Faraone SV, Asherson P, Banaschewski T, Biederman J, Buitelaar JK, Ramos-Quiroga JA, et al. Attention-deficit/hyperactivity disorder. Nat Rev Dis Primers. 2015;1:15020.
4. Gnanavel S, Sharma P, Kaushal P, Hussain S. Attention deficit hyperactivity disorder and comorbidity: a review of literature. World J Clin Cases. 2019;7(17):2420-6.
5. Pfeiffer B, Daly BP, Nicholls EG, Gullo DF. Assessing sensory processing problems in children with and without attention deficit hyperactivity disorder. Phys Occup Ther Pediatr. 2015;35(1):1-12.
6. Dunn W. The sensations of everyday life: empirical, theoretical, and pragmatic considerations. Am J Occup Ther. 2001;55(6):608-20.
7. Lane SJ, Reynolds S, Thacker L. Sensory over-responsivity and ADHD: differentiating using electrodermal responses, cortisol, and anxiety. Front Integr Neurosci. 2010;4:8.
8. Anand P, Sachdeva A. Sensory processing dysfunction in children with attention deficit hyperactivity disorder: a pilot study. J Clin Diagn Res. 2016;10(9):OC01-5.
9. Shimizu VT, Bueno OF, Miranda MC. Sensory processing abilities and their impact on disease severity in children with attention- deficit hyperactivity disorder. J Neurosci Rural Pract. 2023;14(3):521-8.
10. Ghanizadeh A. Sensory processing problems in children with ADHD, a systematic review. Psychiatry Res. 2011;185(1-2):155-60.
11. Yochman A, Parush S, Ornoy A. Responses of preschool children with and without ADHD to sensory events in daily life. Am J Occup Ther. 2004;58(3):294-302.
12. Puts NA, Edden RA, Wodka EL, Mostofsky SH, Tommerdahl M. A vibrotactile behavioral battery for investigation of somatosensory processing in children and adults. J Neurosci Methods. 2013;218(1):39-47.
13. Mostofsky SH, Reiss AL, Lockhart P, Denckla MB. Evaluation of cerebellar size in attention-deficit hyperactivity disorder. J Child Neurol. 1998;13(9):434-9.
14. Bush G, Valera EM, Seidman LJ. Functional neuroimaging of attention-deficit/hyperactivity disorder: a review and suggested future directions. Biol Psychiatry. 2005;57(11):1273-84.
15. Miller LJ, Anzalone ME, Lane SJ, Cermak SA, Osten ET. Concept evolution in sensory integration: a proposed nosology for diagnosis. Am J Occup Ther. 2007;61(2):135-40.
16. Little LM, Dean E, Tomchek S, Dunn W. Sensory processing patterns in autism, attention deficit hyperactivity disorder, and typical development. Phys Occup Ther Pediatr. 2018;38(3):243-54.
17. Nair MKC, Russell PS. Illingworth's the development of the infant and young child: normal

and abnormal. 10th edition. New Delhi: Elsevier; 2017.
18. Gnanavel S, Sharma P, Kaushal P, Hussain S. Attention deficit hyperactivity disorder and comorbidity: a review of literature. World J Clin Cases. 2019;7(17):2420-6.
19. Carter AS, Ben-Sasson A, Briggs-Gowan MJ. Sensory over-responsivity, psychopathology, and family impairment in school-aged children. J Am Acad Child Adolesc Psychiatry. 2011;50(12):1210-9.
20. Schaaf RC, Benevides T, Mailloux Z, Faller P, Hunt J, van Hooydonk E, et al. An intervention for sensory difficulties in children with autism: a randomized trial. J Autism Dev Disord. 2014;44(7):1493-506.

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