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RESEARCH ARTICLE

Boosting Young Minds: The Impact of Sensory Integration Training on Preschoolers' Attention in Nan Chong City, China

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ABSTRACT

As the world develops, preschool education has an increasingly significant impact on children's attention and well-being. While western studies have used sensory integration training as a treatment for preschool attention disorders and to enhance self-regulation, similar research is lacking in China. This study, conducted in Nanchong City, systematically investigated the effects of eight weeks of twice-weekly sensory integration training on four dimensions of attention (concentration, impulsivity and behavioral control, emotional tension and neuroticism, and stereotyped and rigid behaviors) in China preschoolers using a two-group, 40-person randomized controlled pretest-post-test design. Results showed that the intervention group showed the most significant improvements in impulsive control and emotional stability, with positive improvements also observed in concentration behaviors; the control group showed no significant changes. These results suggest that sensory integration training not only has clinical intervention effects but also has preventive and developmental value for preschoolers. It can serve as an important means of restoring sensory experience, consolidating attentional networks, and enhancing emotional self-regulation amidst the pressure of academic achievement. It is recommended that sensory integration activities be regularly incorporated into kindergarten curricula, and that a multicenter, large-sample, long-term follow-up study be conducted to assess sustained benefits and verify external validity. This study has limitations such as limited sample size, convenience sampling, and short follow-up time.

Contribution/Originality: The paper's primary contribution is finding that The Impact of Sensory Integration Training on Preschoolers' Attention in Nan Chong city is significant; an eight-week controlled program improved concentration, impulse control, emotional stability, and rigidity versus controls, providing evidence to embed sensory activities in Chinese preschools and guide curriculum and intervention.

1. Introduction

The development of early childhood attention is an important basis for subsequent academic achievement, social adaptability and mental health in today's world (Rhoades et. al, 2011). The brain's ability to organize and interpret sensory information forms the nerve basis for learning, behavior and attention regulation. Sensory integration refers to the process by which the brain integrates information from limbs and sensory organs, enabling children to generate relevant neural commands and physical responses to their internal and external perceptions (Li et al., 2023). Sensory integration encompasses both perceptual processing and behavioral responses and is a foundational ability for preschoolers learning. The purpose of sensory integration training aims to improve the deficit on sensory processing, which is to increase attention and performing work. Now, China has jointly promoted educational interest in sensory integration training for preschool children, which improves the focus on the rapidly growing educational reforms, unique cultural values and psychological intervention (Fu et al., 2022).

Research worldwide suggests that sensory integration is affected by between 5% and 30% of children. The exact percentage varies depending on the surveyed group and how it is measured. For example, Mulligan et al. (2021) it estimated that sensory processing disorder normally affects 5% -16% of children. However, A study on 392 children found that 21.9% had sensory integration disorder (Li et al., 2021), while a large survey of 933 children reported a composite rate of 34.7% (Wang et al., 2004). Similarly, Ren et al. (1995) and Xie et al. (2012) quoted data from 29% to 35% in Chinese children. These findings suggest that different methods play a role in variety, with Chinese studies report a greater number of sensory integration difficulties than international studies.

In China's unique "intensive parents" culture, preschool education focuses on the rapid "overload" and education (Li et al.., 2023). Parents, inspired by a common concern to ensure that their children do not lose on the early line, put tremendous academic pressure on preschool, whose daily life is filled with reading skills, numerical and structured cognitive training (Li et al., 2021). However, this surplus of academic skills mainly reduces children's time for sensory exploration, which are important nutrients for the development of brain nerve networks. This sensory absence and imbalance can significantly increase the risk of children developing sensory processing disorders, manifesting itself as loss attention.

Attention as the comprehensive ability of an individual to select, maintain, shift, and inhibit limited cognitive resources under goal guidance (Mahone et al., 2012). This ability is supported by three subsystems: alertness, orienting, and executive control, and is closely related to inhibitory control, working memory, cognitive flexibility, and emotional arousal (Graziano,2007). To reliably assess and effectively intervene in attention within preschoolers, attention can be split into four dimensions: concentration, impulsivity and behavioural control, emotional tension and neuroticism, and stereotyped and rigid behaviour (McClelland et al., 2013). These four dimensions correspond, respectively, to attention stability, inhibitory control and rule-following, the regulatory effect of emotions on attention, and the ability to shift and update attentional focus.

Attention and sensory integration have a strong relationship. Sensory integration is the process of treating, organizing, and interpreting sensory information from the body and the environment. It creates neurophysiological foundations for high-level cognitive functions (Crasta et al., 2020). For children, only when the underlying sensory integration

mechanisms work effectively can the cerebral cortex avoid overprocessing or misinterpreting sensations and free cognitive resources to maintain high-level awareness. Especially the integration of the vestibular and correct senses is directly related to the regulation of alertness (ability to maintain a state of vigilance), response bans (ability to filter irrelevant distractions), and attention stability (ability to focus on an assignment) (Božanić Urbančič et al., 2023). Therefore, children with sensory integration disorders have brain chaos where an important amount of cognitive energy is consumed by handling chaotic sensory input, resulting in difficulty in distributing difficulties and accessories, which are often manifested as distraction, regression, or connection (Roberge & Crasta, 2022). On the other hand, improvement in the effectiveness of underlying sensory processing through sensory integration training as an alternative provides a stable and effective foundation for high-level cognitive abilities such as attention and performing work (Ashori et al., 2018).

Therefore, the purpose of this study is to find out if sensory integration training can serve as an effective definition and compensation against the potential negative effects of this specific cultural pressure. Especially by comparing the difference in the performance of attention among 40 children's in Nan Chong city, China who receive and without systematic sensory integration training courses, we will eternally test training models based on physical activities and sensory experiences in promoting the development of children's attention.

2. Literature Review

Sensory integration training is recognized for its potential benefits in enhancing attention and cognitive performance among preschoolers, particularly for those experiencing challenges such as attention deficit hyperactivity disorder (ADHD) or other developmental disorders. This integrative approach, which seeks to harmonize sensory input, can lead to improvements in a child's ability to process and respond to stimuli in their environment.

Research has shown that sensory integration interventions can positively impact various facets of child development, including attention skills. For instance, a systematic review by May-Benson and Koomar (2010) highlighted that children with sensory processing issues often demonstrate improved sensorimotor skills, attention regulation, and behavioral regulation when engaged in sensory integrative therapies. Such therapies are crucial for enabling children to participate fully in daily activities and interactions, thus promoting overall developmental success (Nielsen et al., 2022).

Empirical research on sensory integration training began decades ago in Europe and the United States. Numerous randomized controlled trials have demonstrated that intervention programs for children with significant attentional or behavioural difficulties can significantly improve their attentional performance (Oh et al., 2024). These results have been confirmed by both teacher and parent questionnaires and objective tests. For example, a study of school-age children with attention deficit (AD) found that sensory integration training significantly reduced their error rates on sustained tasks and improved their attention span (Deng et al., 2023).

These findings highlight a key concept: through structured sensory integration activities, children can rebuild their neural modulation capacity, thereby unlocking their attentional potential. In contrast, research in China is still in its infancy. Domestic literature is limited,

and many suffer from small sample sizes and imprecise designs (Ge et al., 2025). Research subjects are heavily concentrated on children with pre-existing behavioral or learning difficulties, while comprehensive interventions in regular kindergartens are rare as if attention issues are merely a label for a "special group" rather than a potential risk to every child's development. Furthermore, intervention programs are often directly transplanted from Western models, lacking local adaptation to the Chinese cultural context (Fu et al., 2022). Under the pressures of "intensive childcare" and "early learning competition," Chinese children may face unique sensory deprivation and cognitive overload. Sensory integration training may serve as a compensatory force to combat alienated development, but this role has yet to be fully explored and researched (Mishra et al., 2016).

Therefore, the child behaviour check list (CBCL) gives a theory-anchored lens for describing youngsters' socioemotional and behavioural functioning that aligns intently with main toddler improvement frameworks. Its broadband Internalizing and Externalizing dimensions map onto developmental psychopathology models of affect regulation and behavioural control, while syndrome scales such as attention issues, social troubles, and Rule-Breaking replicate core responsibilities in executive function maturation, peer model, and ethical improvement across adolescence and childhood (Achenbach & Rescorla, 2001; Diamond, 2013). within a bioecological angle, CBCL scores index how proximal procedures and contexts shape development; multi-informant evaluation throughout domestic and college captures mesosystem impacts and lets in researchers to situate person variations within regular settings (Bronfenbrenner & Morris, 2006). Norm-referenced T-ratings support longitudinal monitoring of trajectories and sensitive intervals, and DSM-orientated scales bridge developmental descriptions with scientific nosology. good sized move-cultural work suggests that the CBCL's empirically derived syndrome structure replicates across many societies, assisting comparative studies and culturally sensitive inference whilst tested translations are used (Achenbach & Rescorla, 2007; Ivanova et al., 2007). consequently, the CBCL capabilities as both a developmental marker and an outcome indicator in intervention research, linking determined behavioural exchange to theoretically grounded mechanisms in self-law, socialization, and competence. This study focusses on four aspects regarding the sensory integration and attention research in CBCL and child development theory as the guide in this research.

2.1. Concentration

Concentration, as a core component of attention in CBCL, reflects an individual's ability to selectively maintain and allocate cognitive resources to specific information sources (Guardado, 2023). From the perspective of sensory integration theory, concentration relies on good sensory modulation, the central nervous system's ability to filter incoming sensory information, suppress irrelevant stimuli, and enhance relevant signals (Crasta et al., 2020). The vestibular-proprioceptive system plays a key role in regulating cortical alertness, and its functional state directly affects a child's ability to maintain steady attention on a target task (Erik et al., 2025). Insufficient concentration often manifests as short attention spans and susceptibility to distraction, which is often closely related to sensory modulation disorders (Lane et al., 2019).

2.2 Impulsivity and behavioural control

Impulsivity and behavioural control reflect the regulatory level of attention and are important components of executive function. Inhibitory control, as its core mechanism, enables individuals to inhibit irrelevant responses, delay gratification, and flexibly adjust behavioral strategies (Kang et al., 2022). Neurophysiological, this function primarily relies on the efficient operation of the prefrontal-striatal circuit (Kim et al., 2018). Sensory integration processes, particularly planned and purposeful sensorimotor activities, can promote the development and integration of this neural network, thereby enhancing an individual's top-down control over impulsive behavior. Deficits in this dimension often manifest as reckless behaviour, insufficient response inhibition, and difficulty following rules (De Kloet et al., 2021).

2.3. Emotion and neuroregulatory

The phenomena of emotional tension and nervous sensitivity reveal the close connection between attention and the emotion regulation system (Rajagopalan et al., 2017). Both excessive and insufficient vigilance can undermine emotional stability, thereby impairing attention performance (Brandes-Aitken et al., 2024). From the perspective of sensory processing, difficulty in emotional regulation is often associated with limbic system dysfunction and autonomic nervous system abnormalities. Appropriate deep pressure, vestibular, and proprioceptive input can regulate parasympathetic nervous system activity, reduce excessive stress, and help maintain an appropriate level of alertness (Brandes-Aitken et al., 2024). Improving this dimension helps create a favorable emotional background, making attention more stable and sustainable (Lazzarelli et al., 2024).

2.4. Repetitive and rigid behaviors

Repetitive and rigid behaviours reflect deficiencies in cognitive flexibility and attentional shifting abilities, often manifesting as fixation on specific routines, resistance to change, and stereotyped thinking (Deng et al., 2023). Neutrally, this dimension is closely linked to the functioning of the prefrontal cortex and anterior cingulate cortex, involving the ability to switch tasks and restructure responses (Baum et al., 2017). Sensory integration interventions promote neuroplasticity and cognitive flexibility by providing novel, progressive, and controlled sensorimotor challenges, thereby helping children reduce stereotyped behaviors and enhance their adaptability to environmental and task changes (Boroujeni et al., 2024).

3. Research Methods

This study examined the effects of sensory integration training on attention in young children using a quantitative randomized controlled trial (RCT) design. A quantitative approach was appropriate because the purpose of this study was to measure and compare numerical changes in attention-related outcomes between groups before and after intervention. A randomized control trial (RCT) is a research strategy that entails the random allocation of participants to either an experimental group or a control group to assess the efficacy of an intervention or therapy (Sabatine, 2011). The experiment consisted of two phases: a pretest and a post-test. The intervention group received an eight-week systematic psychological intervention, while the control group maintained their usual instructional activities. Through pre- and post-test comparisons within the

groups and between-group differences, we aimed to effectively validate the intervention's effectiveness.

The experiment was conducted at Beijing Normal University Crane Kindergarten by researchers with professional backgrounds in psychology and experienced preschool teachers. The entire research process strictly adhered to the Ethical Guidelines for Psychological Research. Parents were provided with detailed information on the study objectives, intervention content, potential risks, and expected benefits before the experiment began. Children were enrolled in the study only after obtaining signed informed consent from parents. To protect participant privacy, all data were anonymized, and children's names were replaced with codes. Parents were also informed that they could withdraw their children from the study at any time without any adverse consequences.

The target population for this study were pre-school children aged 5–6 years with typical development, all of whom attended formal early childhood education institutions by using convenience sampling. The sampling of the study were preschool children in kindergarten in Nanchong city, Sichuan province, China due to factors such as accessibility, time efficiency, and the nature of the target respondents. These children were not diagnosed with any developmental, neurological or sensory disorders before the start of the study, and all had been normal learners since childhood. The study subjects were preschool children from two kindergartens in Shunqing and Gaoping districts of Nanchong City. The sample size for this study was determined based on established guidelines for randomized controlled trials in early childhood intervention research. Cohen's (1988) study convention suggested that a sample size of at least 30 participants (15 per group) was sufficient to determine a significance level of 0.05 and a medium to large effect size of approximately 0.80. Based on this, A total of 40 children was recruited through convenience sampling and randomly assigned to an intervention group and a control group, with 20 children in each group. All children came from the same region and had similar baseline conditions. None had received systematic psychological intervention, and their physical and intellectual development was within normal ranges.

The psychological intervention program implemented in the intervention group was based on child development psychology theory, The Child Behaviour Checklist (CBCL) and covered three modules: attention training, emotion regulation, and behaviour management. Theories of child development concentrate on elucidating the transformations and growth that occur during infancy. These developmental theories focus on several facets of growth, encompassing social, emotional, and cognitive development while CBCL provides caregiver-report core of the ASEBA system for assessing preschoolers emotional–behavioural problems (Miller, 2022). Attention training enhanced concentration through visual tracking tasks (such as "spot the difference" and maze games) and auditory focus activities (such as "sound finds a friend"), with tasks gradually increasing in difficulty to maintain children's engagement. The emotion regulation component used emotion face cards to help children identify and express their emotions. Breathing exercises and quiet corner self-soothing strategies were used to alleviate anxiety. Role-playing was also used to practice appropriate emotional expression in conflict situations. Behavior management relies on establishing classroom rules, positive reinforcement (such as token rewards and verbal praise), and cooperative games (such as group puzzles and construction activities) to strengthen children's awareness of rules and self-regulation and encourage positive social interactions. The team also focused on repetitive and pervasive behaviors, using task-

switching training (such as drawing followed by rhythmic play) and diverse teaching aids (picture books, building blocks, music, etc.) to enhance behavioural flexibility. The control group received no intervention and only engaged in routine activities. Thi study used a structured Preschool Attention Questionnaire developed from previous literature, which includes 20 items across four subscales: concentration, impulsivity and behavioral control, emotional tension and neuroticism, and repetitive and rigid behaviors. Items are rated on a 5-point Likert scale, with higher scores indicating more difficulty. Table 1 shows the full questionnaire that employed in this study.

Table 1: Questionnaire for the experiment

Dimension	Description	Items
Concentration	Assesses children's ability to sustain attention during learning or activities	1. During class or storytelling, he/she can maintain attention for a much shorter time than peers. 2. Easily distracted by minor sounds or movements around (e.g., noises outside the window, classmates' actions). 3. Tasks that require effort to concentrate (e.g., doing exercises, reading) quickly make him/her feel tired or bored. 4. Appears to be listening, but gaze drifts away and thoughts seem elsewhere. 5. In noisy or crowded environments (e.g., classroom, cafeteria), becomes restless and finds it harder to focus.
Impulse and Behavior Control	Observes self-control and rule-following behaviors	1. Often blurts out answers before the question is finished. 2. Has difficulty waiting for turns (e.g., in line, during games), showing impatience or cutting in line. 3. Acts recklessly, often knocking over objects or bumping into others. 4. When emotionally aroused, finds it hard to calm down through self-persuasion. 5. In group activities that require following rules (e.g., class, games), often challenges rules or instructions.
Emotional Tension and Neurotic Sensitivity	Evaluates emotional responses and physiological regulation	1. Shows unusually strong sensitivity or aversion to clothing tags, certain food textures, or sudden sounds. 2. When facing new environments, activities, or strangers, shows obvious tension, withdrawal, or resistance. 3. Emotional reactions are strong and sudden — laughter or crying comes quickly and loudly. 4. After a day of activities, appears more fatigued than peers and needs longer to recover energy. 5. During quiet times (e.g., nap time), keeps moving and seems unable to relax or fall asleep.

Repetitive and Rigid Behaviors	Observes adaptability to change and new situations	1. Insists rigidly on fixed daily routines (e.g., dressing, eating order); changes trigger intense emotions. 2. Tends to play repetitively (e.g., arranging toys repeatedly, spinning objects continuously). 3. Shows narrow range of interests, obsessed with only one or two specific activities or topics. 4. Has great difficulty and resistance when switching from one activity to another (e.g., ending playtime to start homework). 5. Thinking style is rigid, struggles to accept flexible solutions or new suggestions from others.

The experimental process and data collection procedures consisted of three phases that adhere to the organization policy and getting consent from the parents and the children: Phase I was a pretest, conducted in Week 1 and including the signing of an informed consent form and a baseline questionnaire. Phase II was the implementation of intervention, which began in Week 2 and lasted for eight weeks. The intervention group, in small groups of 5–6, received two 40-minute intervention sessions per week. During the sessions, children's participation and behavioral feedback were recorded, while the control group maintained their usual activities. Phase III was a post-test, with both groups re-administered with the same questionnaire within Week 10, one week after the intervention ended.

Lastly, Data was analyzed in SPSS. Data were anonymized, re-entered, and re-checked before analysis. We first assessed reliability using Cronbach's alpha for each subscale and the total scale and then assessed construct adequacy using KMO and Bartlett's sphericity test. We then ran descriptive statistics using the chi-square test for categorical demographics and tested for baseline equivalence between groups. We examined the relationships between the mindfulness dimensions with Pearson's correlation. To assess the effectiveness of the intervention, we used paired-samples t-tests within groups (pre- and post-tests) and independent-samples t-tests for post-test comparisons between groups, with a two-tailed $\alpha = 0.05$.

4. Results

This study used SPSS statistical software and further visualize the data into table, and the relevant results are as follows. First, the questionnaire was tested for reliability and validity to ensure measurement consistency and construct plausibility. Then, internal consistency and sampling adequacy were verified using methods such as Cronbach's alpha, KMO values, and Bartlett's test of sphericity. Subsequently, descriptive and inferential analyses were conducted to explore the relationships between key variables. This section also lists the key findings from the reliability and validity tests, as well as the experimental results**.**

Table 2 shows that questionnaire demonstrated acceptable internal consistency reliability in both the intervention and control groups. For the intervention group, the overall Cronbach's Alpha coefficient was 0.767, indicating good reliability for the total

scale. Among its four dimensions, "Attention" (0.756), "Impulse and Behavior Control" (0.729), and "Repetitive and Rigid Behaviors" (0.759) showed good reliability, while "Emotional Tension and Neuroticism" (0.639) was acceptable but slightly lower. For the control group, the overall reliability was excellent (α = 0.890), with all four dimensions showing good reliability (Attention 0.744, Impulse and Behavior Control 0.805, Emotional Tension and Neuroticism 0.670, Repetitive and Rigid Behaviors 0.837). Overall, the questionnaire demonstrated measurement reliability in both groups.

Table 2: Reliability of the questionnaires

Group	Dimension	Cronbach's Alpha (α)	Overall Cronbach's Alpha (α)
Intervention	Concentration	0.756	0.767
	Impulse and Behavior Control	0.729	
	Emotional Tension and Neuroticism	0.639	
	Repetitive and Rigid Behaviors	0.759	
Control	Concentration	0.744	0.890
	Impulse and Behavior Control	0.805	
	Emotional Tension and Neuroticism	0.670	
	Repetitive and Rigid Behaviors	0.837	

Table 3 shows that highly significant results of Bartlett's test indicate that the correlations among items are adequate for factor analysis. The KMO value for the control group (0.781) clearly supports the suitability of its data for factor analysis. The KMO value for the intervention group (0.602) just exceeds the minimum threshold, suggesting that factor analysis can still be conducted. Overall, the questionnaire data from both groups are appropriate for subsequent factor analysis to explore construct validity.

Table 3: Validity of the questionnaire

Category	Intervention Group	Control Group
KMO Measure of Sampling Adequacy	0.602	0.781
Bartlett's Test of Sphericity		
Approx. Chi-Square	331.587	425.247
Degrees of Freedom	190	190
Significance	< 0.000	< 0.000

Table 4 shows that both the intervention group and the control group consisted of 20 participants, with balanced baseline characteristics. The gender distribution was comparable (P = 0.749), the age composition showed no significant difference (P = 0.744), and the regional distribution was identical (P = 1.000). Overall, there were no significant differences in demographic characteristics between the two groups (all $P > 0.05$).

Table 4: Demographic profile of the preschoolers

Variable	Category	Intervention Group	Control Group	χ^2	P
Gender	Male	11 (55.00)	12 (60.00)	0.102	0.749
	Female	9 (45.00)	8 (40.00)		
Age	5 years	7 (35.00)	8 (40.00)	0.107	0.744
	6 years	13 (65.00)	12 (60.00)		
Region	Shunqing	9 (45.00)	9 (45.00)	0.000	1.000
	Gaoping	11 (55.00)	11 (55.00)		

Table 5 shows that correlation analysis results exhibited a "correlated but non-overlapping" pattern. Concentration showed moderately significant positive correlations with impulsiveness and behavioural control (r = .404). In contrast, the correlations with emotional tension and neuroticism (r = .602) were significantly higher, reaching moderately high levels. This suggests that improved attention is generally associated with enhanced self-regulation and reduced emotional tension, the latter of which warrants particular attention in terms of discriminant validity. The correlation between attention and repetitive and perseverative behaviours was weak and non-significant (r = .204), indicating that these two constructs are relatively independent. Impulsivity and behavioural control showed moderately significant positive correlations with emotional tension and neuroticism (r = 0.490). In contrast, the correlation with repetitive and rigid behaviours was non-significant (r = 0.164), strengthening the discriminative validity of these dimensions. Emotional tension and neuroticism showed small to moderate positive correlations with repetitive and perseverative behaviours (r = 0.306), although overlap was limited. This means that these dimensions are relatively independent and can be safely compared between groups using t-tests without excessively worrying about high overlap between dimensions.

Table 5: Pearson correlation test for Dimension

Dimension	1	2	3	4
1. Concentration	—	.404**	.602**	.204
2. Impulse & Behaviour Control	.404**	—	.490**	.164
3. Emotional Tension & Neuroticism	.602**	.490**	—	.306**
4. Repetitive & Rigid Behaviours	.204	.164	.306**	—

Table 6 shows that Paired-sample t-tests showed that the intervention group demonstrated significant improvements across all compute four dimensions of the attention questionnaire. Specifically, concentration (t = 2.562, p = .014), impulse and behavior control (t = 2.679, p = .011), emotional tension and neurotic sensitivity (t = 2.870, p = .007), and repetitive and rigid behaviours (t = 2.265, p = .029) all showed statistically significant reductions in scores, indicating better regulation after the intervention. The improvements were particularly notable in impulse control and emotional tension, where p-values were the lowest.

In contrast, the control group showed no significant pre–post differences in any dimension (all p > .05). Notably, their impulse and behaviour control scores slightly worsened from pre- to post-test, though the difference was not statistically significant (t = 0.819, p = .418).

Between-group comparisons confirmed that the intervention group outperformed the control group after the intervention in impulse control (t = 3.063, p = .004) and emotional

tension (t = 2.747, p = .009), while differences in attention (t = 1.877, p = .068) and repetitive behaviour's (t = 1.490, p = .144) almost significant but did not reach statistical significance.

Table 6: T-test results of the Intervention and control group

Dimension	Group	Pre-intervention (M ± SD)	Post-intervention (M ± SD)	t	p
Concentration	Intervention	3.59 ± 0.86	2.84 ± 0.99	2.562	.014
	Control	3.51 ± 0.90	3.37 ± 0.79	0.523	.604
Between groups	t	0.287	1.877		
	P	0.776	0.068		
Impulse and Behavior Control	Intervention	3.75 ± 0.84	3.02 ± 0.88	2.679	.011
	Control	3.60 ± 0.98	3.83 ± 0.79	0.819	.418
Between groups	t	0.520	3.063		
	P	0.606	0.004		
Emotional Tension and Neurotic Sensitivity	Intervention	3.86 ± 0.56	3.24 ± 0.79	2.870	.007
	Control	3.51 ± 0.88	3.92 ± 0.78	1.563	.126
Between groups	t	1.503	2.747		
	P	0.141	0.009		
Repetitive and Rigid Behaviours	Intervention	3.52 ± 0.84	2.94 ± 0.77	2.265	.029
	Control	3.64 ± 0.99	3.38 ± 1.07	0.796	.431
Between groups	t	0.411	1.490		
	P	0.683	0.144		

5. Discussion

This research examines whether sensory integration (SI) training should enhance attentional overall performance among preschoolers in Nanchong City, China. After eight weeks of base intervention, the experimental organization established statistically upgrades across all four dimensions of the attention questionnaire: concentration, impulsivity and behavioral control, emotional anxiety and nutriregulation, and repetitive/rigid behaviors. This study conducted a paired sample t-test on the attention of two groups of 20 children that experience intervention. The results showed that after the intervention training of the individualized education system, the children's attention was significantly improved; it also further demonstrated that the individualized education system has a very significant improvement and training effect on the learning ability of children in the preschool and elementary school stages. In addition, the authors' individualized training that integrates CBCL and child development theory have been shown to have significant intervention training effects on children's attention, particularly in the areas of sensory integration and emotional control. This training program, tailored to individual children's differences, is an efficient, reliable, and scientific intervention training method.

The enhancements in attention located in this look are steady with western studies demonstrating that SI complements preschoolers' capacity to maintain and allocate cognitive sources by refining sensory modulation mechanisms (Crasta et al., 2020; Oh et al., 2024). Comparable findings were stated in randomized managed trials carried out in

which SI education decreased distractibility and extended sustained attention amongst youngsters with attentional difficulties (Deng et al., 2023). Importantly, our examination extends this proof to non-scientific populations in China, thereby contributing novel data to a literature base that stays underdeveloped and regularly confined to youngsters with diagnosed issues (Ge et al., 2025).

The sturdy improvements in impulsivity and behavioural behaviours highlight the role of SI in fostering executive function. Prior study has proven that dependent sensory responsibilities can support prefrontal–striatal circuits that underpin impulsivity (Kim et al., 2018; De Kloet et al., 2021). The existing findings echo Kang et al. (2022), who pronounced that SI activities enhance top-down regulatory mechanisms. In the China context, where preschoolers is frequently characterized via educational acceleration and reduced opportunities for unstructured play (Ma et al, 2021), such interventions may additionally make amends for the shortage of environments that in any other case nurture self-regulation.

Equally significant are the discovered discounts in emotional anxiety and neurotic sensitivity. Those enhancements align with physiological proof that vestibular and proprioceptive inputs assist in modulating autonomic responses, lessen arousal, and stabilize affective states (Rajagopalan et al., 2017; Brandes-Aitken et al., 2024). At the same time as tons of prior literature has emphasized that sensory integration consisting of children with autism spectrum disease or ADHD (Afif et al., 2022), our findings show that emotional law blessings additionally increase for generally developing preschoolers in mainstream educational settings. This result incorporates specific importance in China, wherein heightened parental expectancies and “intensive parenting” practices regularly exacerbate strain and tension among younger children (Ma et al., 2021).

Likewise, even though gains in decreasing repetitive and inflexible behaviours have been much less reported in among-group analyses, the inside-group upgrades are noteworthy. These effects converge with neuroscientific proof that SI promotes neuroplasticity and cognitive flexibility through demanding situations that engage the anterior cingulate cortex (Boroujeni et al., 2022). In contexts in which preschoolers play is regularly replaced via dependent drills, interventions that adaptive behaviors may also provide an essential corrective mechanism.

6. Conclusion

In the real world of education, children's attention and emotions don't develop naturally; they require intentional nurturing. This study, focusing on preschool children in Nanchong City, examined the feasibility and effectiveness of sensory integration training in a real-world preschool setting. The aim of this experiment is the rising trend of sensory processing difficulties among Chinese children and the increasingly prevalent "intensive parenting" paradigm under pressure from early childhood education. This latter paradigm, often cantered on cognitive prioritization and accelerated training, objectively compresses the time children have for multi-channel sensory exploration and self-regulation practice. Our results remind educators and parents that development should be balanced. Sensory regulation is the foundation of higher-order cognitive and social-emotional abilities.

Over an eight-week intervention, children participating in structured sensory integration activities demonstrated significant improvements in attention maintenance, inhibitory

control, emotional regulation, and behavioural adaptation, while children in a control group did not show comparable gains. This finding reinforces the positive international evidence on the effectiveness of sensory integration interventions for children with neurodevelopmental disorders. More importantly, it expands the evidence base to include typically developing children in the traditional Chinese preschool context, demonstrating that sensory experiences are not a "problem-oriented" remedial technique but rather a universal developmental resource.

Theoretically, this study reinforces the logical chain: sensory regulation provides stable input to executive function, which in turn provides strategic support for attention, emotional, and behavioral self-management. Together, these three constitute the core hub of young children's adaptation and learning. Practically, the study recommends regularizing and integrating sensory-based activities into the curriculum, rather than viewing them as a supplementary module. Kindergartens can implement this approach in three ways: First, curriculum integration: arranging predictable and playful tactile, vestibular, and proprioceptive activities daily with manageable time and tiered intensity, focusing on child-directed activities and safety boundaries; second, teacher empowerment: establishing a kindergarten-based training and supervision system to improve their ability to identify, record, and respond to sensory behavioral signals; and third, home-school collaboration: transforming cognitive anxiety into sensory support through parent workshops, guiding families to create a tactile-friendly, exercise-rich, and rhythmically stable microenvironment in their daily lives.

This study still has limitations. The sample size and intervention duration were relatively limited, and cultural and institutional characteristics of the regional sample may affect extrapolation. Future research could explore this further in three ways. First, researchers could increase the sample size and use stratified randomization. This would allow them to study how the results differ based on gender, socioeconomic status, and parenting styles. Second, they could lengthen the follow-up period to see if the intervention's effects last into the early elementary grades. Third, adding information from multiple sources and objective measurements, for example, coding classroom behavior, using teacher rating scales, and including physiological indicators would improve the research's validity and help uncover the reasons behind the results. Furthermore, cross-sector comparisons can be conducted between urban and suburban areas, and between private and public kindergartens, to assess implementation fidelity and cost-effectiveness under different educational governance structures.

A more culturally sensitive discussion is also necessary. Chinese preschool education has long emphasized "fair starting points" and "academic readiness." Sensory integration education offers a path to realign academic readiness with physical and mental preparation. Instead of hindering cognitive development, it builds a stronger base for things like understanding, memory, and problem-solving. It does this by keeping arousal levels steady, focusing attention effectively, and boosting emotional strength. When we look at policy and how we measure success, it's important to add sensory and health aspects to how we judge kindergarten quality. We should also make sensory experiences a key part of what we expect kids to learn and what we expect teachers to be good at. If we don't, we might miss how deeply kids are growing, both physically and mentally, as we rush them forward. For children, the main goal of education is to help them learn to feel comfortable, calm down, and pay attention in a world they can see and explore. Our research demonstrates that sensory integration education, as a developmentally appropriate and culturally accessible approach, holds clear and practical promise for

enhancing young children's interest in learning and emotional resilience. Establishing balanced sensory development as the common foundation of early childhood education is both a rational choice for lifelong learning and a gentle safeguard for the full range of experiences that childhood deserves. Based on this, we call on educational decision-makers, kindergartens, and families to work together to ensure that sensory experiences are no longer squeezed to the margins of the curriculum, but rather become an integral part of daily life, systems, and assessments. Only in this way can children's focus, kindness, and curiosity continue to grow through authentic and rich experiences.

Ethics Approval and Consent to Participate

Given the absence of a centralized Research Ethics Committee for non-medical studies at the university, the researcher assumed personal responsibility to ensure that all procedures complied with established ethical standards regarding voluntary participation, informed consent, anonymity, and data protection. All procedures performed in this study involving human participants were conducted in accordance with the ethical standards of the Belmont report and Chinese Psychological Society. Informed consent was obtained from all participants according to the Declaration of Helsinki.

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Conflict of Interest

The authors reported no conflicts of interest for this work and declare that there is no potential conflict of interest with respect to the research, authorship, or publication of this article.

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