FOCUSED QUESTION
Is the Write Start handwriting and writing program effective in improving the handwriting legibility and speed, writing fluency, and written composition of first-grade students?


CLINICAL BOTTOM LINE:
The authors of this study conducted a Level II, nonrandomized controlled design to determine the effectiveness of the Write Start handwriting and writing program for first-grade students. This was an appropriate design when considering the existence of other studies on and current level of knowledge about the efficacy of handwriting programs. The Write Start program includes characteristics of other supplemental handwriting and writing interventions that were previously demonstrated as efficacious, including practice of underlying sensorimotor skills, visual cueing, reinforced practice, self-evaluation, and peer modeling and support. The Write Start program is distinguished from other programs by its full integration into a classroom’s existing writing curriculum, helping to prevent later handwriting problems and unnecessary service referrals. Handwriting instruction in the Write Start program follows a developmental sequence, and all sessions include instruction; small-group practice with peer modeling, feedback, and self-evaluation; activities reinforcing handwriting fundamentals; story writing activities; modeled letter formation; simple and consistent verbal and visual cues; frequent and immediate feedback; and monitored performance.

The authors were careful to avoid potential contamination, co-intervention, timing, site, and recall or memory biases, and all evaluators were blind to the students’ treatment status. In addition, the same two co-teaching teams implemented the Write Start program in both years, limiting any teacher-related effects. The authors also developed a fidelity measure for the Write Start program to define co-teachers’ expected behaviors. The co-teachers, rated by graduate students, achieved 94%–96% fidelity across all sessions. The study was conducted across 2 school years, capturing a larger sample size and increasing generalizability.

Though this study demonstrated several merits, it also contained many limitations. The administrators were not blinded to students’ treatment status, though complete blinding may
have been challenging to carry out in this context. The limited socioeconomic diversity among the middle-class students assessed and the non-randomized group assignment limit the study’s overall generalizability. The Woodcock-Johnson III Tests of Achievement (WJIII) Writing Samples test exhibited ceiling effects, limiting the value of its measuring effectiveness and, therefore, generalizability of the findings. When considering future studies on the Write Start program, researchers should include group assignment randomization (if possible), greater diversity within the sample, a larger sample size and use of additional trained teams, and a replacement for the WJIII’s Writing Samples assessment to allow for higher scores.

The clinical implications of this study are most relevant for school-based occupational therapists. School-based occupational therapists should consider this approach to handwriting and writing instruction and support because it would facilitate a more collaborative work environment and emphasize contextualized and evidence-based services, all important parts of occupational therapy best practice. Most importantly, it may improve first graders’ handwriting legibility and speed, writing fluency, and written composition, especially for those students who are at risk for handwriting and writing problems.

**RESEARCH OBJECTIVE(S)**

List study objectives.

Determine whether the Write Start program resulted in greater improvement in handwriting legibility and speed, writing fluency, and written composition in first-grade students when compared with standard handwriting and writing instruction and determine whether students with low, average, and high baseline handwriting legibility who completed the Write Start program made significant progress and demonstrated significantly different rates of progress in handwriting legibility and speed, writing fluency, and written composition (p. 691).

**DESIGN TYPE AND LEVEL OF EVIDENCE:**

Level II: Nonrandomized controlled design

Limitations (appropriateness of study design):

Was the study design type appropriate for the knowledge level about this topic? *Circle yes or no, and if no, explain.*

YES/NO  | NR

**SAMPLE SELECTION**

How were subjects selected to participate? Please describe.

The authors used a convenience sample of eight district-approved, public first-grade classrooms from Dublin City Schools, a suburban Midwestern U.S. school district in Ohio. Parents were informed about the study and completed consent forms during teachers’ initial student assessments before the start of the school year. Four classrooms \((n = 80)\) received the Write Start program and four \((n = 58)\) received standard instruction.
- Students in first-grade regular education classrooms
- English spoken as a first language

**Exclusion Criteria**
- Down syndrome*
- Autism*
- Severe visual or hearing loss
- English spoken as a second language*

*Some students who had these diagnoses or who spoke English as their second language participated in the Write Start program, but the authors did not include their data in the analyses.

**SAMPLE CHARACTERISTICS**

N = 138

<table>
<thead>
<tr>
<th># Dropouts</th>
<th>Total: 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Between pretest and posttest: 1; student from standard instruction group left district, results not included in results analysis.</td>
<td></td>
</tr>
<tr>
<td>Between posttest and follow-up: 3; students from Write Start group left district, results not included in follow-up analysis.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>#/% Male</th>
<th>71/51.4%</th>
</tr>
</thead>
<tbody>
<tr>
<td>#/% Female</td>
<td>67/48.6%</td>
</tr>
</tbody>
</table>

**Ethnicity**
- Not recorded

**Disease/disability diagnosis**
- Seven students in the Write Start program received individualized education programs (IEPs). Specifics about IEP referrals and educational diagnoses were not included in the article, though it can be assumed that not all IEP referrals were handwriting/writing-based, as one of the students in the high-performing group received an IEP

Check appropriate group:

<table>
<thead>
<tr>
<th>Group</th>
<th>Brief Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;20/study group</td>
<td>Four first-grade classrooms (n = 80) received the Write Start program led by the co-teaching team. All lowercase manuscript letters were taught in a developmental sequence. Each session included instruction; small-group practice with peer modeling, feedback, and self-evaluation; activities reinforcing handwriting fundamentals; story writing activities; modeled</td>
</tr>
</tbody>
</table>
letter formation; simple and consistent verbal and visual cues; frequent and immediate feedback; and monitored performance.

Write Start students were further categorized by their baseline legibility scores for pretest–posttest data analysis purposes: a low-performing group (<50% legibility, \(n = 24\), 6 with IEPs), an average-performing group (50%–80% legibility, \(n = 34\), 0 with IEPs), and a high-performing group (>80% legibility, \(n = 19\), 1 with an IEP).

<table>
<thead>
<tr>
<th>Setting</th>
<th>First-grade classrooms within Dublin City Schools school district</th>
</tr>
</thead>
<tbody>
<tr>
<td>Who Delivered?</td>
<td>A co-teaching team, consisting of a first-grade teacher, intervention specialist (special educator), and an occupational therapist</td>
</tr>
<tr>
<td>Frequency?</td>
<td>Twice weekly for 45 minutes per session</td>
</tr>
<tr>
<td>Duration?</td>
<td>12 weeks, for each of 2 school years</td>
</tr>
</tbody>
</table>

Group 2 (comparison group)

<table>
<thead>
<tr>
<th>Brief Description</th>
<th>Four first-grade classrooms ((n = 58)) received standard handwriting and writing instruction that followed the district’s writing curriculum. The district writing curriculum included word books and visual letter models. One or two letters were introduced or reviewed during each session. Sessions included teachers reinforcing letter formation using students’ writing assignments or “sentence of the day,” completion of short writing assignments.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Setting</td>
<td>First-grade classrooms within Dublin City Schools school district</td>
</tr>
<tr>
<td>Who Delivered?</td>
<td>Four teachers</td>
</tr>
<tr>
<td>Frequency?</td>
<td>3–4 mornings per week, with 15–20 minutes per session</td>
</tr>
<tr>
<td>Duration?</td>
<td>12 weeks, for each of 2 school years</td>
</tr>
</tbody>
</table>

**Intervention Biases:** *Circle yes or no and explain, if needed.*

Contamination

YES/NO

Co-intervention

YES/NO

Timing

YES/NO

Site

YES/NO

Use of different therapists to provide intervention
MEASURES AND OUTCOMES
Complete for each relevant measure when answering the evidence-based question:
Name of measure, what outcome was measured, whether the measure is reliable and valid (as reported in article – yes/no/NR [not reported]), and how frequently the measure was used.

The Evaluation Tool of Children’s Handwriting-Manuscript (ETCH-M) was used to assess students’ lowercase legibility and speed. “Students were required to write the lowercase alphabet by memory. A percentage score was generated based on the number of legible letters, using the manual’s criteria for legibility. The time (in seconds) a student required to write the lowercase alphabet yielded a speed score” (p. 693).

- Reliability: Yes; moderate test–retest reliability for total letter legibility ($r = .77$)
- Validity: Yes; high construct validity comparing ETCH-M and teachers’ ratings of handwriting (values not reported)
- The authors found a high correlation between the teachers’ ratings of handwriting and ETCH-M scores (95% agreement).
- Frequency: At baseline, 1 week after intervention, and 6 months (follow-up) after intervention
- Measured by graduate students blinded to time and group

“The Woodcock-Johnson III Tests of Achievement (WJIII) is a norm-referenced, widely used test of academic achievement” (p. 693). Two portions, the Writing Fluency and Writing Samples tests, were used to assess students’ handwriting fluency and handwriting fluency.

For the Writing Fluency test, students were instructed “to compose a short sentence from three words written beside a picture. The standard procedures and criteria were used. A student was awarded 1 point for each grammatical sentence that used all three words exactly as they were listed” (p. 693).

“For the Writing Samples test, students were instructed to write a word or a sentence describing a picture. This test required retrieval of word meaning and syntactic information” (p. 693).

- Reliability: Yes; high reliability for both test portions used (no values reported); good interrater reliability ($rs = .89–.90$)
- Validity: Not reported
- Frequency: At baseline, 1 week after intervention, and 6 months (follow-up) after intervention
- Measured by graduate students blinded to time and group

Measurement Biases
Were the evaluators blind to treatment status? Circle yes or no, and if no, explain.

**YES/NO**

The same co-teaching teams implemented the program in both years.
Recall or memory bias. *Circle yes or no, and if yes, explain.*

**YES/NO**

**RESULTS**
List results of outcomes relevant to answering the focused question. Include statistical significance where appropriate (*p* < 0.05). Include effect size if reported.

- All students significantly improved in handwriting legibility and speed (*p* < .001).
- Students who completed the Write Start program improved more in handwriting legibility than the group receiving standard instruction (*p* < .001, *d* = 0.60). At 6-month follow-up, the Group x Time interaction for legibility remained significant (*p* = .001, *d* = 0.59).
- Students who completed the Write Start program improved more in handwriting speed than the group receiving standard instruction (*p* = .025, *d* = 0.52). At 6-month follow-up, the Group x Time interaction for speed remained significant (*p* = 0.16, *d* = 0.58).
- The two groups performed similarly on writing fluency and written composition sample posttests, and the Time x Group interaction effect was not significant (*d* = .06 and *d* = .04, respectively).
- At 6-month follow-up, students who completed the Write Start program improved significantly more in writing fluency than the students receiving standard instruction (*p* = .005, *d* = .60).
- At 6-month follow-up, the two groups did not differ on their scores of writing composition samples (*p* = .456, *d* = 0.11), but both scored near the maximum points possible.
- At 6-month follow-up, all performance groups in the Write Start program made significant improvement in legibility (low, 39.6%; average, 29.9%; high, 12.7%), but the high-performing students exhibited a ceiling effect.
- The low-performing group in the Write Start program improved significantly more than the high-performing group in legibility as indicated by the Time x Group interaction effect (*p* < .0001).
- At 6-month follow-up, all performance groups in the Write Start program significantly improved in handwriting speed, but their differences in gains demonstrated a Time x Group interaction effect (*p* = .018)
- All performance groups in the Write Start program improved significantly in writing fluency (*p* < .001), though the high- and average-performing groups improved more than the low-performing group. The Group x Time interaction was significant (*p* < .006).
- All of the performance groups in the Write Start program improved significantly in written composition (*p* < .001), and the low-performing group improved more (4.3 points) than the average- and high-performing groups (note: ceiling effect limited score improvement). The Time x Group interaction was significant (*p* < .001).

Was this study adequately powered (large enough to show a difference)? *Circle yes or no, and if yes, explain.*
Were appropriate analytic methods used? Circle yes or no, and if no, explain.

YES/NO

Were statistics appropriately reported (in written or table format)? Circle yes or no, and if no, explain.

YES/NO

CONCLUSIONS

State the authors’ conclusions that are applicable to answering the evidence-based question.

The Write Start program, developed by the authors of this study, is a “handwriting and writing program that is co-taught by teachers and occupational therapists to provide well-designed instruction with classroom-embedded individualized supports to prevent handwriting problems and promote writing fluency in first-grade students of all ability levels” (p. 691). Write Start emphasizes instruction; small-group practice with peer modeling, feedback, and self-evaluation; activities reinforcing handwriting fundamentals; story writing activities; modeled letter formation; simple and consistent verbal and visual cues; frequent and immediate feedback; and monitored performance.

This study sought to determine whether the Write Start program, when compared to standard handwriting and writing instruction, would result in greater improvement in first-grade students’ handwriting legibility and speed, writing fluency, and written composition. It also sought to determine whether Write Start program students with varying baseline abilities would make significant progress and demonstrate significantly different rates of progress in handwriting legibility and speed, writing fluency, and written composition.

Students who received the Write Start program improved more in legibility and handwriting speed than students who received standardized instruction. It was not until the 6-month follow-up assessment that the Write Start students demonstrated higher writing fluency. The 6 months between posttest and follow-up assessments may have provided students with ample time to achieve handwriting automaticity, which in turn may have allowed their cognitive resources to focus more on ideas and subject knowledge than on the handwriting itself. Students of all performance levels in the Write Start program showed improvements. At the 6-month follow-up, the low-performing students improved significantly more than high-performing students in handwriting legibility, while the average- and high-performing students improved significantly more in writing fluency.

The co-taught Write Start program may benefit first-grade students with diverse needs, especially those who are at risk for handwriting and writing problems. Implementation of the Write Start program may facilitate students’ handwriting development and success when writing demands increase.
This work is based on the evidence-based literature review completed by Hannah M. Goldner, OTS, and Margaret Morris, OTD, OTR/L, Faculty Advisor, Tufts University.


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