Multisensory Learning Intervention (“Sawaru Glyph”) for Specific Learning Disorder Through Interprofessional Collaboration

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This study is a case report describing a collaborative initiative between Public Tosei Hospital and a local school using the “Sawaru Glyph” multisensory learning materials. The case was originally presented at the 134th Annual Meeting of the Japanese Society of Child and Adolescent Psychiatry on December 9, 2025. Because the copyright for the conference presentation materials is held by the society, the present manuscript was written and reorganized in narrative form by Miyazaki (Miyazaki Language Therapy Office, Inc.). At the request of the hospital, the intervention utilized “Sawaru Glyph” sheets for Japanese kana, kanji, and short sentences, which were donated by our company. There are no conflicts of interest between our company and the participating medical institution.

Abstract

Interdisciplinary collaboration between medical and educational professionals is essential when supporting children with learning disabilities who present with reading and writing difficulties. However, findings obtained in medical assessments are not always sufficiently reflected in learning support practices within school settings. This case report describes the course of introducing a tactile-based multisensory learning approach in regular classroom instruction and examines its clinical implications.

Case Presentation

The participant was a fifth-grade girl who presented to a medical facility with complaints of reading and writing difficulties, particularly involving contracted sounds and kanji. Initial assessment revealed impairments in reading and writing abilities, along with weaknesses in visual perception and visual memory. Following a

multidisciplinary case conference involving medical, educational, and welfare professionals, a support plan for implementation within the school setting was developed.

Methods

The intervention was delivered during regular classroom lessons. A three-dimensional tactile reading material ("Sawaru Glyph," Miyazaki Language Therapy Office, Inc.) was used to provide multisensory learning integrating visual, tactile, and auditory modalities. Sessions were conducted for 10–20 minutes, three to four times per week, over approximately eight months. Changes in reading–writing abilities and cognitive functions were evaluated before and after the intervention.

Results

Post-intervention, substantial improvements were observed in reading accuracy, reading fluency, and writing performance on the STRAW-R assessment. An increase in spontaneous reading behavior in daily life was also reported. Re-evaluation using the WISC-V indicated score improvements across multiple indices.

Conclusion

These findings suggest that tactile-based multisensory learning in educational settings may be a useful approach for supporting children with learning disabilities who experience reading and writing difficulties.

I. Background

Interdisciplinary collaboration among medical, educational, and social welfare professionals is considered essential when supporting children with specific learning disorder (SLD). In children who present with reading and writing difficulties, it is particularly important to understand their cognitive characteristics based on medical assessment and to implement educational support that reflects these findings. However, in clinical practice, the detailed results of medical evaluations are not always sufficiently translated into concrete learning support strategies within school settings. One contributing factor is that therapeutic or instructional interventions delivered in medical facilities are often constrained by visit frequency and limited time, making ongoing involvement in daily learning contexts difficult. In contrast, schools constitute the primary environment where children spend most of their time and provide opportunities for frequent, continuous learning support. Nevertheless, concrete support strategies grounded in medical assessment results are not always adequately shared or implemented. Recently, multisensory learning approaches have been reported as effective supports for children with reading difficulties. Multisensory learning integrates multiple sensory modalities—such as visual, auditory, and tactile input—to facilitate the association between graphemic forms and phonological information, and may be particularly beneficial for children who exhibit weaknesses in a single sensory modality. Among these modalities, tactile stimulation has attracted attention as a means of supporting the retention and recall of letter forms; however, systematic implementation of tactile-based interventions within school settings remains limited. Furthermore, in supporting children with SLD, it is important not only to improve academic

performance but also to evaluate broader aspects of learning behavior, including motivation and reading activities in daily life. Developing feasible models of learning support within school environments through collaboration among medical, educational, and social welfare systems represents an important practical and social challenge. Therefore, in this study, we introduced a tactile-based multisensory learning approach into regular classroom instruction for a child with learning difficulties, grounded in medical evaluation findings, and examined the course and outcomes as a case report.

II. Methods

1. Study Design

This study was a retrospective single-case report involving a child with specific learning disorder who presented with reading and writing difficulties. Based on the results of the initial medical evaluation, a tactile-based multisensory learning approach was introduced within the school setting. A follow-up evaluation was conducted after the intervention, and changes in the child's reading–writing abilities and intellectual functioning were examined descriptively.

2. Participant

Table 1. Assessment Profile of the Child

Overall Intellectual Functioning	WISC-V	Full-Scale IQ (FSIQ)	74
		Verbal Comprehension	78
		Visual–Spatial	94
		Fluid Reasoning	91
		Working Memory	71
		Processing Speed	73
Reading and Writing Abilities	STRAW-R	Reading Fluency - Words (hiragana)	2 SD slower than average
		Reading Fluency – Sentences	2 SD slower than average
		Oral Reading — Single Letters (hiragana)	2 SD（−） 17/20 correct
		Oral Reading — Words (hiragana)	2 SD (−） 15/20 correct
		Dictation — Single Letters (hiragana)	2 SD （−） 12/20 correct
		Dictation — Words (hiragana)	2 SD （−） 1/20 correct
Language and Cognitive Processing	Vocabulary Comprehension Test (Auditory / Pointing)		Average for grade level
	ELC (3-mora backward repetition; reaction time)		2 SD slower
Visuomotor / Visual Perception	WAVES	General Index of Eye–Hand Coordination	69
		Perception Index	58
	Rey-Osterrieth Complex Figure		1SD(−)
Auditory-Verbal Memory	AVLT	auditory-verbal memory	1.5SD(−)

The participant was a fifth-grade girl who presented to a medical facility with primary complaints of reading and writing difficulties. She was enrolled in a resource classroom and attended some subjects in a general education classroom. The purpose and procedures of the study were fully explained to her guardian, and written informed consent was obtained. At baseline, a comprehensive assessment was conducted, including an intelligence test, evaluations of reading and writing abilities, and cognitive function measures. Reading and writing abilities were assessed using the standardized test STRAW-R, focusing on both accuracy and fluency. Cognitive functions were evaluated using the WISC-V, assessing indices of verbal comprehension, visual–spatial ability, fluid reasoning, working memory, and processing speed. A profile of the child's assessment results is presented in Table 1. The intelligence assessment revealed a Full-Scale Intelligence Quotient (FSIQ) of 74, placing her overall intellectual functioning in the borderline range. Considerable inter-index variability was observed, with pronounced weaknesses in areas related to visual information processing. In the assessment of reading and writing abilities, performance in both domains was more than 2 standard deviations below age norms, indicating difficulties in both accuracy and fluency. Her vocabulary level was within the expected range for her grade, and no major problems were observed in everyday conversation or oral comprehension. In contrast, although accuracy on phonological awareness tasks was preserved, response times were markedly prolonged, suggesting reduced efficiency in phonological processing. With respect to visual cognition, the Visual Perception Index (VPI) score was extremely low at 58, indicating potential difficulty in the visual retention of letter forms. Visual memory scores were approximately 1 SD below the mean, implying increased cognitive load for learning tasks reliant on visual stimuli. In addition, verbal–auditory memory scores were 1.5 SDs below the mean, indicating weaknesses in the retention of auditory information. Taken together, these findings indicate that while higher-order linguistic functions such as vocabulary and verbal comprehension were relatively preserved, the child showed an uneven cognitive profile characterized by weaknesses in visual perception, efficiency of phonological processing, and memory functions. Learning approaches relying on a single sensory modality were considered likely to be challenging, and support integrating multiple sensory modalities was deemed necessary.

3. Coordination and Decision-Making for Support

Following the initial assessment, a multidisciplinary case conference was convened with participation from the attending physician, a speech-language pathologist, the classroom teacher, staff from a disability support agency, and the child's guardian. During the conference, the results of the medical evaluation were shared, and concrete support strategies for use within the school setting were discussed based on the child's cognitive profile. As a result, the team agreed to implement a tactile-augmented multisensory learning approach continuously within regular classroom lessons.

4. Intervention and Outcome Measures

Figure 1. “Sawaru Glyph” Kana Word Materials

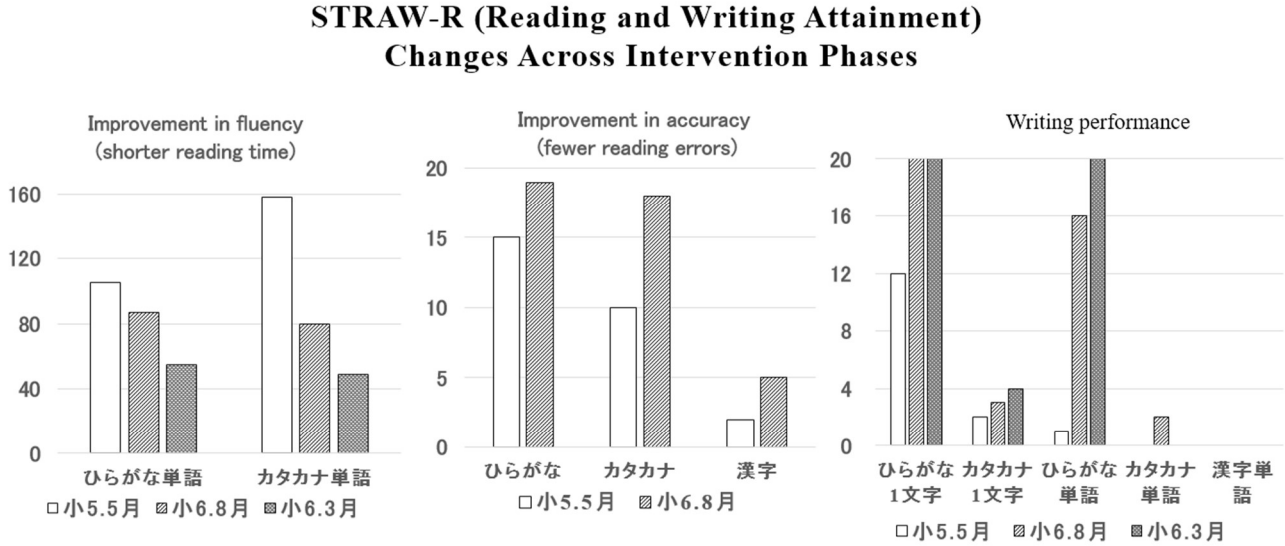
The intervention was implemented within the school setting. A multisensory learning approach was introduced in which the child simultaneously traced raised letters, visually inspected them, and read them aloud, using the “Sawaru Glyph” tactile materials (Figure 1). The Sawaru Glyph program progresses stepwise from basic hiragana and katakana (including voiced and special syllables) to words, short sentences, and fundamental kanji. It is designed to facilitate (1) memory for letter forms, (2) associative memory linking letters and sounds, and (3) lexical form representations. The present case followed this structured program. Sessions were conducted for 10–20 minutes, three to four times per week, and continued for approximately eight months. At the medical facility, follow-up consultations were held twice per month to review progress and provide guidance. To evaluate intervention effects, changes in reading accuracy, reading fluency, and writing performance were assessed using the STRAW-R before and after intervention. In addition, interviews were conducted with the guardian and school teachers to document changes in daily reading behavior and learning attitudes. Cognitive function was also re-evaluated after the intervention using an intelligence test.

5. Ethical Considerations

This study was approved by the institutional ethics review committee of the authors’ affiliated institution. Care was taken to ensure that the personal identities of the child and guardian could not be disclosed, and it was explained that participation in the study was entirely voluntary.

III. Results

1. Changes in Reading and Writing Abilities (STRAW-R)



STRAW-R outcome indices: enhanced reading fluency (reduced reading time), enhanced accuracy (reduced errors), and writing outcomes (greater number of correctly produced characters)

At baseline, STRAW-R results indicated low accuracy and fluency in reading across hiragana, katakana, and kanji, with a pronounced tendency toward sequential letter-by-letter reading. In the kanji reading task, only 7 of 126 items were answered correctly, indicating substantial difficulty in grade-level reading. Writing performance was also poor across all script types, with scores markedly below age norms. After approximately eight months of tactile-based multisensory instruction delivered in the school setting, reassessment using STRAW-R demonstrated improvements in both reading and writing abilities (Figure 2). For reading, accuracy and fluency improved in both hiragana and katakana, and responses increasingly reflected reading words as meaningful units rather than letter-by-letter decoding. In the kanji reading task, correct responses increased to 38 of 126 items, representing a clear improvement compared with pre-intervention performance. In writing tasks, the participant achieved perfect accuracy in hiragana, including special syllables, and showed increased accuracy in katakana. Although grade-level kanji writing remained difficult, performance improved for lower-grade kanji items.

2. Changes in Learning Behavior in Daily Life

Interviews with school staff and the child's family indicated that, after hiragana reading became more stable, the child increasingly engaged in self-initiated reading of texts. In particular, resistance to printed materials

containing a large amount of text—such as books with furigana (ruby annotations) and comic books—decreased, and a noticeable increase in reading volume was observed.

3. Changes in Cognitive Function (WISC-V)

WISC-V (pre-intervention / post-intervention)

	Overall Intellectual Functioning（WISC-V）					
	FSIQ	VCI	VSI	FRI	WMI	PSI
Pre-intervention	74	78	94	91	71	73
Post-intervention	87	97	109	110	66	80

On the WISC-V administered prior to intervention, the child's full-scale IQ (FSIQ) was 74. At follow-up approximately eight months later, the FSIQ had increased to 87 (Figure 3). The General Ability Index (GAI) also increased, from 80 to 106. At the index level, notable improvements were observed primarily in Verbal Comprehension and Fluid Reasoning. On individual subtests, qualitative changes such as more stable task comprehension and faster responses were observed. It should be noted, however, that these changes in intelligence test scores may reflect not only the effects of the intervention but also potential retest effects and general learning experiences over time.

IV. Discussion

In this case, we introduced a tactile-based multisensory learning program in the school setting for a child with learning disability who exhibited reading and writing difficulties, grounded in detailed assessments conducted in a medical facility. As a result, improvements were observed in standardized measures of reading and writing, along with an increase in self-initiated reading behavior in daily life. Gains were also observed in cognitive assessment outcomes. These findings suggest that the multisensory learning approach, incorporating tactile input, may have compensated for weaknesses in visual cognition and processing efficiency identified in this child. In particular, conducting the intervention within the school environment—where learning occurs frequently and in authentic daily contexts—may have contributed to the consolidation and generalization of learning behaviors. At the same time, this report describes a single case, and changes in intelligence test scores may include contributions from retest effects and general learning experiences. Therefore, caution is warranted when attempting to generalize the effects of this intervention. Nevertheless, the present case is meaningful in demonstrating that coordinated collaboration among medical, educational, and welfare services can translate

medical assessment findings into concrete, feasible, and sustainable learning support within school settings for children with reading and writing difficulties. Future studies accumulating additional cases and employing comparative designs will be necessary to further clarify the effectiveness and conditions of application of multisensory learning approaches in educational settings.

References

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