

Introduction & Background

Writing has been identified as students' predominant fine motor task in the classroom.¹ It is a performance skill children use to fulfill many of the required school based activities they experience during their roles as students. With multiple studies identifying up to 27% of students in primary schools as having difficulty writing, this is a major area of concern in the school system and the most common reason for referral to school-based occupational therapy.^{2,3}

To address the internal mechanisms, handwriting programs have been developed using different approaches as methods of implementation. The literature identifies these approaches as: perceptual motor, sensory integrative, task-oriented, cognitive behavioral, and multisensory-based.^{6,2,7} Results from show 92.1% of occupational therapists use a multisensory approach, signifying a study that found multisensory-based approaches to be most commonly practiced among occupational therapists addressing handwriting.^{8,9} However, the literature available on multisensory approaches shows inconsistent and contradictory results regarding their effectiveness.^{10,9}

There is a lack of evidence, which supports the implementation of handwriting remediation programs in a setting outside the traditional school day. Only one study was found to apply a handwriting remediation program during the summer months which aided the student in carrying over the skills they had learned during the school year.¹¹ This study aims to compare the effectiveness of two multisensory-based handwriting programs used in an afterschool setting with students who have handwriting difficulties, but have not been formally identified with a disability.

Hypothesis

- **The use of handwriting programs, Handwriting Without Tears (HWT) and First Strokes (FS) will improve:**

- Legibility
- Formation
- Proportion
- Spacing

Results

Effect of First Strokes Intervention on Handwriting
FS participants revealed significant improvements in letter legibility and proportion ($Z = -2.077, p = 0.027$).

Table 2. Pretest, Posttest, and Within-Group Differences After 6 Weeks of Handwriting Intervention

| Variable | First Strokes (n=6) | | | | Handwriting Without Tears (n=7) | | | |
|-------------------|---------------------|-------------|------------|--------|---------------------------------|-------------|------------|--------|
| | Pretest | Posttest | Difference | p^a | Pretest | Posttest | Difference | p^a |
| | Mean (SD) | Mean (SD) | | | Mean (SD) | Mean (SD) | | |
| Word Legibility | 67.5 (22.1) | 74.5 (14.8) | 7 | 0.345 | 65.5 (9.6) | 84.2 (12.4) | 18.7 | 0.043* |
| Letter Legibility | 67.5 (10.1) | 82.3 (5.7) | 14.8 | 0.027* | 82.2 (10.2) | 88.5 (4.6) | 6.3 | 0.108 |
| Formation | 42.8 (6.5) | 45.3 (2.8) | 2.5 | 0.206 | 47.2 (3.4) | 48.0 (2.3) | 0.8 | 0.609 |
| Proportion | 37.5 (6.4) | 45.6 (5.4) | 8.1 | 0.027* | 42.2 (5.2) | 45.8 (5.0) | 3.6 | 0.061 |
| Spacing | 52.0 (0.0) | 51.1 (2.0) | -0.9 | 0.317 | 52.0 (0.0) | 51.8 (0.3) | -0.2 | 0.317 |

Note. *SD* = standard deviation; ^aAll *ps* statistically significant at $p < .05$.

Significance level: one star () for 0.05

Results

Effect of HWT Intervention on Handwriting
HWT participants revealed significantly improved word legibility ($Z = -2.028, p = .043$).

Methods & Materials

Design: Pretest/Posttest, two group design

Participants: Participants consisted of 13 students (9 girls, 4 boys; *M* age = 84 months) 1st grade students from two schools who attended an afterschool program in the St. Louis area. All participants were recruited following Maryville University's Institutional Review Board (IRB) approved procedures. Participants were screened for handwriting difficulties using the Evaluation Tool of Children's Handwriting (ETCH). Participants who scored 85% or below were included in this study.

Procedure: Prior to data collection, student researchers participated in training sessions for each handwriting program conducted by the research advisor. Two afterschool programs were randomly assigned a handwriting program: Handwriting Without Tears® (HWT) or First Strokes® (FS). Both intervention programs were performed in small groups one day a week for a total of six weeks with each session lasting 30-45 minutes. After completing six weeks of intervention, the student researchers re-administered the ETCH to all participants (posttest).

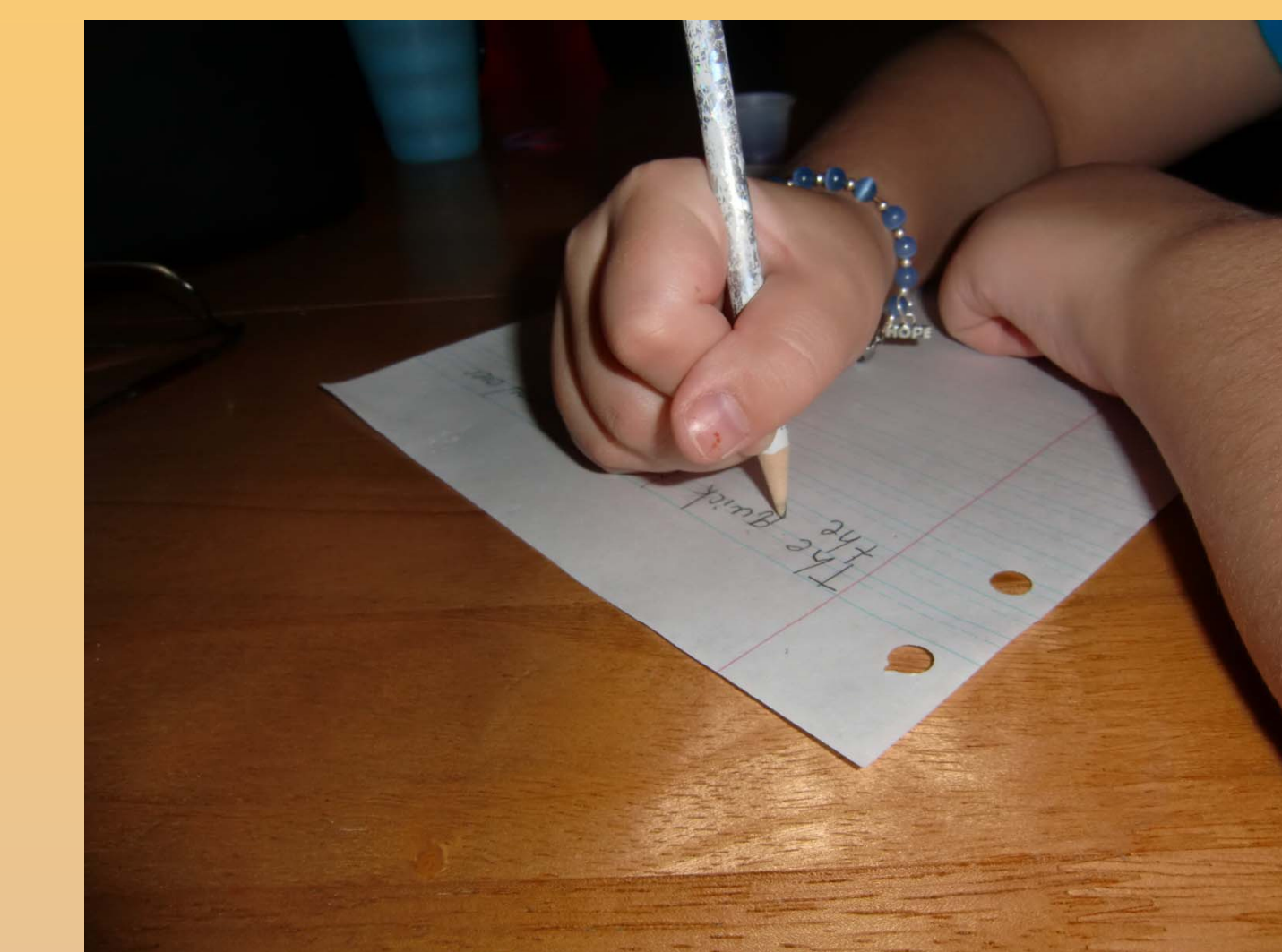
Data Analysis: To compare the results between pre and posttest data, the Wilcoxon Signed-Ranks test was used. The Mann-Whitney U Test was performed to measure the impact between both groups.

Discussion

This study focused on typically developing students in grades one, who had not been identified as having physical impairments, cognitive impairments, psychological diagnoses, and were not receiving any special services or supplementary handwriting instruction. Essentially, these students had handwriting difficulties, but lacked the diagnosis to warrant an IEP/504. It was believed they could benefit from a handwriting intervention program that encouraged development of skills.

While both handwriting programs are designed to influence handwriting performance, neither program showed significant improvement within all five variables. Despite this finding, both programs did improve components of handwriting. Furthermore, the results from HWT® echo previous studies of handwriting intervention that reported an improvement in legibility and proportion using the multi-sensory structured handwriting program.^{12,13} No prior research has been conducted to assess the effectiveness of FS®, therefore further research is needed to confirm the outcomes of our study.

Strengths of the study include: the use of a standardized outcome measure with high reliability and validity, and the use of a blinded independent assessor to score handwriting samples. In addition, since the study was conducted within an after-school setting, a new opportunity of service delivery for occupational therapy was observed.



Conclusion

Both handwriting programs showed improved handwriting legibility, letter formation, and proportion. However, students receiving the First Strokes® handwriting program improved significantly more in letter legibility and proportion than students participating in the Handwriting Without Tears® program. In addition, First Strokes® recorded a greater mean improvement for letter legibility, formation and proportion as compared to Handwriting Without Tears®.

The results of this study indicate the efficacy of two handwriting programs widely used by occupational therapists. Furthermore, this study warrants further investigation to guide the therapist in making informed and evidence based decisions when selecting handwriting programs.



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