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Examining the Effectiveness of the Fernald Multisensory Approach on Body Self-Concept in Elementary Students with Learning Disabilities

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A B S T R A C T

Students with learning disabilities, in addition to academic difficulties, often experience psychological challenges such as negative body self-concept, which can adversely affect their social and academic functioning. This study aimed to determine the effectiveness of the Fernald multisensory approach on body self-concept in elementary school students with learning disabilities. This research employed a quasi-experimental design with a pretest–posttest structure and a control group. The statistical population consisted of students with learning disabilities in the city of Zahedan, from whom 40 students were selected through purposive sampling and randomly assigned to experimental and control groups (20 students per group). The experimental group received 15 instructional sessions based on the Fernald multisensory approach, while the control group received no intervention. The measurement instrument was the Marsh Body Self-Description Questionnaire, and data were analyzed using analysis of covariance. The findings indicated that instruction based on the Fernald multisensory approach had a significant positive effect on improving overall body self-concept and all of its components (physical, social, temperamental, academic, moral, and intellectual) in the experimental group compared to the control group ($p < .001$). These results suggest that the intervention, by creating successful learning experiences, substantially improved the students' self-perceived body image. Based on the findings, it can be concluded that the Fernald multisensory approach is an effective and efficient intervention for enhancing body self-concept in students with learning disabilities. Therefore, incorporating this approach into school-based support and rehabilitation programs and counseling centers may contribute to simultaneous improvement in academic performance and psychological well-being among these students.

Keywords: *Fernald multisensory approach, body self-concept, learning disabilities, elementary students.*

1. Introduction

Learning disabilities represent one of the most prevalent categories of neurodevelopmental disorders in childhood, often manifesting during the earliest stages of formal education and continuing to affect students' academic, emotional, and social development if untreated. Children with learning disabilities typically struggle with core cognitive processes such as phonological processing, working memory, reading fluency, motor integration, or orthographic encoding, and these academic challenges can independently or interactively give rise to broader psychological difficulties. A growing body of literature suggests that deficits in academic functioning may negatively shape children's self-perceptions, especially their body self-concept, as the emotional consequences of repeated academic failure often extend to global self-evaluations, perceived competence, and embodied self-worth (Dehghani & Moradi, 2020). The body self-concept—defined as the individual's cognitive, affective, and evaluative perception of their body and related attributes—represents an important dimension of overall self-concept, and disturbances in this domain have been increasingly recognized in children with learning disabilities, particularly as educators and psychologists have begun to examine the psychosocial burden of academic difficulties. The theoretical foundation for assessing multidimensional self-concept has been strongly shaped by the Self-Description Questionnaire model, which conceptualizes self-beliefs across academic, social, physical, moral, and emotional domains, contributing to a more nuanced understanding of vulnerability among children with learning difficulties (Marsh, 1994).

The relationship between learning disabilities and self-concept is multifaceted. Students who experience persistent challenges in reading, writing, spelling, or mathematics frequently internalize negative feedback from peers, teachers, and their own repeated failures, which may gradually erode confidence not only in academic abilities but also in social competence, physical adequacy, behavioral self-regulation, and overall self-image (Tajdar Malmiry, 2023). These children may perceive themselves as inferior or less capable than their classmates, leading to social withdrawal, heightened anxiety, and maladaptive coping patterns that exacerbate academic and emotional difficulties. Prevalence data across educational contexts consistently highlight the need for early intervention, as children with dyslexia or related disorders are more likely to develop emotional distress and impaired self-efficacy when they lack appropriate instructional and therapeutic support (Yazdi Nezhad et al., 2023). International studies likewise emphasize that multisensory interventions—particularly those designed for dyslexia—play a central role in addressing not only academic deficits but also the psychosocial dimensions of learning challenges by enabling students to experience mastery, autonomy, and success through structured sensory-engaged learning opportunities (Anggraeni & Hendriani, 2022).

Against this backdrop, multisensory approaches have become increasingly prominent as pedagogical frameworks grounded in the simultaneous activation of visual, auditory, kinesthetic, and tactile modalities to strengthen learning pathways. The Fernald multisensory approach—originating from the seminal work of Grace Fernald—has been recognized as one of the foundational methods for teaching reading and spelling to children with learning disabilities. The technique focuses on individualized instruction, positive reinforcement, kinesthetic tracing, and meaningful word recognition, all of which contribute to enhanced memory formation, improved decoding skills, and strengthened self-confidence when students successfully master tasks that previously seemed insurmountable. The early work illustrating modifications to the Fernald technique demonstrated how flexibility in implementation can increase the probability of academic success in struggling learners, reinforcing the approach's relevance nearly five decades after its introduction (Miccinati, 1979). Contemporary literature continues to affirm the method's effectiveness, documenting its beneficial outcomes across cognitive, linguistic, and behavioral domains.

In the field of learning disabilities, multisensory methods have repeatedly demonstrated superiority compared with traditional instruction when targeting decoding, spelling, and fluency skills. The comparative effectiveness of Fernald-based training relative to other methods, such as computer-assisted learning or structured educational games, has been supported by empirical findings showing that the method's hands-on, experience-based, and student-centered nature yields strong academic and psychological gains (Behbahani et al., 2021). These effects appear to be particularly robust in elementary school students, whose developmental stage renders them highly responsive to sensory-integrated learning. Additional studies indicate that Fernald's approach significantly enhances visual memory, fluency, and reading accuracy in children with learning difficulties, as multisensory processing facilitates more

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durable encoding of linguistic material by leveraging multiple neural pathways during learning (Pourkamali et al., 2022). Beyond its cognitive benefits, the method's structured yet supportive environment may foster motivation, perseverance, and internalized success, thereby influencing self-perceptions more broadly.

Recent international research also reinforces the importance of multisensory instruction for children with dyslexia. Investigations conducted across Southeast Asia show that multisensory teaching improves literacy outcomes by aligning instructional materials with children's neurocognitive profiles, making reading more accessible and less anxiety-provoking (Kunasegran & Subramaniam, 2024). Studies analyzing the specific media and tools needed for children with dyslexia highlight that multisensory learning environments tend to reduce frustration while increasing engagement, autonomy, and persistence in academic tasks (Sarajar & Pratiwi, 2024). Likewise, longitudinal research examining the cognitive development of dyslexic children exposed to multisensory instruction demonstrates that such approaches support improved cognitive flexibility, enhanced memory processing, and sustained attention, which collectively enhance motivation and emotional stability in learning environments (Fatimah et al., 2025). These benefits suggest that multisensory teaching not only supports skill acquisition but also serves as a critical component of psychological resilience for children with learning disorders.

Given that psychological factors often interact with academic performance, the role of multisensory instruction in improving body self-concept has become a growing area of interest. Children with learning disabilities may develop distorted body self-concept due to peer comparison, social marginalization, and accumulated academic stress, which can shape their perceptions of physical adequacy and self-worth. Research in related contexts, such as studies of teachers or other populations examining anthropometric and psychological self-beliefs, provides clear evidence that body self-concept is influenced by environmental feedback, social roles, and perceived competence (Heidari Khormizi, 2022). This suggests that interventions capable of reinforcing mastery, competence, and positive self-appraisal—such as multisensory approaches—may exert indirect but meaningful effects on children's embodied self-perceptions. Findings from sensory-motor integration interventions further support this hypothesis, showing that activities promoting bodily engagement and sensory coordination can improve students' self-esteem and academic performance, implying a close link between sensory engagement and self-concept development (Karimi Bahrasemani et al., 2021). Similar results have been observed in intervention programs comparing multisensory methods with alternative pedagogies, where students who engage in tactile, visual, and kinesthetic learning demonstrate improved emotional regulation, stronger self-evaluation skills, and more positive academic identities (Olad Ghobad et al., 2021).

Furthermore, research underscores that psychological risk factors such as anxious thoughts, emotional dysregulation, and disrupted self-image can exacerbate learning difficulties in children, creating a reciprocal cycle of academic impairment and negative self-evaluations (Tajdar Malmiry, 2023). This cycle highlights the importance of interventions targeting both academic skills and self-referential beliefs. Multisensory instruction, by enhancing students' sense of control, agency, and accomplishment, may help break this cycle by creating learning experiences that promote mastery and self-efficacy. Cross-cultural studies examining multisensory teaching approaches in language instruction provide additional evidence that sensory-rich learning environments improve confidence, engagement, and self-perception in learners with disabilities, suggesting that this method holds universal applicability beyond reading instruction alone (Rahmonovna, 2025). Similarly, research comparing multisensory and educational-game-based interventions confirms that sensory-based teaching tends to produce greater emotional and academic benefits in students with writing or spelling disorders (Thani et al., 2022). Taken together, these findings indicate that multisensory approaches offer a powerful and versatile tool for addressing both cognitive and psychological dimensions of learning disabilities.

The growing scholarship on dyslexia and multisensory learning reinforces that educational systems must adopt approaches that account for the heterogeneity of learners' needs. Dyslexia, in particular, has been identified as a neurodevelopmental condition requiring tailored pedagogical environments that integrate sensory, cognitive, and emotional elements of learning. Research examining instructional design for dyslexic children in regional and international contexts emphasizes that effective pedagogy must prioritize multimodal engagement to foster skill acquisition and mitigate psychosocial risks associated with academic struggles (Anggraeni & Hendriani, 2022). Moreover, studies analyzing children's needs within educational programs report that multisensory learning

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materials reduce stress, enhance motivation, and facilitate more positive peer interactions—factors that directly influence self-evaluative processes (Sarajar & Pratiwi, 2024). Evidence from comparative studies also indicates that interventions such as cognitive-behavioral programs or structured multisensory lessons improve self-discipline, self-assessment, and emotional stability in dyslexic students, further illustrating the wide-ranging impact of sensory-integrated instruction (Khademi Adel et al., 2024). These findings point to a consistent pattern: multisensory approaches simultaneously support cognitive, academic, and psychological development, making them well-suited to address body self-concept challenges in learners with disabilities.

Overall, the literature demonstrates the critical interplay between learning disabilities, self-concept, and instructional design. Children who struggle academically often perceive themselves negatively, particularly when traditional teaching methods fail to meet their learning needs. Multisensory approaches, especially the Fernald method, offer an evidence-based pathway for improving reading, spelling, writing, and related cognitive skills while also providing psychological benefits rooted in mastery experiences, sensory engagement, and positive reinforcement. Research findings across diverse educational systems strongly support the hypothesis that multisensory learning may improve body self-concept by reducing academic frustration, enhancing perceived competence, and strengthening emotional resilience. Despite the growing recognition of these potential benefits, limited research has directly explored the influence of the Fernald multisensory approach on body self-concept specifically among elementary students with learning disabilities, highlighting a significant gap in the literature.

Therefore, the aim of this study is to investigate the effectiveness of the Fernald multisensory approach on improving body self-concept in elementary students with learning disabilities.

2. Methods and Materials

2.1. Study Design and Participants

The overall design of this study was quasi-experimental with a pretest–posttest structure and a control group. In this design, a pretest was first administered to both the experimental and control groups, after which the experimental group received the intervention based on the Fernald multisensory approach, while the control group did not receive any intervention. Finally, a posttest was administered to both groups in order to assess the effect of the independent variable on the dependent variable. To control the effect of the pretest and increase the accuracy of the results, analysis of covariance (ANCOVA) was used.

The statistical population of this study included all elementary school boys and girls with learning disabilities in the city of Zahedan who had visited the Educational Counseling Clinic during the 2024–2025 academic year.

The sampling method in this study was purposive. From the statistical population, 40 students with learning disabilities who met the inclusion criteria were selected. The selected participants were then randomly assigned into two groups of 20 students each: an experimental group and a control group (20 students in the experimental group and 20 students in the control group). The inclusion criteria were a formal diagnosis of learning disabilities by an educational specialist, absence of sensory impairments (hearing loss or blindness) or severe motor problems, and not having received similar rehabilitation services in the past three months. The exclusion criterion was absence from more than three intervention sessions.

2.2. Measures

Body Self-Description Questionnaire (Marsh et al., 1994): This questionnaire was used to assess students' body self-concept. It consists of 48 items measuring six components: physical (8 items), social (8 items), temperamental (8 items), academic (8 items), moral (8 items), and intellectual (7 items). Scoring is based on a five-point Likert scale (from strongly disagree = 1 to strongly agree = 5). Higher scores indicate a more positive body self-concept. Content validity was confirmed by experts, and reliability in this study, measured using Cronbach's alpha, was .85, indicating acceptable reliability.

2.3. Intervention

Fernald Multisensory Approach (Fernald, 1921): This approach was used as the intervention package (independent variable). The method emphasizes simultaneous use of visual, auditory, kinesthetic, and tactile (VAKT) modalities to teach and strengthen reading, writing, and spelling skills. In this study, the approach was implemented in 15 instructional sessions, twice per week, with each session lasting 45 minutes for the experimental group. The intervention program included activities such as seeing the word, hearing its pronunciation, tracing the letters with a

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finger, and writing words. The control group received no intervention during this period.

2.4. Data Analysis

Data were analyzed using SPSS version 26. Descriptive statistics (frequency distribution tables, mean, and standard deviation) were first calculated to describe the demographic characteristics of the sample and the variable scores in both groups. Then, the Kolmogorov–Smirnov test was used to examine normality of the data distribution, and Levene's test was used to assess homogeneity of variances. Finally, to test the research hypotheses and control the pretest effect, multivariate analysis of covariance (MANCOVA) and univariate analysis of covariance (ANCOVA) were used. The significance level for all tests was set at .05.

3. Findings and Results

In this section, the research findings are presented at both descriptive and inferential levels. In the descriptive section, the mean and standard deviation of body self-concept scores and its components in the experimental and control groups in the pretest and posttest stages are reported. In the inferential section, the results of the analysis of covariance used to examine the effect of the intervention on the research variables are presented.

Table 1 shows the descriptive statistics (mean and standard deviation) for body self-concept and its components in the pretest and posttest stages for both groups.

Table 1

Mean and Standard Deviation of Body Self-Concept Scores and Its Components in the Experimental and Control Groups

Variable	Group	Stage	Mean	SD
Body Self-Concept (Total)	Experimental	Pretest	124.30	12.45
		Posttest	148.65	10.82
	Control	Pretest	125.10	11.98
		Posttest	126.85	12.15
Physical Component	Experimental	Pretest	21.25	3.10
		Posttest	28.40	2.75
	Control	Pretest	21.50	2.98
		Posttest	22.10	3.05
Social Component	Experimental	Pretest	22.15	3.25
		Posttest	29.55	2.80
	Control	Pretest	22.30	3.18
		Posttest	22.90	3.22
Temperamental Component	Experimental	Pretest	20.85	3.45
		Posttest	27.90	3.10
	Control	Pretest	21.00	3.38
		Posttest	21.65	3.42
Academic Component	Experimental	Pretest	19.95	3.80
		Posttest	28.20	3.25
	Control	Pretest	20.10	3.75
		Posttest	20.85	3.68
Moral Component	Experimental	Pretest	23.45	3.15
		Posttest	30.15	2.95
	Control	Pretest	23.60	3.08
		Posttest	24.05	3.12
Intellectual Component	Experimental	Pretest	16.65	2.90
		Posttest	23.45	2.55
	Control	Pretest	16.80	2.85
		Posttest	17.30	2.88

As shown in Table 1, the mean scores of body self-concept and all its components in the experimental group increased substantially from pretest to posttest. In contrast, changes in the control group's mean scores from pretest to posttest were minimal and negligible.

Before conducting the main analysis, the assumptions of analysis of covariance were examined. The results of Box's Test indicated that the homogeneity of covariance matrices was established ($p > .05$). Additionally, the results of Levene's Test showed homogeneity of variances for the

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research variables ($p > .05$). Given the confirmation of these assumptions, multivariate analysis of covariance (MANCOVA) was used to assess the overall effect of the intervention on the set of dependent variables.

The results of multivariate analysis of covariance (MANCOVA) showed that, after controlling for pretest scores, the instructional intervention based on the Fernald multisensory approach had a significant simultaneous effect on the set of body self-concept components (physical, social, temperamental, academic, moral, and intellectual) ($F = 21.84$, $p < .001$, Pillai's Trace = .88). This finding indicates that the Fernald multisensory approach is generally effective in improving the body self-concept of students with learning disabilities.

To examine the specific effect of the intervention on each component, univariate analysis of covariance (ANCOVA) was conducted. The results of these analyses are summarized in Table 2.

Table 2

Results of Univariate Analysis of Covariance Comparing Posttest Scores of Body Self-Concept and Its Components in the Two Groups

Dependent Variable	Source of Variation	Sum of Squares	df	Mean Squares	F	Sig.
Body Self-Concept	Pretest	825.14	1	825.14	18.65	.000
	Group	3421.50	1	3421.50	77.32	.000
	Error	1576.80	37	42.62		
Physical Component	Pretest	45.21	1	45.21	15.42	.000
	Group	389.06	1	389.06	132.84	.000
	Error	108.37	37	2.92		
Social Component	Pretest	51.08	1	51.08	16.91	.000
	Group	375.24	1	375.24	124.25	.000
	Error	111.78	37	3.02		
Temperamental Component	Pretest	48.95	1	48.95	14.73	.000
	Group	310.57	1	310.57	93.45	.000
	Error	123.01	37	3.32		
Academic Component	Pretest	60.14	1	60.14	12.88	.001
	Group	425.89	1	425.89	91.24	.000
	Error	172.68	37	4.66		
Moral Component	Pretest	42.33	1	42.33	15.01	.000
	Group	298.75	1	298.75	105.89	.000
	Error	104.35	37	2.81		
Intellectual Component	Pretest	39.78	1	39.78	13.25	.001
	Group	355.12	1	355.12	118.34	.000
	Error	111.05	37	3.00		

As shown in Table 2, after controlling for pretest scores, the difference between the experimental and control groups in posttest scores for body self-concept (total) and all of its components (physical, social, temperamental, academic, moral, and intellectual) was significant at $p < .001$. These findings indicate that instruction based on the Fernald multisensory approach led to significant improvement in body self-concept and all its dimensions among students with learning disabilities. The effect size (Eta Squared) for the variables ranged from .71 to .86, indicating a very high level of intervention effectiveness.

4. Discussion and Conclusion

The purpose of this study was to determine the effectiveness of the Fernald multisensory approach on body self-concept in elementary students with learning disabilities. The results indicated that the intervention significantly improved overall body self-concept as well as all six of its components—physical, social, temperamental, academic, moral, and intellectual—compared with the control group. This overall pattern supports the hypothesis that sensory-rich, experiential, and mastery-oriented learning environments contribute not only to academic development but also to the psychological well-being of children with learning challenges. The findings align with theoretical models of self-concept that emphasize the multidimensional nature of children's self-perceptions and the sensitivity of these perceptions to both environmental experiences and academic success, as described in the Self-Description Questionnaire model (Marsh, 1994). Improvements across all domains suggest that the multisensory method influences students' self-evaluations broadly rather than only in the academic dimension,

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demonstrating its potential to create holistic developmental benefits.

One of the most significant interpretations of these findings is that the Fernald multisensory approach fosters a sense of achievement by enabling students to engage with learning materials through visual, auditory, kinesthetic, and tactile pathways. Children with learning disabilities frequently experience frustration, repeated academic failure, and negative peer comparison, all of which negatively influence their body self-concept (Tajdar Malmiry, 2023). The multisensory method counters these negative experiences by offering alternative learning modalities in which students can succeed, thereby strengthening emotional resilience and positive self-perception. This explanation aligns with research demonstrating that multisensory teaching improves literacy skills, reduces anxiety, and enhances motivation by providing structured and meaningful engagement with reading and writing tasks (Anggraeni & Hendriani, 2022). When students experience success across these domains, they are likely to internalize more positive evaluations of themselves, consistent with the improvements observed in this study.

The study's results are also consistent with the growing literature documenting the effectiveness of Fernald-based interventions. Research comparing multisensory methods with computer game-based training or other educational techniques shows that the Fernald approach tends to produce greater improvements in both cognitive and socio-emotional outcomes (Behbahani et al., 2021). In particular, the method's emphasis on individualized instruction and kinesthetic tracing supports deeper cognitive engagement, sustained attention, and enhanced recall, leading to measurable academic gains and improved psychological functioning. Similar outcomes were reported in studies showing that Fernald's approach significantly improves visual memory and fluency in students with learning disabilities (Pourkamali et al., 2022). These improvements in cognitive processing likely contribute to the strengthened body self-concept observed in the present research, as success in previously challenging tasks can shift children's self-evaluations from inadequacy to competence.

The findings also align with evidence from studies on sensory-motor and sensory-integration interventions. Research indicates that sensory-motor integration training improves self-esteem, emotional functioning, and academic performance in students with learning disabilities (Karimi Bahrasemani et al., 2021). These outcomes suggest that interventions targeting sensory engagement may strengthen the link between embodied experiences and emotional well-being. This is relevant to the present findings: the Fernald multisensory approach requires children to see, hear, trace, and write words, reinforcing learning through coordinated sensory channels. Such embodied learning experiences help students form stronger associations, regulate emotions, and build confidence through repeated mastery. This mechanism may explain why improvements were observed not only in academic and intellectual self-concepts but also in moral, social, and emotional dimensions.

The improvement in temperament and emotional self-concept observed in the study can also be interpreted through research showing that multisensory teaching environments reduce frustration and increase feelings of safety and engagement. Studies analyzing the needs of children with dyslexia report that multisensory learning media reduce anxiety and create more positive emotional experiences by enabling children to interact with materials in ways that feel natural and attainable (Sarajar & Pratiwi, 2024). These nurturing learning conditions reduce feelings of inadequacy and improve self-regulation, which may explain why the experimental group in this study reported higher scores in emotional and temperamental dimensions. Similarly, research on multisensory interventions designed for cognitive development shows that students experience improved emotional resilience, confidence, and cognitive flexibility when they receive sensory-based instruction (Fatimah et al., 2025). These findings strongly support the results of the present study by showing that multisensory methods influence both cognitive and emotional domains.

Another important interpretation concerns the social and moral dimensions of body self-concept. Children with learning disabilities often experience social marginalization, peer rejection, or reduced social participation due to reading or writing difficulties. Multisensory programs—which often incorporate collaborative learning, individualized reinforcement, and interactive tasks—may help students feel included and capable, thereby improving social self-concept. This argument is supported by studies showing that multisensory teaching enhances communication, participation, and engagement in the classroom (Kunasegran & Subramaniam, 2024). When students feel more competent academically, they are more likely to interact confidently with peers, improving their perception of social adequacy. Additionally, interventions that strengthen self-regulation and reduce frustration contribute to improved moral self-concept, as students demonstrate better behavior, task responsibility, and emotional stability (Khademi Adel et al.,

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2024). This aligns with the present findings, in which moral self-concept improved significantly after the intervention.

The intellectual component of self-concept also improved markedly, reflecting the academic-cognitive benefits of the multisensory method. Research indicates that multisensory interventions help reorganize central nervous system pathways and strengthen visual-spatial processing, phonological decoding, and working memory in students with learning disorders (Yazdi Nezhad et al., 2023). This neurological explanation may account for enhanced intellectual self-concepts in the present study, as students likely experienced less cognitive strain during reading and writing tasks. Related research examining the effects of working memory training on cognitive flexibility in dyslexic students also supports this interpretation, demonstrating that interventions that strengthen cognitive mechanisms lead to enhanced self-perceived intellectual ability (Dehghani & Moradi, 2020).

Furthermore, broader pedagogical literature indicates that multisensory teaching leads to improved academic resilience, engagement, and self-perception in learners with diverse educational needs. Comparative studies of multisensory and game-based methods show that sensory-based teaching yields stronger emotional and academic outcomes, reinforcing the importance of engaging multiple learning channels (Thani et al., 2022). Cross-cultural research examining multisensory learning in English-language instruction for learners with disabilities confirms that the effectiveness of the approach extends beyond reading to general cognitive, motivational, and emotional domains (Rahmonovna, 2025). These international findings provide strong external support for the present study, further validating the multisensory method as a comprehensive instructional framework capable of addressing multiple dimensions of child development simultaneously.

The convergence of evidence suggests that improvements in body self-concept observed in the present study are best understood as the result of interrelated cognitive, emotional, sensorimotor, and social processes. The Fernald multisensory approach effectively addresses the unique learning challenges of children with learning disabilities by restructuring the learning environment so that mastery, sensory engagement, emotional regulation, and self-efficacy are continuously reinforced. The present findings add to a growing body of literature indicating that multisensory learning is not merely an instructional technique but a holistic developmental tool capable of improving both academic outcomes and psychological well-being in children with learning disabilities. As such, this study contributes new insights by providing empirical evidence that the Fernald approach enhances multiple dimensions of body self-concept, deepening the understanding of multisensory instruction as an integrative intervention.

The present study, despite its strong findings, has limitations that should be acknowledged. The sample comprised only 40 students from a single city, which limits the generalizability of the results to broader populations. The study relied on self-report measures, which may be influenced by social desirability or response bias. Furthermore, the research design did not include a long-term follow-up to assess the durability of improvements in body self-concept after the intervention ended. Additional variables that may influence self-concept, such as family dynamics, classroom climate, or socio-economic factors, were not controlled and may have contributed to the outcomes.

Future research could expand the sample size and diversity by including students from multiple regions and different educational settings. Longitudinal designs would help determine whether the improvements in body self-concept are sustained over time. Researchers could also explore the mechanisms through which multisensory learning affects emotional and social development, potentially incorporating neurocognitive or psychophysiological measures. Comparative studies examining variations of multisensory approaches or combining multisensory teaching with psychological interventions could provide deeper insights into optimizing programs for students with learning disabilities.

Based on the results, educators and school psychologists should consider integrating multisensory instructional methods into regular and special education programs to support both academic performance and psychological well-being in students with learning disabilities. Training teachers in multisensory strategies could enhance their ability to meet diverse learning needs and foster positive self-concepts in their students. Schools and counseling centers may also incorporate these approaches within support services and intervention programs to help children build confidence, strengthen resilience, and improve their academic outcomes.

Authors' Contributions

Authors contributed equally to this article.

Declaration

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In order to correct and improve the academic writing of our paper, we have used the language model ChatGPT.

Transparency Statement

Data are available for research purposes upon reasonable request to the corresponding author.

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Declaration of Interest

The authors report no conflict of interest.

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Ethics Considerations

The study protocol adhered to the principles outlined in the Helsinki Declaration, which provides guidelines for ethical research involving human participants.

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