
Outcomes Associated With a Summer Handwriting Course for Elementary Students

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OBJECTIVE. The purpose of this study was to examine the benefits of a summer handwriting instruction course offered to community elementary-age students.

METHODS. Twenty-six students participated in the study and attended instruction for 1 hour per day for 2 weeks. Pre- and posttesting with the Evaluation Tool of Children's Handwriting (ETCH) were conducted. Parents were also asked to rate their child's handwriting at pretest, posttest, and 3 months posttest.

RESULTS. Participants made significant improvement in two subtests of the ETCH and in parent ratings between pretest and posttest. Parent ratings remained significantly improved 3 months posttesting. Additional results suggest that children who received special education during the previous school year improved their handwriting scores on the ETCH to a greater degree than those who did not receive special education.

CONCLUSION. A new service delivery model for handwriting instruction has the potential to benefit students. Occupational therapists should consider offering handwriting training to students in the summer especially if deterioration of performance is anticipated.

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The use of paper and a writing implement is a common and frequent part of every child's school day. Children use crayons, paintbrushes, pencils, markers, pens, and chalk to make creative art projects, respond on academic work sheets, and demonstrate their knowledge in narrative form. The use of paper and a writing implement has been found to constitute 3.7% of the school day for Head Start preschool students, 19.3% of the day for kindergartners, and 26% to 51% of the day for second, fourth, and sixth graders (Marr, Cermak, Cohn, & Henderson, 2003; McHale & Cermak, 1992).

Limited legibility on handwritten school assignments such as spelling tests or creative writing can negatively influence the scores received, resulting in a lower score than what would otherwise have been earned (Briggs, 1980; Chase, 1986; Eames & Loewenthal, 1990; Sprouse & Webb, 1994; Sweedler-Brown, 1992). The scores earned by elementary students (up to the sixth grade) are more likely to be affected by illegible handwriting. In higher grades, computer-generated assignments are encouraged and are more common, altering the dynamic between legibility and grade. One exception is the recent addition of a handwritten essay to the Scholastic Aptitude Test, which may have a negative impact on the students as they advance toward higher education (The College Board, 2005).

It is common for elementary-school children with handwriting difficulties including legibility problems to receive remedial instruction from their teacher or be referred to occupational therapy for evaluation and intervention. Tait (1998) found that 98% of occupational therapists working in schools reported referrals for handwriting. Although remedial instruction and/or occupational therapy intervention may be warranted, handwriting instruction during the school day may not be available or sufficient to address the issue. Several reasons may contribute to this: lack of teacher's time for remedial instruction, classroom focus is on written composition rather than handwriting, or lack of continued handwriting progress over

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the summer months (Bergman & McLaughlin, 1988; Keller, 2001; Spillman, Friedman, & Hutchcraft, 1994).

Although some research has been conducted examining the effectiveness of school-day remedial handwriting intervention programs conducted by occupational therapists with positive outcomes (Case-Smith, 2002; Lockhart & Law, 1994; Peterson & Nelson, 2003; Sudsawad, Trombly, Henderson, & Tickle-Degnen, 2002), no known research has addressed other models of providing remedial handwriting instruction. An alternative to the school-day traditional model is to provide handwriting instruction over the summer months.

Handwriting instruction during the summer months has several advantages. It provides intense, focused instruction, is conducted when the stress of school performance is low, and can allow children to see that others have similar challenges in this arena. An additional benefit to summer instruction comes from motor learning theory that points to the benefits of supplementary handwriting practice leading to skill development (Shumway-Cook & Woollacott, 2000). If a nonschool-year method of service delivery is found to be effective and long-lasting, children may be able to improve their handwriting performance during the subsequent school year. The purpose of this study was to evaluate the benefits associated with summer handwriting instruction for elementary-age children. Specifically, what is the relationship between summer handwriting instruction and handwriting performance?

Methods

Design and Participants

This study used a single-group pretest, posttest design (Dumholdt, 2005) and was approved by the Institutional Review Board of the sponsoring college. The participants were children whose families responded to a flyer sent home with students through local elementary schools in a suburban/rural area of upstate New York. The flyers were prepared by the college and sent to the elementary schools located closest to the college. Any family interested in enrolling their child was welcome. The final sample of convenience was a total of 36 children who participated over two summer sessions during the summers of 2002 and 2003. Each family paid a small tuition fee and provided their own transportation. Twenty-six of the children completed both the pretest and posttest and provided signed consent forms. Table 1 provides demographic information on the 26 study participants. Although diagnostic information was not collected, 13 of the 26 children received some type of special education and/or therapy services during the previous school year. Eight of those 13 children received

Table 1. Participant Characteristics (N = 26)

Mean and <i>SD</i> of Age (years)	8.4 (1.6) ^a
Range of Ages (years)	6.2–11.9
Number of Children per Grade Level ^b	
First	4
Second	7
Third	5
Fourth	5
Fifth	3
Sixth	2
Gender	
Male	15
Female	11
Hand Dominance	
Right	22
Left	4
Special Education	
Yes	13
No	13
Type of ETCH Administered	
Manuscript	18
Cursive	8

Note. ^aAge at the beginning of the course. ^bGrade level the child will be entering following the course.

occupational therapy, 3 received physical therapy, 5 received speech services, and 4 received special education through a resource teacher. No child withdrew from the course before its conclusion, and attendance was generally good. Eighteen children attended all classes, 4 children missed one or two classes, 2 children missed three classes, and 2 children missed four or five classes.

Measures

The Evaluation Tool of Children's Handwriting (ETCH; Amundson, 1995) was used to assess handwriting performance on the first and last day of the class. The ETCH was developed for children from 6 to 12 years old and can be administered in one of two formats: cursive or manuscript. Both formats include five tasks: writing the alphabet from memory (both upper- and lowercase), copying a near-point model sentence, copying a far-point model sentence, writing from dictation, and composing a sentence. The following scores representing the percent of legible letters or words in each task were used for analysis in this study: alphabet lowercase score, alphabet uppercase score, near-point letter score, near-point word score, far-point letter score, far-point word score, dictation letter score, dictation word score, compose a sentence letter score, compose a sentence word score, total letter score, and total word score.

Three additional elements of the ETCH were not used in the analysis for this study. The subtest task of writing in cursive from a manuscript model was not used for analysis, as it is not included in both the cursive and manuscript formats. The subtest of writing numerals from memory was not included in the data analysis, as numeral writing was

not taught in this summer program. Handwriting speed was not analyzed in this study, as improving speed was not emphasized in the summer handwriting instruction. In fact, children were encouraged to take their time to promote quality performance.

Test-retest reliability on the ETCH has been reported as .77 for total letter legibility and .71 for total word legibility, and interrater reliability on three raters was found to range from ICC = .82 to ICC = .84 (Diekema, Deitz, & Amundson, 1998). All tests in this study were scored by an occupational therapist who was experienced with the ETCH, was not involved in the handwriting instruction course, and was blind to whether a test was a pre- or posttest.

To assess the long-term impact on handwriting performance, on the first day of instruction, the last day of instruction, and 3 months after the conclusion of instruction, a parent was asked to rate each child's handwriting on a 5-point Likert scale ranging from definitely below average to definitely above average. The final round of data collection was conducted by phone and not all parents were able to be contacted ($n = 21$).

Procedure

In May of 2002 and 2003, flyers were sent to the schools. The schools were asked to distribute a flyer to each child to take home to his or her family. The flyer, describing the format of the course, invited parents to register their children for 2-week, 1-hour-per-day handwriting instruction using the Handwriting Without Tears curriculum (Olsen, 1999). This curriculum was chosen because of its developmental approach of grouping letters based on difficulty, the simple vertical writing style, and the fun format of the program. Families designated on the registration form the type of handwriting instruction they wanted their child to receive: manuscript or cursive. Generally, parents signed their child up for the type of instruction that would be used in the upcoming school year. An exception was found in the third- and fourth-grade students. Cursive handwriting instruction is commonly introduced in the third grade in the northeastern United States; however, of the five children about to enter third grade, none were signed up for cursive instruction. Additionally, only three of the five fourth graders were signed up for cursive instruction. For those choosing manuscript instructions, the Handwriting Without Tears book titled *Printing Power* was used. For those choosing cursive instructions, the Handwriting Without Tears book titled *Cursive Success* was used. On the first day, consent forms for the study were signed by the parents or legal guardians and verbal assent was received from the children as required by the Institutional Review

Board of the sponsoring college. Each child was tested with the ETCH (manuscript or cursive, depending on which training group he or she was to attend) and was given some initial instruction on pencil grip, posture, an overview of the curriculum, and some initial letter instruction. Volunteer occupational therapists familiar with the ETCH assisted in the test administration. Two occupational therapy faculty from the sponsoring college who had participated in a Handwriting Without Tears curriculum workshop conducted the handwriting instruction. Each of the non-testing days started with gross and fine motor activities meant to prepare the hands (Amundson, 1998; Benbow, Hanft, & Marsh, 1992; Olsen, 1999) and was followed by specific letter training. Homework was assigned each night and generally consisted of one half to one full page of writing. During the 2nd week, homework assignments emphasized writing sentences and paragraphs as appropriate for each child's abilities. Participant compliance with homework assignments was not recorded; however, instructors estimate that the homework was completed by over 90% of the participants. On the last day of instruction, the ETCH was readministered.

Results

Calculation of each of the 12 ETCH scores was conducted for mean, standard deviation, and effect size. Paired sample t tests between the pretest and posttest scores also were conducted. The results are found in Table 2. An alpha level of .004 was applied after making a Bonferroni adjustment for the 12 t tests conducted. Two ETCH subtests produced a significant change from pretest to posttest; alphabet (lowercase) and alphabet (uppercase). Effect sizes also were calculated and the alphabet (lowercase) produced an effect size of .5. Effect sizes of .50 or greater indicate an improvement that is clinically valuable (Cohen, 1988).

Paired sample t tests analyzed the Likert ratings provided by the parents. Mean and standard deviation of parent ratings at each of the three data collection points are presented in Table 3. A t test that analyzed change over time found a significant difference from the beginning of the instruction to the end of the instruction ($t = -6.4, p = .000$), which was maintained 3 months later despite a slight drop in the mean rating ($t = -4.26, p = .000$). The effect size from preinstruction to 3-months postinstruction was .74, which is considered large (Cohen, 1988).

Change scores (posttest minus pretest) for all ETCH subtests as well as parent rating scores from the beginning of the course to 3 months after the course were analyzed on sample subgroups to determine interaction effects. Table 4 presents the subgroup t test results. Only two sets of scores

Table 2. Evaluation Tool of Children's Handwriting (ETCH) (Percent Legible) Subtest Scores

ETCH Subtest	Pretraining Mean (SD)	Posttraining Mean (SD)	<i>t</i>	<i>d</i>
Alphabet (lowercase)	64.3 (28.6)	77.7 (24.6)	-3.8*	.5
Alphabet (uppercase)	61.7 (28.5)	71.2 (26.6)	-3.3*	.34
Near-Point Letter	77.6 (20.2)	82.7 (21.5)	-1.7	.24
Near-Point Word	57.7 (33.1)	50.8 (32.6)	1.4	-.21
Far-Point Letter	71.7 (22.6)	76.3 (23.3)	-1.4	.2
Far-Point Word	60.4 (29.3)	55.9 (35.3)	.8	-.13
Dictation Letter	75.9 (21.8)	77.5 (25.1)	-4	.07
Dictation Word	57.1 (41.2)	64.8 (39)	-1.0	.19
Sentence Composition Letter	74.5 (16.6)	75 (26.9)	-.1	.02
Sentence Composition Word	57.8 (35.6)	65.5 (33.8)	-1.3	.22
Total Letter Legibility	71.0 (16.9)	77.5 (19.4)	-2.7	.36
Total Word Legibility	57.1 (29.9)	59.2 (27.9)	-6	.07

Note. * $p \leq .004$

demonstrated significant difference between groups on any ETCH scores or on parent ratings; those receiving cursive instruction improved significantly more when writing the alphabet in uppercase and those receiving special education during the previous school year improved significantly more when writing the lowercase alphabet.

At pretest, those children receiving special education during the previous school year were significantly different from children not receiving special education during the previous school year on 8 of the 12 ETCH subtests (alphabet lowercase score, alphabet uppercase score, far-point letter score, far-point word score, dictation letter score, compose a sentence letter score, compose a sentence word score, and total letter score); therefore, independent sample *t* tests were conducted between the two groups on posttest scores. Results suggested that children receiving special education during the previous school year were significantly different from children not receiving special education during the previous school year on only 6 of the 12 subtest scores at posttest (alphabet lowercase, far-point letter score, near-point letter score, compose a sentence letter score, compose a sentence word score, and total letter score).

Discussion

Two weeks of handwriting instruction was associated with significant changes in upper- and lowercase alphabet writing across children with a wide range of characteristics. Significant changes in these subtests of single-letter writing

Table 3. Means and Standard Deviations for Parent Rating of Handwriting

	Pretraining ^a	Posttraining ^b	3 Months Posttraining ^c
Mean (SD)	2.1 (.91)	3.5 (1.1)	2.8 (.98)
Range	1-4	2-5	1-5

Note. Parent rating was on a scale of 1-5 (1 = definitely below average; 5 = definitely above average). ^a $N = 26$, ^b $N = 25$, ^c $N = 21$.

may reflect the focus of the curriculum and the time spent on the various aspects of handwriting. Although the 2nd week was meant to focus on sentence and paragraph writing, it is possible that individual letter formation was actually stressed throughout the entire training. This may be particularly true for the students receiving manuscript training as they may not have been developmentally ready to focus on legibility issues for an entire sentence.

Parent rating of handwriting, although subjective, showed significant improvement after only 2 weeks and was maintained after 3 months. The parents were clearly invested in having their children improve handwriting performance based on the fact that they registered their child for the instruction and were willing to pay a registration fee and provide transportation. This investment may make it difficult to provide an objective rating on performance and may have biased their ratings in a positive direction.

There was limited evidence that benefits could be associated with specific groups of children. The cursive group did make significantly greater improvement in uppercase alphabet performance. This may be due to limited time spent in uppercase instruction in school. The Handwriting Without Tears training may have provided that extra time to help children improve in that area. Children receiving special education made significantly more improvement in lowercase writing than nonspecial education students and were found to be no different in two additional subtests of the ETCH from pretest to posttest (i.e., pretest found 8 out of 12 subtests were significantly different but posttest found 6 out of 12 subtests significantly different). These results suggest that students receiving special education may gain more from the summer instruction than their nonspecial education peers. Although the special education students made significantly more progress in only one subtest (lowercase writing), that may be the area that could have the most impact on classroom function as lowercase letters are the most common letters written.

Table 4. Mean Change Scores and *t* Tests Among Subgroups of Students

	AlphaLC	AlphaUC	NPL	NPW	FPL	FPW	DicL	DicW	SCL	SCW	TLL	TWL	Parent Rating
Type of ETCH Administered													
Manuscript ^a	13.6	4.8	5.2	-10	5.9	-8.9	-6	11.1	0	14.4	4.8	1.4	.82
Cursive ^b	13.0	16.8	4.8	0	1.7	5.4	6.4	0	1.4	-7.5	10.4	3.7	.29
<i>t</i>	.07	-2.4*	.06	-.93	.59	-1.2	.9	-.7	.13	-1.8	-1.1	-.29	-1.8
Receiving Special Education													
Yes ^c	20.1	10.6	1.8	-6.2	5.6	-3.5	5	5.2	-4.8	5.9	7.0	2.6	.55
No ^d	6.65	6.3	8.3	-7.7	3.6	-5.5	-1.8	10.2	5.7	9.5	6.0	1.6	.73
<i>t</i>	2.0*	.84	-1.1	.15	.32	.18	1.0	-.3	-1.2	.2	.21	.14	-.58
Gender													
Male ^e	13.2	8.6	8.1	-1.3	3.9	-1.9	2.6	11.1	-6.6	10.1	5.8	6.6	.6
Female ^f	13.6	8.3	1.0	-14.5	5.5	-8.0	.2	3	10.1	4.5	7.5	-4.1	.7
<i>t</i>	.06	-.06	-1.2	-1.3	.24	-.6	.3	.5	-1.9	.5	.36	-1.5	-.35

Note. ^a*n* = 18, ^b*n* = 8, ^c*n* = 13, ^d*n* = 13, ^e*n* = 15, ^f*n* = 11. **p* < .05.

AlphaLC = Alphabet Lowercase
 AlphaUC = Alphabet Uppercase
 NPL = Near-Point Letter Copying
 NPW = Near-Point Word Copying
 FPL = Far-Point Letter Copying
 FPW = Far-Point Word Copying

DicL = Dictation Letter
 DicW = Dictation Word
 SCL = Sentence Composition Letter
 SCW = Sentence Composition Word
 TLL = Total Letter Legibility
 TWL = Total Word Legibility

Limitations

Several limitations need to be considered with this study. Caution should be used when interpreting the results due to the small sample size. These results should be considered a pilot study. Additionally, the ETCH is a widely used handwriting assessment but may not be the best tool to use to measure change with this curriculum. Handwriting Without Tears letter formation may not be compatible with the scoring criteria from the ETCH, making it difficult to measure change in legibility performance. It cannot be assumed that these changes are associated with changes in classroom performance because no relationship between ETCH scores and first-grade teachers' judgments in either general legibility or task-specific legibility has been found (Sudsawad, Trombly, Henderson, & Tickle-Degnen, 2001).

Future Research

Several areas for future research are needed. First, although some change in handwriting performance was seen in this study, future studies should examine if a longer period of instruction or longer instructional sessions could improve other categories such as word legibility. Outcomes of future studies would be strengthened by adding a control group. Second, because parent ratings are difficult to interpret because of the potential for bias, future research also needs to retest children longitudinally and/or ask teachers to rate handwriting pre- and posttraining.

Finally, it cannot be determined if classroom performance changed in association with instruction; however,

because near-point copying and far-point copying, which make up a large portion of classroom work, did not significantly change, it is possible that there was no related change in classroom performance. The effect on classroom performance needs to be further explored for its potential to benefit handwriting without disrupting the child's school time. Another alternative to examine would be handwriting instruction that is provided in an after-school format.

Conclusion

Summer handwriting instruction was associated with significant changes in the legibility of writing the upper- and lowercase alphabets. Parent ratings demonstrated their perspective of improvement over the 2-week period of the instruction as well as maintaining improvements 3 months after its conclusion. Although the effectiveness of this approach remains to be tested in a controlled study, occupational therapists should consider offering handwriting instruction to students in the summer especially if deterioration of performance is anticipated. ▲

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