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The Impact of Transcription Writing Interventions for First-Grade Students

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Abstract

We examined the effects of transcription instruction for students in first grade. Students in the lowest 70% of the participating schools were selected for the study. These 81 students were randomly assigned to: (a) spelling instruction, (b) handwriting instruction, (c) combination spelling and handwriting instruction, or (d) no intervention. Intervention was provided in small groups of 4 students, 25 min a day, 4 days a week for 8 weeks. Students in the spelling condition outperformed the control group on spelling measures with moderate effect sizes noted on curriculum-based writing measures (e.g., correct word sequence; g range = 0.34 to 0.68). Students in the handwriting condition outperformed the control group on correct word sequences with small to moderate effects on other handwriting and writing measures (g range = 0.31 to 0.71). Students in the combined condition outperformed the control group on correct word sequences with a small effect on total words written (g range = 0.39 to 0.84).

Proficient writing is one key to academic and work place success, and writing instruction can assist with this success by positively impacting achievement (Bangert-Drowns, Hurley, & Wilkinson, 2004; Graham & Perin, 2007; National Commission on Writing, 2005). However, current trends suggest school-age children in the United States do not reach their potential in writing with the large majority of students (approximately 70%) reaching only basic levels of written communication (National Center for Education Statistics, 2011). These difficulties with writing may begin as early as first grade (Juel, 1988), where grade level expectations for early writers are to be able to write sequential stories and informational text regarding experiences, people, and events (National Governors Association, & Council of Chief School Officers, 2010).

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Poor writing achievement may be a consequence of the writing instruction typically available to students in the elementary grades. Over a decade ago, the National Commission on Writing in America's Schools and Colleges (2003) called writing the "neglected R" (p. 3) across the grade levels and specifically noted limited time devoted to writing assignments at the elementary level. Studies examining teachers' instruction have consistently noted a wide variation across teachers or schools in the amount and quality of writing instruction available to elementary students (Bridge & Heibert, 1985; Cutler & Graham, 2008; Puranik, Al Otaiba, Folsom, & Greulich, 2014; Wharton-McDonald, Pressley, Hampston, 1998). Recommendations for kindergarten students are for 30 min of writing instruction per day (Graham, McKeown, Kiuahara, & Harris, 2012), but few studies have directly examined the amounts and types of instruction in the skills that are necessary for early writers to progress in their written composition and their effects on writing achievement. One study of handwriting instruction in kindergarten (Hart, Fitzpatrick, & Cortesa, 2010) employed teacher survey and direct observation of instruction and noted handwriting instruction was typically a daily practice for about the first 5 weeks of school, but tapered off to 3–4 days per week after that. Puranik et al. (2014) observed kindergarten writing during the language arts block and noted writing and writing-related activities occurred an average of 6 min in the fall and 11 min in the winter, with most of the time devoted to students writing independently. Handwriting and spelling instruction occurred less than 2 min each on average. Similar to other research on early writing instruction, significant variability was noted in the amount of writing instruction provided in different classrooms.

Theoretical Foundations

Transcription skill, the basic writing skill that involves written production of letters and words, is one of the necessary component skills of writing according to the developmental models of writing. Both the simple view of writing (Berninger et al., 2002; Juel, Griffith, & Gough, 1986) and the not-so-simple view of writing (Berninger & Winn, 2006) theorize that, in addition to oral language and executive function, transcription skills are necessary for writing ability. Essentially, transcription skill is theorized to allow students to compose written text from their generated ideas. Previous research has validated the role of transcription skills in writing (Berninger, 1999; Graham, Berninger, Abbott, Abbott, & Whitaker, 1997; Jones & Christensen, 1999; Kim, Al Otaiba, Wanzek, & Gatlin, 2015; Kim, Al Otaiba, Puranik, Folsom, Greulich, & Wagner, 2011; Wagner et al., 2011). Further, automaticity in transcription skills can facilitate idea generation and development as students focus their mental resources on ideas rather than on producing correct spelling or handwriting of the written text (Berninger & Swanson, 1994; Graham, Harris, & Fink, 2000; Graham et al., 1997; Scardamalia, Bereiter, & Goleman, 1982). Writing fluency and quality is negatively affected when the writer has inefficient transcription skills (Bourdin & Fayol, 1994; Olive & Kellogg, 2002). Thus, for young writers, written composition can be constrained by their developing transcription skills, and not surprisingly correlations between writing quality, productivity, and transcription skills are strong for elementary age students (e.g., Abbott & Berninger, 1993; Graham et al., 1997; Jones & Christensen, 1999; Kim, Al Otaiba, Folsom, Greulich, & Puranik, 2014; Olinghouse & Graham, 2009).

Transcription skills, operationalized as spelling abilities and handwriting fluency, and their relationships to writing productivity and quality have been examined in several research studies. Spelling requires phonological awareness, letter-sound correspondence knowledge, morphological awareness, and orthographic awareness (Bourassa, Treiman, & Kessler, 2006; Kim, Apel, Al Otaiba, 2013; Kim et al., 2014). Handwriting fluency relates to a student's ability to accurately and efficiently write letters and words, which is a necessary aspect of converting ideas into the written form. It does require different processes than spelling (Graham et al., 1997). Handwriting fluency has been found to be related to both writing quality and productivity (Graham et al., 1997; Kent, Wanzek, Petscher, Al Otaiba, & Kim, 2014; Kim et al., 2014; Kim et al., 2011; Wagner et al., 2011). Together spelling and handwriting fluency accounted for 66% of the variance in compositional productivity and 25% of variance in students' writing quality in the early elementary grades (Graham et al., 1997). Even as early as kindergarten, transcription skills uniquely predict students' writing productivity over and above language, reading, and IQ abilities (Puranik & Al Otaiba, 2012). Thus, transcription skills appear to be an important aspect of early writers' success. Additional research has begun to examine the effects of instruction in transcription skills for early elementary students.

Transcription Instruction

A recent meta-analysis of writing instruction for students in the elementary grades found that elementary students who were taught transcription skills performed significantly better than comparison groups on measures of writing quality with an average weighted effect size of 0.55 (Graham et al., 2012). Five of the studies examined handwriting instruction and three studies examined spelling instruction. Based on the meta-analytic findings, the authors included a recommendation that in the early elementary grades, students should receive explicit instruction in spelling and handwriting/keyboarding. However, the authors noted there is limited research at the earliest grade levels, particularly in first grade.

Only two of the published studies examined by Graham et al. (2012) included first graders; both implemented handwriting interventions. One study (Jones & Christensen, 1999) found that students struggling with handwriting could improve handwriting skill and writing quality to match their higher level peers after 10 min daily sessions over 8 weeks. Instruction for the struggling writers in this quasi-experimental study focused on the formation of letters, corrective feedback, and fluent writing of letters. In the second study, Graham, Harris, and Fink (2000) examined the effects of handwriting instruction for first graders with and without disabilities relative to students receiving phonological awareness instruction. In both conditions, intervention was provided for 27 sessions each lasting 15 min. Students learned the names of the letters, formation of the letter through teacher modeling and discussion of the formation, tracing the letter, and practicing the letter with and without a copy of the letter. Students in the handwriting condition performed significantly better in handwriting and writing productivity on the immediate posttests as well as a 6 month follow-up, with similar effects for students with and without disabilities. Effect sizes for writing letters outcomes ranged from $d = 0.94$ to $d = 1.46$ at posttest with writing fluency effect sizes ranging from $d = 0.76$ to $d = 1.21$. There was no statistically significant improvement in writing quality.

Another study of first graders, conducted by Berninger et al. (1997), examined the effect of handwriting instruction on writing productivity across 24 sessions of 20 min each with five handwriting conditions that were compared to a phonological awareness control condition. The five conditions included (a) the instructor modeling the letter followed by students writing the letter, (b) the students writing the letter while examining a copy of the letter with numbered arrows showing the steps for producing the letter, (c) the students examining a copy of the letter with numbered arrows showing the steps for producing the letter and then write the letter from memory, (d) the students writing the letter while looking at an unmarked copy of the letter, (e) the students examining an unmarked copy of the letter and then write the letter from memory. Handwriting instruction was provided during the first half of the session and was followed by students writing and sharing their writing during the second half of the session. All of the handwriting conditions were more beneficial than the phonological awareness control condition for improving students' handwriting abilities. The handwriting condition where students' examined a model of the letter written with numbered arrows for producing the letter and then wrote the letter from memory had the highest effects on students' handwriting and also produced significantly greater gains on a standardized writing productivity test.

Although no studies were located by Graham et al. (2012) that included spelling intervention at first grade, spelling intervention has been noted to improve students' writing productivity for students in Grades 2 and up (Berninger et al., 1998; Berninger et al., 2002; Graham, Harris, & Chorzempa, 2002). Spelling intervention in these studies typically involved teaching letter-sound relationships, spelling patterns, use of these relationships and patterns to spell or build words, as well as instruction in spelling words that do not fit the typical patterns. Berninger et al. (2002) found third grade students receiving spelling or writing instruction performed significantly higher than a control group on spelling of taught words, but a standardized measure of spelling did not yield differences among the study groups. In another study of spelling intervention with second graders, Berninger et al. (1998) also found improvements on taught words but not on standardized measures of spelling. Graham et al. (2002) examined spelling intervention for second graders and reported significant benefits for the treatment on three of six standardized spelling scores as well as writing fluency and decoding. In addition to providing the intervention to younger students, the spelling intervention by Graham et al. was implemented for twice as many sessions as the spelling interventions examined in the Berninger et al. studies.

The extant literature suggests that early instruction in transcription skills can not only improve transcription skills, but also generalize to early writers' achievement, particularly in writing productivity. These findings support the theoretical views described earlier that efficient transcription skills are a necessary aspect of successful writing. However, the previous work has not fully examined these interventions at the earliest grades, including first grade, and no study has examined the effects of combining spelling and handwriting in one intervention.

The Present Study

Given the importance of transcription skills to students' writing, perhaps particularly at the earliest elementary grades, we sought to examine the effects of transcription instruction for students at-risk for writing difficulties in first grade. Specifically, the purpose of this study was to examine the effects of providing a spelling, handwriting, or combination spelling and handwriting intervention for first grade students at risk for written expression difficulties.

Method

Participants

This study was conducted in two schools located in a mid-sized city in the southeastern United States. Both schools served a large percentage of students from low-income backgrounds, and free lunch was offered to all of the students at each of the two schools. At the beginning of the year, all consented first grade students ($n = 125$) were screened on two writing prompts (see below) for potential participation in the study. Students were rank ordered on the composite total number of words written (TWW) and then again on composite correct word sequences (CWS). Students who scored in the lowest 70th percent on both TWW and CWS were selected for the intervention.

The sample consisted of a total of 81 students, of which 45 (55.6%) were male. Students' mean age was 6.63 years ($SD = 0.40$), ranging from 6.06 to 7.88 years. The majority of the participants were White ($n = 53$; 65.4%), 22 were African American (27.2%), and the remaining 7.4% ($n = 6$) consisted of students who identified as Multiracial or Other. Eight students (9.9%) were also Hispanic. There were no significant differences between the study conditions on any of the demographic variables. Over the course of the study, two students moved to different schools (1 from spelling intervention, 1 from the control group), and one student (spelling) withdrew assent.

Procedures

Qualifying students were pretested (see Measures) and randomly assigned within school to one of four conditions: (a) spelling, (b) handwriting, (c) combination spelling and handwriting, or (d) no intervention through stratification (rank ordering) based on their composite CWS score. In other words, students' total CWS scores from both prompts were ordered from lowest to highest and students were then randomly assigned to condition within the rank ordering. Students in each of the treatment conditions (spelling, handwriting, or combination spelling and handwriting) were then placed into homogenous instructional groups of four students within their schools. These clusters were based on each student's CWS screening score so that students with similar scores within each treatment condition were instructed in the same group.

Intervention was provided during non-academic times identified by the schools (e.g., recess, special areas). During these non-academic periods, students in the no intervention control group remained with their classes and did not receive literacy or other academic instruction.

Students who were assigned to treatment received intervention four days a week for 25 min per session. Each of these students completed a total of 24 sessions. Due to various school activities, holidays, and student absences, the 24 sessions were completed over approximately eight weeks. During intervention, the second author conducted informal observations of each interventionist once a week and provided feedback. These observations consisted of the author writing detailed notes during instruction and just after the session, commenting on the session, giving the interventionist feedback for more effective implementation of instruction or providing suggestions for maintaining on-task behavior. Within 2 weeks of the intervention ending, post-tests were administered.

Intervention Descriptions

Spelling—Students assigned to the spelling condition participated in interventionist-directed and engaging activities that emphasized encoding skills. The spelling sections from Book 1 of the *SPELL-Links to Reading and Writing* (Wasowicz, Apel, Masterson, & Whitney, 2004) were used. SPELL-Links is appropriate for first grade students and provides research-based, systematic instruction in the sound structure of English and connecting it to letter sounds and letter patterns for spelling words (Apel, Masterson, & Hart, 2004). Students were taught to segment and discriminate sounds, match sounds to corresponding letters, and create mental images of sight words. The lessons consisted of word study activities that focused on either a subset of consonants (e.g., Section 1: b, p, t, d, v, z, k, and j) or one short vowel sound. Although *SPELL-Links* is originally designed for 30 min of instruction per session, due to time constraints in the present study (i.e., 25 min available for each intervention session), lessons were modified by reducing the number of practice items. In addition, lesson sections focused on decoding, reading fluency, or connected writing were not implemented.

Handwriting—The handwriting condition consisted of lessons from Lesson Set 3, Tier 1 of the *Process Assessment of the Learner (PAL) Handwriting Lessons* used in a previous study of handwriting instruction for first graders (Berninger, 1998). For each lesson, students in the handwriting condition were provided with lined paper and presented with the ball-and-stick style of each letter of the alphabet in a different order with arrows to demonstrate the step-by-step formation of the letter. Interventionists modeled the correct formation of the letter and directed attention to the arrows in the letter presentation. Students were given guidance and specific feedback on letter formation from the interventionist during each session. Students were instructed to slowly and carefully copy the letter three times, covering up the provided letter on the third try. Each interventionist provided specific and corrective feedback using language provided by the curriculum, including verbal cues pointing out the correct positioning of letters relative to the *header* (top solid line), *belt* (middle dashed line), *footer* (bottom solid line), and *basement* (space below the footer). At the end of the lesson when all letters of the alphabet had been copied, the interventionist wrote two words separately for the students using an index card, carefully modeling appropriate letter formation. The students copied these words three times in their workbooks on the lined paper. During the last four weeks of the study, students were given primary lined paper and a writing prompt during the last 5 min of the session. They were instructed

to write neatly and carefully about the topic. Feedback on letter formation was provided during the writing time.

Spelling and handwriting combination—Students in the spelling and handwriting combination condition completed both the *SPELL-Links* and the *PAL* lesson plans described above. In order to keep session time consistent, lessons were modified so that half of the session (12–13 min) would consist of the *SPELL-Links* lesson and the other half would come from the *PAL* handwriting lesson. These modifications consisted of shortening the spelling lessons by deleting some practice items or portions in which repetition occurred, and reducing the repetition in the handwriting portion by having students write letters and words from the handwriting lesson twice as opposed to three times.

Interventionists

Seven interventionists were hired and trained by the researchers to implement the intervention for the treatment groups. All of the interventionists were women, held a minimum of a bachelor's degree, and had previous experience working with children in K-12 settings. Two of the interventionists had bachelor's degrees in elementary education; one was a graduate student in elementary education; another was certified to teach special education; and the remaining interventionists had degrees in other fields including social work and criminology. The interventionists participated in roughly 30 hours of training and practice prior to the intervention implementation. Each interventionist was assigned from one to three instructional groups in the spelling, handwriting, or combined spelling and handwriting condition. Initially, we intended to assign each interventionist to teach each of the three different conditions in order to control for teacher effects. However, due to scheduling conflicts and availability, this was not possible. Therefore, three of the interventionists taught three sessions a day, one of each intervention condition. Another interventionist taught three sessions, but these lessons included two handwriting conditions and one spelling condition. Finally, three of the interventionists taught one intervention each, a spelling group and two combined spelling and handwriting groups.

Fidelity of Implementation

To ensure fidelity of implementation within each intervention condition, two formal observations were conducted for each interventionist for each intervention that she taught. One observation was done in the first four weeks of the intervention period, and the second observation was conducted in the second four weeks of the intervention. The first two authors conducted the observations. These fidelity observations were conducted using a checklist that consisted of a Likert-type scale reflecting both implementation of individual components of each intervention condition and overall quality of implementation. Specifically, the implementation ratings reflected the extent to which the intervention elements and procedures were completed. The observer rated the interventionist on each component on a scale of 1 for weak implementation (less than half of required elements implemented), 2 for adequate implementation (most required elements implemented, or 3 for excellent implementation (all or nearly all of the required elements implemented).

The global quality of implementation rating consisted of separate ratings for both instruction and engagement. For instruction, the rating reflected how well an element was implemented, addressing areas such as pacing and monitoring student performance. The rating of engagement during the lesson was based on the interventionist's interaction with the students during the lesson including facilitating active engagement of students and providing feedback. Overall quality of instruction and student engagement were each rated on a scale of 1 (low) to 5 (high). Twelve of the observations were rated independently by both authors with inter-rater reliability within each intervention condition ranging from .82 – .89 (agreements divided by the sum of agreements and disagreements).

The overall mean implementation fidelity rating across conditions was high: (a) spelling $M=2.57$, $SD=0.05$; (b) handwriting $M=2.66$, $SD=0.22$; and (c) combination spelling and handwriting $M=2.48$, $SD=0.15$ on a scale of 1 to 3. The mean instructional quality ratings were in the high average range based on a scale of 1 to 5. For the spelling condition, the mean instructional quality rating was 4.40 ($SD=0.72$). The average instructional quality rating for the handwriting condition was 4.13 ($SD=0.54$), and the mean instructional quality rating for the combination condition was 3.90 ($SD=1.01$). For quality of engagement, the ratings were also generally high average: 4.63 ($SD=0.75$) for the handwriting condition was, 4.70 ($SD=0.50$), for the spelling condition, and 4.10 ($SD=1.03$) for the combination spelling and handwriting condition.

Measures

Several spelling and writing measures were used to assess the effectiveness of each of the interventions. These assessments were given by trained data collectors (three graduate students in the field of education, one former classroom teacher, and another professional with experience in assessment) who were blind to the study conditions. Before administering assessments to students, each examiner was required to pass fidelity of test administration by administering all assessments to a senior research assistant and scoring 100% in administration accuracy for each measure. All assessments were administered in small groups (up to six students per test administrator). The following measures were administered prior to and following intervention.

Curriculum based writing measures (CBM)—The same two written essays were used for the screening prior to the intervention and as an outcome measure following intervention. Specifically, each student was administered two writing prompts on the same day. For each prompt, students were given ten minutes to write. First, students were given a prompt for an experimental narrative writing task that has been used in previous studies (e.g., Kim et al., 2014; McMaster, Du, & Pestursdottir, 2009; McMaster, Du, Yeo, Deno, Parker, & Ellis, 2011). Students were given primary lined paper with the words “One day when I got home from school...” printed at the top and were told to write about something interesting or unusual that happened on a day when they returned home from school. Subsequently, students were given the Written Essay subtest of the Wechsler Individual Achievement Test – Third Edition (WIAT-III; Wechsler, 2009), which provides an expository writing prompt. In this assessment, students are instructed to write an essay about their favorite game and to include at least three reasons why they like it.

Once the writing samples were collected, each essay was scored by trained research assistants using CBM writing scoring, TWW and CWS, in particular. TWW is a count of all attempted words written in the essay, indicated by students' spacing of individual letters. CWS refers to "any two adjacent, correctly spelled words that are acceptable within the context of the sample"; McMaster & Espin, 2007, p. 76). Two trained research assistants who were blind to study condition scored the essays for each of the components of CBM writing scoring. Interrater reliability was established at .95 for all aspects of CBM scoring components (similarity coefficient; Shrout & Fleiss, 1979) prior to coding at pretest and at posttest. Composite scores from both writing tasks were used to analyze students' written expression skills before and after the intervention.

Spelling measures—Two tasks, one experimental task and one norm-referenced task, were used to measure students' spelling skills. The experimental task was a proximal measure, created by the researchers in order to examine whether the intervention had an effect on directly taught words (e.g., *zap*, *top*) as well as words that were not directly taught but could be spelled using spelling pattern knowledge from the intervention (e.g., *hop*). A total of 20 words were included, consisting mainly of CVC words such as *bet* and *top* and CVCe words like *bake*. The list also contained words with what the *SPELL-Links* program refers to as other "allowable spellings" for short vowel sounds such as *said* and *bread*. Cronbach's alpha at pretest for the experimental spelling assessment was .83 and .82 at posttest.

The norm-referenced spelling task was the Spelling subtest of the Woodcock-Johnson Tests of Achievement – Third Edition (Woodcock, McGrew, & Mather, 2001). This task was used to examine whether the intervention had an effect on general spelling, not necessarily taught in the intervention. The initial items ask students to perform prewriting skills such as drawing lines or tracing letters and progress to letter writing and spelling words correctly. According to the test manual (McGrew, Schrank, & Woodcock, 2007), this test has a median split-half reliability of .89 for the 5–19 age range. The sample reliability was .73 at pretest and .80 at posttest (Cronbach's alpha). Standard scores were calculated based on each student's raw score and their chronological age at the time the test was administered.

Handwriting measures—One experimental task and one norm-referenced task were used to measure students' handwriting fluency skills. The experimental task was a sentence copying task similar to that used in several previous studies (e.g., Connelly, Gee, & Walsh, 2007; Wagner et al., 2011; Zhang, McBride-Chang, Wagner, & Chan, 2014). Students were provided with a laminated strip of paper with the words "The quick brown fox jumps over the lazy dog," a pangram that uses every letter of the English alphabet at least once, and instructed to copy the sentence as many times and as fast and as carefully as they could for a minute. Once testing was over, trained research assistants who were blind to students' study condition scored the tasks for the number of words attempted and the number of word errors. The difference between the two (words attempted minus word errors) provided the number of words correct, which was used in the analysis of the pretest and posttest data. Word errors included words that were copied incorrectly or contained letters that were poorly formed or unreadable. Interrater reliability for this task was .91 at pretest and .93 at posttest.

The WIAT-III Alphabet Writing Fluency (Wechsler, 2009) task was used to measure the number of different letters each student could correctly form in 30 seconds. Students were provided with lined paper with a lowercase ‘a’ printed at the top left corner and were instructed to write as many different letters of the alphabet as they could as quickly and as neatly as possible. Students received credit for each unique and appropriately formed letter. Because the letter ‘a’ was provided for the students, the maximum raw score for this assessment was 25. Interrater reliability on the scoring of the Alphabet Writing Fluency task was .94 at both pretest and posttest. Raw scores were later standardized based on individual student’s chronological age at the time of testing.

Data Analysis

In order to address the research question regarding the effect of each treatment condition (spelling, handwriting, and combination spelling and handwriting), each treatment group’s posttest scores were separately compared to those of the no intervention condition, using analysis of covariance (ANCOVA). Both pretest scores and gender were used as covariates in order to control for any pretest differences or potential gender effects. Because we were conducting multiple comparisons, we used the Benjamini-Hochberg linear step-up procedure (Benjamini & Hochberg, 1995) to correct for Type I error. This procedure, also known as the false discovery rate, is appropriate when multiple statistical tests are being performed on the same set of data.

In addition to analyzing the statistical significance between outcomes for each intervention group and the control group, we also computed an effect size for each measure and each intervention condition using the method suggested by the What Works Clearinghouse (2013). This procedure involved calculating Hedge’s g using the formula:

$$g = \sqrt{\frac{F(n_1+n_2)(1-r^2)}{n_1n_2}}$$

where F is computed from the covariate-adjusted within-group variance from the ANCOVA, n_1 and n_2 are the sample sizes for the given intervention group and the control group, and r is the pretest-posttest correlation for the measure.

Results

Pretest

Table 1 displays the pretest scores for each of the writing, spelling, and handwriting assessments by condition. On average, students wrote a combined TWW of 21.68 ($SD = 12.27$) and 6.09 CWS on the two essays ($SD = 4.16$). These numbers were lower than TWW and CWS in previous research examining writing among first grade students (e.g., Kent et al., 2014; McMaster et al., 2011), but expected because our sample consisted of students in the average to below average range in writing skills. On the experimental spelling task, students were able to spell roughly 7.69 ($SD = 3.51$) orally dictated words. On the Woodcock-Johnson Spelling subtest, based on the test-provided norms, the mean score of the sample was within the average range ($M = 96.26$, $SD = 12.20$). On the WIAT-III

Alphabet Writing Fluency task, students were able to correctly form on average 5.58 ($SD = 4.18$) out of 25 letters in 30 seconds. Standard scores demonstrated the sample was generally within the low average range ($M = 87.60$, $SD = 18.87$). Finally, on the sentence copying task, students wrote about 5 words correct per minute at pre-test ($M = 4.94$, $SD = 1.53$). There were no significant overall differences between study groups on any of the measures at pretest ($F_s = 0.08 - 1.35$, $p_s > .25$).

Bivariate correlations between each of the measures at pretest are shown in the lower diagonal of Table 2. Most of the measures were significantly and positively related to one another with a small to moderate magnitude range ($r_s = .23 - .67$, $p_s < .05$). Nonsignificant correlations were noted between the Woodcock-Johnson Spelling and TWW ($r = .11$, $p = .33$), sentence copying task and experimental spelling task ($r = .20$, $p = .07$), and the sentence copying task and Alphabet Writing Fluency ($r = .01$, $p = .91$).

Posttest

Table 1 also provides the posttest means and standard deviations by study condition. The bivariate correlations are shown in the upper diagonal of Table 2. As before, most measures were significantly, positively related with a small to moderate range in magnitude ($r_s = .24 - .67$, $p_s < .05$). Correlations between the sentence copying task and the Woodcock-Johnson spelling test ($r = .20$, $p = .08$) and Alphabet Writing Fluency ($r = .20$, $p = .08$) were not significant. Posttest correlations between Alphabet Writing Fluency and CWS ($r = .11$, $p = .33$) on the experimental spelling task ($r = .17$, $p = .14$) were also not significant.

Controlling for pretest scores and gender, overall ANCOVA results indicated significant differences between the individual study treatment groups and the no intervention group in favor of the treatment groups on several of the measures at posttest. The students who participated in the spelling intervention group demonstrated significantly higher scores on the experimental spelling task ($F = 7.36$, $p = .01$) and the Woodcock-Johnson spelling assessment ($F = 7.15$, $p = .01$) relative to the control group. As shown in Table 3, the computed effect sizes between the spelling condition and the control condition at posttest on the experimental spelling task ($g = 0.64$) and the Woodcock-Johnson Spelling test ($g = 0.68$) were moderate. Differences between the two groups on CWS ($F = 4.11$, $p = .05$) were not significant, but there was a moderate effect size found in favor of the spelling group ($g = 0.57$). On the other measures, group differences were not significant, and the effect sizes were negligible to small: TWW ($F = 1.26$, $p = .21$, $g = 0.34$), Alphabet Writing Fluency ($F = 0.05$, $p = .82$, $g = 0.07$), and the sentence copying task ($F = 0.05$, $p = .83$, $g = 0.07$).

The students in the handwriting condition outperformed the control group on CWS ($F = 6.64$, $p = .01$) with an effect size of 0.71. Differences were not significant on the other measures: TWW ($F = 3.93$, $p = .05$, $g = 0.52$), experimental spelling task ($F = 0.27$, $p = .61$, $g = 0.12$), Woodcock-Johnson Spelling ($F = 0.81$, $p = .37$, $g = 0.16$), Alphabet Writing Fluency ($F = 1.21$, $p = .28$, $g = 0.31$), and sentence copying ($F = 1.36$, $p = .25$, $g = 0.34$), though effect sizes were generally small to moderate in favor of the handwriting group.

Students in the combined spelling and handwriting condition had significantly higher scores at posttest than the students in the no intervention control on CWS ($F = 9.21$, $p < .01$) with a

large effect size ($g = 0.84$). Differences were not significant between the combination group and the control group on TWW ($F = 2.17, p = .15, g = 0.39$), the experimental spelling task ($F = 0.48, p = .49, g = 0.16$), Woodcock-Johnson Spelling ($F = 0.68, p = .41, g = 0.21$), Alphabet Writing Fluency ($F = 2.66, p = .11, g = -0.45$), and the sentence copying task ($F = 0.06, p = .81, g = 0.07$). Not surprisingly, the pretest score was a significant predictor for all of the measures ($F_s = 8.15 - 91.99, p_s < .01$). However, gender was not significant in any of the analyses ($F_s = 0.01 - 2.88, p_s = .16 - .91$).

Discussion

Prior research suggests young writers may be constrained in written expression by their early transcription skills, which are an important foundational, or component, skill of writing (Berninger et al., 2002; Juel, Griffith, & Gough, 1986). In this study we sought to extend the limited research on writing intervention for first graders by examining the effects of varying types of transcription instruction for students learning to write. Overall, we noted that receiving specific transcription instruction in small groups for 25 min, 4 times a week over 24 sessions was beneficial to one or more areas of students' handwriting, spelling, or written expression.

This was the first study to examine the effects of spelling instruction on writing outcomes for first graders. We found that intervention focused specifically on spelling significantly improved students' spelling outcomes only. Large effects were noted on each of the spelling outcomes (experimental and standardized), similar to findings of Graham et al.'s (2002) study with second graders where large effects for spelling intervention were also found on three standardized measures of spelling. A potentially important implication is that earlier intervention may provide better opportunity for increases in generalized spelling. The increase in spelling ability on both an intervention aligned, or proximal, spelling test and a general, standardized measure of spelling did not significantly transfer to written expression outcomes by the end of the intervention. However, there was practical significance in students' writing outcomes with small to moderate positive effects on TWW ($g = .34; p = .21$) and CWS ($g = .57; p = .05$), levels of improvement over the control group that are considered substantive and meaningful by the What Works Clearinghouse (2013). Thus, the increase in spelling for students in the intervention may have been meaningful for reducing some cognitive load during writing activities, allowing them to get more words into print and more coherent thoughts than those who did not receive intervention.

Students who received the handwriting intervention significantly outperformed the control group on CWS with an effect size of .71. This finding is in line with the effects on writing productivity for first graders noted by Graham et al. (2000). It also aligns with the writing fluency effects reported for first graders by Berninger et al. (1997) when participating in a handwriting intervention that was similar to the current study. Related, in the current study there was a moderate effect size in favor of the handwriting treatment for TWW ($g = 0.52; p = .05$). However, in contrast to both Graham et al. and Berninger et al., who found large, statistically significant effects on letter writing measures, small nonsignificant effects were noted on handwriting measures in this study (g range = 0.31 to 0.34). These small, but practically significant, findings suggest the potential of the handwriting intervention to

improve students' automaticity in this area, which may have led to the increases in writing productivity. Nonetheless, these effects are smaller than those noted by Graham et al., who reported effect sizes ranging from .94 to 1.46 on letter writing and letter writing fluency measures, and Berninger et al., who also reported large effects for some handwriting interventions on measures of letter and word writing (g range across interventions = 0.13 to 1.86). In particular, the visual cues and memory handwriting intervention examined in the Berninger et al. study was similar to the intervention provided in the current study and had the highest effects in the Berninger et al. study; however their sample was specifically students selected with handwriting difficulties. One difference between the handwriting intervention in the Graham et al. study and the current study was specific instruction in handwriting fluency. The handwriting intervention in this study focused on correct, accurate writing of letters and not fluency of letter writing. Though this instruction may have been enough to free resources for students and lead to the significant effects in CWS and the moderate effect for TWW, the addition of fluency instruction may have assisted students in better improving their handwriting fluency and perhaps written expression as well. There were negligible differences between groups on the spelling measures as would be expected for an intervention focusing on handwriting. As with the spelling findings, these results for the handwriting intervention are in line with the simple view of writing (Berninger et al., 2002) suggesting that when students reduce their transcription level loads, more resources can be put into turning thoughts into print, or written expression productivity.

Our study adds uniquely to research on beginning writers by combining both spelling and handwriting instruction in the same amount of intervention time; students assigned to this condition significantly outperformed the control group on CWS with a large effect size of 0.84. There were no other significant effects, but a moderate effect size was also noted in favor of the treatment group for TWW ($g = 0.39$). Negligible to small effect sizes were seen on the spelling measures and the sentence copying measure suggesting there was little benefit to the combined intervention in these individual skill areas. These spelling and handwriting effects did not reach the levels of effect seen in the interventions that focused on only spelling or handwriting. Thus, instructional attention to both spelling and handwriting fluency improved students' writing productivity but did not significantly improve students' general transcription skills. It may be that more substantial, dedicated amounts of instructional time are needed to significantly improve these skills. In addition, there was a surprising moderate, negative effect size for alphabet fluency. Though not significant ($p = .11$), it is not clear why the control group would have higher alphabet fluency scores at posttest relative to the combination intervention. In looking at the pretest and posttest scores it appears that the spelling and handwriting combination study group made less than typical growth on the alphabet fluency measure, but it is not clear why this would have occurred only in the combination intervention.

Overall, the spelling intervention demonstrated promise for improving spelling with results generalizable to a norm-referenced measure. In addition, the spelling intervention showed potential for improving students' written expression, CWS in particular. The nonsignificant findings suggest that improvement in spelling may not generalize to written expression easily at the first grade level without additional instruction. But, given the practical effects, further research with larger sample sizes could shed more light on this finding. Handwriting

instruction also demonstrated potential for improving writing, though handwriting fluency itself proved to be a difficult skill to directly affect through the accuracy focused intervention. Thus, explicit, dedicated instruction in both of these transcription skills may improve writing outcomes for first grade students as can be seen by the results of the combined intervention, but more time in the combined intervention may be needed to see improved individual transcription skills. It is also possible that students would benefit from having either handwriting first and spelling subsequently (or vice versa) in order to focus on skills and fluency.

Limitations and Future Directions

The current study was implemented for a fairly short duration, 24 sessions in 8 weeks. The trends seen in effect sizes may be replicated in interventions of longer duration to determine the consistency of impacts on students' writing. In addition, examining the impact of early intervention for students' longer term writing outcomes would provide valuable information regarding the cost-benefits of the various interventions over the long term. This would also allow a closer examination of the impact on students' writing quality as students' writing productivity increases developmentally through the elementary grade levels, allowing for more information to assess quality indicators. We selected TWW and CWS as indicators of students' written expression because of the strong relation to writing to quality and overall writing proficiency for primary writers (e.g., Jewell & Malecki, 2005; Lembke, Deno, & Hall, 2003). We were also limited in sample size for the study, with the ability to reliably detect only moderate effects. Thus, we examined practical significance as well as statistical significance to guide future research in the area of writing intervention for early elementary students.

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Appendix

Implementation

Rate the extent to which required elements and procedures for each expected component are implemented by the interventionist during the observation period.

Enter N/A if the component is not a required component for the day’s lesson.

- 3 **Excellent implementation** = The interventionist completed all or nearly all of the required elements and procedures to meet the objective.
- 2 **Adequate implementation** = The interventionist followed most of the required elements and procedures to meet the objective.
- 1 **Weak implementation** = The interventionist followed less than half of the required elements and procedures to meet the objective.

Overall Quality

Look for the following teacher behaviors when assessing the quality of instruction during each component observed:

- Begins and ends lesson on time
- Allocates majority of time available to instruction
- Prepared for lesson and activities
- Clearly explains the purpose of activities

- Provides clear directions
- Effectively communicates expectations to the students.
- Uses appropriate pacing, including wait time
- Shows enthusiasm for content and teaching
- Monitors student performance and adjusts pacing as needed
- Checks initial practice items for correctness and provides immediate feedback
- Assists students to perform tasks correctly.

5= Highest Quality	4 = Relatively High Quality	3= Average Quality	2 = Below Average Quality	1= Lowest Quality
Consistently demonstrates all or nearly all of the quality indicators*		Inconsistently demonstrates the quality indicators*		Rarely demonstrates the quality indicators*

* Consider the opportunities to engage in the indicated behaviors and rate according to how many of the opportunities were utilized.

Look for the following indicators when assessing the quality of student engagement during each component observed:

- Facilitates active engagement of students during instruction
- Monitors student & group performance during activities to ensure they are performing correctly
- Implements clear behavioral expectations
- Reinforces appropriate student behavior
- Provides frequent, positive feedback to students
- Redirects off-task behavior quickly and efficiently
- Engages all students in the lesson
- Demonstrates continuous and active supervision of students across activities

5= Highest Quality	4 = Relatively High Quality	3= Average Quality	2= Below Average Quality	1= Lowest Quality
Consistently demonstrates all or nearly all of the quality indicators*		Inconsistently demonstrates the quality indicators*		Rarely demonstrates the quality indicators*

* Consider the opportunities to engage in the indicated behaviors and rate according to how many of the opportunities were utilized.

Table 1

Pretest and Posttest Scores by Study Condition

	Spelling		Handwriting		Combination		Control	
	Pre	Post	Pre	Post	Pre	Post	Pre	Post
	<i>n</i> = 20	<i>n</i> = 18	<i>n</i> = 20	<i>n</i> = 20	<i>n</i> = 20	<i>n</i> = 20	<i>n</i> = 21	<i>n</i> = 20
Total Number of Words Written	21.45 (10.40)	40.33 (16.36)	21.15 (12.97)	44.15 (17.38)	22.15 (13.32)	42.55 (23.73)	21.95 (13.05)	34.60 (20.20)
Correct Word Sequences	5.90 (4.08)	16.39 (7.59)	6.10 (4.17)	17.95 (11.80)	6.45 (4.31)	20.15 (16.48)	5.90 (4.36)	10.20 (7.14)
Experimental Spelling Task	7.35 (3.30)	11.28 (3.68)	7.45 (3.19)	7.71 (2.70)	8.95 (2.89)	9.15 (3.80)	8.25 (4.77)	9.90 (4.81)
Woodcock-Johnson Spelling (Raw Score)	16.70 (2.90)	21.39 (2.83)	16.75 (2.45)	19.80 (2.69)	15.65 (3.35)	19.20 (4.06)	16.29 (2.37)	19.10 (2.27)
Woodcock-Johnson Spelling (Standard Score)	97.55 (9.56)	107.72 (8.83)	100.10 (13.20)	94.24 (13.14)	99.35 (10.28)	104.80 (10.41)	93.25 (12.16)	99.70 (14.11)
WIAT-III Alphabet Writing Fluency (Raw Score)	5.25 (3.48)	8.39 (3.42)	5.80 (4.50)	10.20 (4.15)	5.30 (5.95)	6.70 (4.58)	5.95 (4.89)	9.05 (4.77)
WIAT-III Alphabet Writing Fluency (Standard Score)	87.80 (15.80)	97.44 (13.93)	88.85 (21.83)	104.85 (13.04)	86.65 (17.17)	89.45 (18.61)	87.14 (20.66)	97.80 (17.15)
Sentence Copying – Words Correct	3.95 (1.36)	4.26 (1.73)	3.90 (1.80)	4.14 (1.53)	4.55 (1.99)	5.15 (2.21)	3.75 (1.48)	4.55 (2.31)

Note. WIAT-III = Wechsler Individual Achievement Test – Third Edition.

Table 2

Pretest and Posttest Correlations among Measures

	1	2	3	4	5	6
1 Total Number of Words Written	-	.67***	.32**	.33**	.38**	.28*
2 Correct Word Sequences	.67***	-	.48***	.34**	.11	.36**
3 Experimental Spelling Task	.39***	.41***	-	.59***	.17	.29*
4 Woodcock-Johnson Spelling	.11	.23*	.41***	-	.24*	.20 [†]
5 WIAT-III Alphabet Writing Fluency	.44***	.47***	.48***	.36**	-	.20 [†]
6 Sentence Copying	.47***	.35**	.20 [†]	.01	.28*	-

Note. WIAT-III = Wechsler Individual Achievement Test – Third Edition. Lower diagonal, pretest correlations. Upper diagonal, posttest correlations.

[†] $p < .10$,

* $p < .05$,

** $p < .01$,

*** $p < .001$.

Effect Sizes for Intervention Conditions and Control Group Controlling for Pretest and Gender

Table 3

	Spelling	Handwriting	Combination
Total Number of Words Written	0.34	0.52	0.39
Correct Word Sequences	0.57	0.71	0.84
Experimental Spelling Task	0.64	0.12	0.16
Woodcock-Johnson Spelling	0.68	0.16	0.21
WIAT-III Alphabet Writing Fluency	0.07	0.31	-0.45
Sentence Copying	0.07	0.34	0.07

Note. WIAT-III = Wechsler Individual Achievement Test – Third Edition.