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## Abstract

A large percentage of elementary-aged students in the United States are performing below the proficient level in writing (Aud et al., 2012) and a key component in improving writing quality is the acquisition of proficient spelling skills (Berninger, 1999). One intervention, Cover, Copy, Compare, has shown effectiveness in improving third-grade students' spelling performance (Williams, 2017); and it has been found to be most effective when combined with another instructional component (Jaspers et al., 2012). A second intervention, Performance Feedback, has been found to be effective in increasing third-grade students' writing performance (Eckert et al., 2006). However, limited research has examined the integration of these two empirically-based interventions. Therefore, the primary purpose of the present study was to examine these interventions in combination, as well as their independent contribution in improving students' spelling and writing performance using a randomized controlled trial. A total of 79 third-grade students were randomly assigned to one of three conditions: (a) Cover, Copy, Compare Only condition ( $n = 26$ ); (b) Performance Feedback Only condition ( $n = 27$ ); or (c) Cover, Copy, Compare + Performance Feedback condition ( $n = 26$ ). Results indicated that students across conditions performed similarly on post-intervention spelling and writing measures. Implications for combining Cover, Copy, Compare and Performance Feedback to improve students' spelling and writing performance are discussed.

*Keywords:* spelling, writing, academic intervention, randomized controlled trial

Examining the Efficacy of Combining Cover, Copy, Compare and Performance Feedback:

A Randomized Controlled Trial

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B.A., George Mason University 2015

M.S., Syracuse University, 2017

Dissertation

Submitted in partial fulfillment of the requirements for the degree of Doctor of Philosophy in  
School Psychology.

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Examining the Efficacy of Combining Cover, Copy, Compare and Performance Feedback:  
A Randomized Control Trial

Writing and spelling are two important academic skills that are closely related. In order for a writing composition to be considered exceptional, the document must be free of spelling errors. Frequent misspelled words interrupt the flow of the document and create confusion and frustration in the reader. Due to the importance of strong writing skills in higher education settings and in the workplace, it is important that lower-level skills (e.g., spelling) are explicitly taught to early elementary school students. Unfortunately, spelling instruction is limited in classrooms across the country, and a call for an efficient and effective spelling intervention is warranted (Fresch, 2003). Because spelling is considered a key lower-level skill in the area of writing (Berninger, 1999), an integrated writing and spelling intervention for elementary school students would be the most advantageous to examine. The current study aimed to explore the combination of these two academic areas, and the effectiveness of an integrative spelling and writing intervention on student spelling and writing performance.

**Spelling: Importance and Theoretical Conceptualization**

A number of studies have demonstrated that providing elementary students with explicit spelling instruction results in improved outcomes in reading, including phonemic awareness, the alphabetic principle, phonological awareness, and sight word recognition (Conrad, 2008; Ehri & Wilce, 1987; Ehri, 2005; Moats, Foorman, & Taylor, 2006; Treiman, Berch, & Weatherston 1993). In writing, the impact of spelling is more apparent given that misspelled words can make written text more difficult to read (Graham et al., 2008) and may impact the writer's ability to generate text due to the investment of cognitive resources (Berninger, 1999). Results from a



meta-analysis conducted by Graham and Santangelo (2014) demonstrated strong effects of spelling skills on students' writing performance ( $d = 0.94$ ). These findings suggest that in order to demonstrate proficient writing skills, instruction in the foundational skill of spelling must not be neglected.

Conceptual models of spelling further emphasize the linkages between spelling, reading, and writing. Frith (1985) identified three phases of spelling development that highlighted the importance of visual cues, phonological awareness, and the integration of phonological skills. In this conceptual spelling model, emphasis was placed on the interdependence between spelling, reading, and writing skills. That is, it is proposed that alphabetic and phonological skills are acquired in spelling and transfer to reading through the understanding of letter-sound relationships (Frith, 1985). Although this theoretical model emphasizes the intertwining of spelling, reading, and writing, the model does not present a developmental sequence in which these skills develop in young readers and writers.

In a second conceptual model, Henderson and Templeton (1986) recognized the importance of reading and writing skills in relation to spelling, and expanded Frith's (1985) model by breaking down stages into specific steps that follow a developmental sequence. In this model, three key principles are proposed to be associated with developing spelling skills: (a) the alphabetic principle (i.e., letters match sounds), (b) the within-word pattern principle (i.e., the sound a letter makes depends on its position within a word), and (c) the meaning principle (i.e., words or parts of words that have similar meaning tend to be spelled the same). This conceptual model highlights the interdependence of spelling, reading, and writing skills, and sequentially organizes key principles in the development of spelling. Therefore, based on this model, when

designing spelling interventions, it is important to understand the current stage of students' spelling development.

### **Spelling Instruction**

For decades, spelling instruction has followed the same traditional sequence, which includes: (a) introduction to new words, (b) administration of a pretest, (c) use of target words in a sentence, (d) identification of difficult words, and (e) administration of a final spelling test (Rowell, 1972). Although taking a developmental approach to spelling instruction has been recommended (e.g. Henderson & Templeton, 1986), teachers predominately utilize traditional spelling instruction procedures in the classroom, without properly adapting spelling instruction for students that are struggling (Graham et al., 2008). As a result, classroom spelling instruction has been criticized for its failure to account for the wide range of students' spelling abilities (Graham, 1983). In an article addressing effective instructional spelling practices that emphasize a developmental approach, Graham (1983) described three principles that should be considered when planning spelling instruction: (a) the program should offer an individualized component, (b) instruction should be planned, monitored, and modified through systematic formative evaluation, and (c) student attitudes need to be positive toward spelling instruction.

Despite these recommendations, studies examining teachers' instructional practices suggest that although teachers acknowledge the importance of the developmental approach to spelling, they do not incorporate key instructional components (i.e., individualized word lists, systematic, formative evaluation) in the classroom. For example, in one study, Johnston (2001) assessed 42 elementary teachers' beliefs and practices regarding spelling instruction. Results of the survey found that elementary school teachers often utilized activities that required students to write words multiple times, alphabetize words, and look up words in the dictionary. A total of

93% of teachers reported using traditional spelling instructional methods in their classroom, and often provided struggling spellers with shorter words. Fresch (2003) found similar results when surveying 355 teachers in grades 1 to 5 on their beliefs and practices in spelling instruction. Although 55% of respondents did not agree that assigning a common word list was effective, 72% of the teacher respondents adopted this practice in the classroom. The evidence from these studies reflect that the majority of elementary school teachers are not utilizing effective instructional practices in spelling that are consistent with best practices or a developmental approach.

### **Spelling Interventions**

An emerging literature base has developed regarding the effectiveness of spelling interventions on students' spelling performance. Wansek and colleagues (2006) conducted a meta-analysis of studies evaluating the effectiveness of different types of spelling interventions among students with learning disabilities in kindergarten to twelfth grade. A total of 19 studies were included in the research synthesis, which examined the effectiveness of explicit spelling instructional interventions ( $n = 9$ ), multiple modality and/or assistive technology approaches ( $n = 7$ ), or explicit reading interventions ( $n = 3$ ). Although all interventions were found to have a positive effect on students' spelling performance, explicit spelling instruction produced the greatest gains, specifically when students were provided with spelling study strategies (e.g., spelling words orally or writing words with immediate error correction;  $ES = 1.76$ ) or word practice paired with immediate feedback (e.g., teacher provided feedback or a student self-monitoring procedures;  $ES = 1.25$ ). Interventions that utilized multiple modalities and assistive technology were found to have small effects ( $ES$  range, 0.11 to 0.16), whereas reading interventions were found to have moderate effects ( $ES$  range, 0.46 to 0.59).

Although these results demonstrate the effectiveness of utilizing explicit instruction and multiple practice opportunities with feedback to significantly improve students' spelling performance, the studies included in this meta-analysis were restricted to students who were classified as having a learning disability and receiving special education services. Further, given the relatively small number of studies included in the meta-analysis, effect sizes were aggregated across student grade levels. As a result, there is limited empirical evidence regarding the effectiveness of classroom-based spelling interventions for general education students within grade levels.

To date, three spelling interventions that include multiple practice opportunities and immediate feedback have been examined with general education students experiencing spelling difficulties. These interventions include: word box strategy, taped spelling intervention, and Cover, Copy, Compare. Word box strategy is an instructional strategy used in the area of phonological awareness and spelling. In a word box activity, students are presented with connecting boxes that are created by dividing a rectangle into sections that correspond to the number of sounds in a word. Then, students are to write the letters of the word in the connected boxes as they slowly say each sound. As students progress, the sections of the rectangle turn into dotted lines, and then the lines are faded altogether (Joseph, 1999). In the taped spelling intervention, students listen to target word lists on a digital audio device and then the students are provided with a delay to spell the dictated word. Then, the recording provides the correct spelling of the letter and the student self-corrects their work (McCallum et al., 2014). However, the supporting empirical evidence for word box strategy and the taped spelling intervention, is limited in scope. For example, word box strategy has been exclusively examined among young students with emerging literacy skills because it primarily relies upon providing students with

multiple practice opportunities and immediate feedback regarding phonological awareness skills (e.g., phoneme segmentation). Despite preliminary evidence suggesting the word box strategy improves emerging spelling skills of kindergarten and first-grade students enrolled in general education classrooms (Alber-Morgan et al., 2016; Joseph, 2000; Keeseey, Konrad, & Joseph, 2015), the spelling intervention has limited applicability to older elementary aged students. The taped spelling intervention, which has been examined among older general education students, has only been empirically evaluated in two studies (McCallum et al., 2014; Zannikos et al., 2018). One of the studies (Zannikos et al., 2018) found that another spelling intervention, Cover, Copy, Compare, was more effective in improving students' spelling performance compared to the taped spelling intervention.

### **Cover, Copy, Compare**

Cover, Copy, Compare has been used to help students acquire a range of academic skills, specifically those skills that require memorization or recall, such as math facts, vocabulary definitions, or spelling words (Poncy, Skinner, & Jaspers, 2007). Cover, Copy, Compare incorporates the key instructional variables identified by Wansek and colleagues (2014) and Graham (1983) as important to spelling development including: multiple practice opportunities, immediate feedback, and individualization of instruction. Cover, Copy, Compare is a self-managed intervention in which the student: (a) views and studies the correct response; (b) covers the correct response; (c) writes the correct response from memory; and (d) uncovers the correct response to check if the written response matches the correct response. If the response is correct, then the student moves to the next item. If the response is incorrect, then the student repeats the procedure (Konrad & Joseph, 2013). Self-monitoring and self-evaluation are key characteristics in Cover, Copy, Compare through the features of immediate feedback and error correction.

Immediate error correction (i.e., positive practice overcorrection and repetition) ensures lower probability of students practicing incorrect responses (Skinner et al., 1997).

Cover, Copy, Compare can be implemented in the context of general education classrooms and has been studied among students with and without disabilities. Joseph and colleagues (2012) conducted a meta-analysis of the effectiveness of Cover, Copy, Compare by examining 31 studies that used this intervention with elementary and secondary school students with and without disabilities. The meta-analysis focused on studies that incorporated single-subject designs in the academic areas of mathematics and spelling, and measured outcomes by evaluating the percentage of non-overlapping data (PND) reported in each study. A total of 17 studies (55%) explicitly focused on improving students' spelling performance, and of those studies, about 80% of the participants were classified with a disability. Results showed that overall, Cover, Copy, Compare had limited effectiveness on students' spelling performance (PND = 67.3%). The strongest effects (PND = 92.3%) were obtained when Cover, Copy, Compare was modified to include an additional intervention component (i.e., token economy, goal setting, additional opportunities to respond). However, because the majority of the studies included in the meta-analysis were conducted with students with disabilities, the findings have limited generalizability to students without disabilities.

Limited empirical attention has focused on evaluating Cover, Copy, Compare in the general education classroom among students who are developing their spelling skills. In one study, Jaspers and colleagues (2012) compared Cover, Copy, Compare to an intervention that utilized Cover, Copy, Compare with additional cues (i.e., a sentence and definition that accompanied a dictated word). An alternating treatments design was used to compare the effectiveness of the two intervention conditions among three first-grade male students identified

as experiencing difficulties in spelling and enrolled in an after-school program. Words were selected from experimental spelling materials developed in previous research (Graham, Harris, & Loynachan, 1993), which reflected grade-level words commonly found in reading, writing, and spelling curricula. Students were pre-assessed on grade-level words, and unknown words were randomly assigned to the two intervention conditions and the control condition. At the start of each session, the students' spelling performance was assessed and then the three conditions were presented in a counterbalanced order. When a word was mastered (i.e., word spelled correctly over two consecutive sessions), it was replaced with an unknown word. During the intervention sessions, data were collected on the number of trials and spelling errors in each session. The number of cumulative words mastered served as the primary outcome measure. Additionally, follow up data were collected at three time points (i.e., 2 days, 2 weeks, and 4 weeks) after the final intervention session to examine maintenance effects.

Visual inspection of the data revealed that both interventions, in comparison to the control condition, resulted in steady improvements in the students' cumulative words spelled correctly, with a modest separation between the two intervention conditions. Visual inspection of the follow-up data indicated a downward trend of cumulative words spelled correctly by the 4-week follow up for two out of three students. The remaining student correctly spelled a relatively low percentage of words immediately following the interventions but maintained that level throughout follow-up assessment. Taken together, these results suggest that the two interventions increased the spelling accuracy of three first-grade students; however, the addition of sentence definition to Cover, Copy, Compare did not further improve students' spelling accuracy. Further, the follow-up data indicate that the observed effects did not maintain at four weeks following the interventions. In terms of intervention efficiency, students exhibited similar patterns of learning

trials and errors for both interventions, suggesting that although the addition of sentence definition to Cover, Copy, Compare did not further increase spelling performance, it did not hinder the efficiency of the Cover, Copy, Compare intervention. Treatment acceptability data indicated that the students rated the Cover, Copy, Compare intervention as acceptable.

The Jaspers and colleagues (2012) study has some important limitations to consider. First, the study was a single-case design with only three, first-grade male students, which limits the external validity of the findings. It is unknown to what extent Cover, Copy, Compare improves students' spelling performance in the context of a group setting within the general education classroom. Second, the administration of conditions resulted in students receiving all three conditions in one session, which could impact students' performance (e.g., fatigue, carryover effects). Third, assessments solely relied on performance within the context of a spelling list; there was not a measure of naturalistic assessment of spelling performance in the classroom context. Future studies should examine to what extent the effectiveness of Cover, Copy, Compare carries over to more generalized and naturalistic measures of spelling, such as spelling accuracy within the context of a writing sample.

A more recent study conducted by Williams (2017) examined the effectiveness of combining Cover, Copy, Compare with an intervention that focuses on a related skill – writing. This study expanded upon the study by Jaspers and colleagues (2012) by examining the effectiveness of the combination of two distinct interventions on two related skills (i.e., spelling and writing) in a third-grade, general education classroom. Using a randomized controlled trial, 54 students were randomly assigned to one of two conditions: (a) a Performance Feedback condition that received individualized performance feedback on weekly writing probes; and (b) a Cover, Copy, Compare + Performance Feedback condition that received the Cover, Copy,



Compare intervention each week in addition to the Performance Feedback intervention. The spelling words that were used in the Cover, Copy, Compare intervention were derived from the most commonly misspelled words identified across all the students' pre-intervention writing probes. A pre-post experimental design was used to examine the effectiveness of the intervention in improving students' spelling and writing. Spelling performance was assessed by computing the number of correct letter sequences and words spelled correctly on the target spelling word list as well as the number of words spelled correctly on the writing probe. Students' writing performance was assessed by computing the number of correct writing sequences in the context of the writing probe. Student treatment acceptability data were also collected.

Results of the Williams (2017) study indicated that students in both conditions demonstrated improvements in their spelling and writing performance on the post-intervention writing probe after controlling for their pre-intervention performance. On the target spelling word list, the results of an analysis of covariance (ANCOVA) indicated statistically significant differences between conditions, with students assigned to the Cover, Copy, Compare + Performance Feedback condition demonstrating greater spelling accuracy compared to students in the Performance Feedback condition. However, this result was found only for students in the Cover, Copy, Compare + Performance Feedback condition that were performing at average or below average range on the pre-intervention spelling test, not for students performing above average. The observed results for students performing in the above average range at pre-intervention suggested the possibility of a ceiling effect, which is common when examining mastery skills such as spelling. Treatment acceptability outcomes indicated that the students rated both interventions as acceptable.

Although the Williams (2017) study provided preliminary evidence of the efficacy of integrating Cover, Copy, Compare with a writing intervention, some methodological limitations are important to consider. First, the study design did not include a true control condition that could account for the potential effects of repeated writing practice on students' spelling and writing performance over time. As a result, it is difficult to determine the relative efficacy of the addition of a Cover, Copy, Compare in the context of the general education classroom. Second, students' assignment to the two conditions was not homogenous with respect to race and ethnicity. Specifically, although students were randomly assigned to conditions, there were more White students in the Performance Feedback condition compared to the Cover, Copy, Compare + Performance Feedback condition. Third, although this study examined spelling performance in the context of a target spelling word list as well as spelling performance in the context of a writing probe, there was not a measure of spelling performance on grade-level spelling words. It would be advantageous to examine the effect of a Cover, Copy, Compare intervention on students' accuracy on untargeted, grade-level spelling words in future studies. Finally, treatment acceptability outcomes were only collected on students' perception of the interventions. Teacher acceptability is just as important to collect given that if teachers view the intervention as unacceptable, they are unlikely to implement it in their classroom (Fuchs & Fuchs, 1992; Lindsley, 1992).

### **The Role of Spelling in Writing**

The study conducted by Williams (2017) is one of few studies focusing on the implementation of interventions that target lower-level skills in writing, such as spelling, and overall writing performance. This is unfortunate, as writing and spelling are two important academic skills that are closely related. In Berninger's (1999) theoretical conceptualization of the

writing process, transcription skills (i.e., spelling and handwriting) are critical lower-level processes in students' writing development. Until transcription skills become fluent, cognitive resources of beginning writers are quickly depleted by having to consciously think about how to spell a word. Further, uncertainty about how to spell a word may lead to the selection of a different word the student knows how to spell, potentially limiting the preciseness of the intended message (Graham et al., 2018). In addition, frequently misspelled words can negatively impact the quality of a written composition as they interrupt the flow of the document, and create confusion and frustration for the reader. Unfortunately, limited research has examined the efficacy of integrated spelling and writing interventions on students' spelling and writing performance.

One recent study by Graham and colleagues (2018) examined the effectiveness of supplemental handwriting and spelling instruction on underachieving students' handwriting, spelling, and writing performance. A total of 30 first-grade students performing below the 25<sup>th</sup> percentile on handwriting and spelling measures were randomly assigned to either: (a) a handwriting and spelling instructional condition ( $n = 15$ ) or (b) a phonological awareness condition ( $n = 15$ ). Both conditions received individualized instruction three times a week for 20 minutes per session for two weeks. In the handwriting and spelling instructional condition, the students received individualized instruction regarding how to form letters and how to correctly spell common and uncommon spelling patterns. The students in the phonological awareness condition received individualized lessons from a widely used literacy program (i.e., Ladders to Literacy Program; O'Connor, Notari-Syverson, & Vadasy, 1998). The primary outcome measures included writing performance (i.e., total words written, composition vocabulary, and composition quality), sentence construction fluency, handwriting fluency, and spelling

performance (i.e., performance on spelling lists and spelling in the context of written compositions).

Results indicated that students in the handwriting and spelling instructional condition demonstrated statistically significant gains in composition vocabulary, sentence construction fluency, handwriting fluency, and spelling achievement measures compared to the students in the phonological awareness condition. However, no significant differences were found between the two conditions on measures of total words written and writing quality or spelling performance in the context of the written composition. These results suggest that the supplemental handwriting and spelling instruction was effective in improving handwriting and proximal spelling outcomes, however, it was not effective in improving more distal outcomes of spelling performance (i.e., spelling performance in the context of a writing composition) or writing composition quality.

Although the Graham and colleagues (2018) study was one of the first studies to examine the efficacy of an integrated writing and spelling intervention among low-performing students, there are some limitations to consider. First, the condition contrasts evaluated in this study were restricted (i.e., combined intervention versus alternative intervention). Therefore, it is impossible to determine the relative contribution of each intervention component. When examining the efficacy of combined interventions, it is important to examine the interventions in isolation, as well as in combination. Second, the supplemental handwriting and spelling instruction was individually administered. Given that a high percentage of students are performing below proficiency in writing (Aud et al., 2012), it would be advantageous to examine the efficacy of integrated writing interventions that can be group administered within the context of the general education classroom. Finally, no measures of treatment acceptability were administered. Reporting standards in psychology (APA Presidential Task Force on Evidence-Based Practice,

2006), school psychology (Kratochwill & Shernoff, 2004) and special education (Losinski et al., 2014), highlight the importance of considering teachers' and students' perceptions of academic interventions, so it would be of interest for future studies to take teacher and student acceptability into consideration.

Unlike the study conducted by Graham and colleagues (2018), Berninger and colleagues (2002) evaluated the effectiveness of a combined composition and spelling intervention as well as the effectiveness of each intervention component in isolation on the writing and spelling outcomes of third-grade students at-risk for writing difficulties. At-risk status was determined by performing in the below average range on a measure of compositional fluency. A total of 96 third-grade students were randomly assigned to one of four conditions: (a) spelling-only treatment ( $n = 24$ ); (b) composition-only treatment ( $n = 24$ ); (c) combined spelling-and-composition treatment ( $n = 24$ ); or (d) control ( $n = 24$ ). Across four months, participants received 20-minute sessions that were delivered by one of four tutors. In the spelling-only treatment, students were explicitly taught the alphabetic principle and how it applied to spelling words, as well as common exceptions. The composition-only treatment explicitly taught planning, translating, reviewing, and revising skills. The spelling-and-composition treatment received a combination of instruction in components of the alphabetic principle as well as composition skills. Finally, in the control condition, students were instructed to type the alphabet using a keyboard and received time to write about various topics; no other explicit instruction or feedback was provided. The primary outcome measures included compositional quality in a persuasive and an informational essay, spelling accuracy on a standardized measure of spelling and on a list of spelling intervention words, and spelling accuracy within the context of a written composition.

The results indicated that students in the spelling-only condition and the spelling-and-composition condition spelled significantly more words correct compared to the composition-only and the control conditions on the spelling test. There were no significant differences in words spelled correctly between the spelling-only condition and the spelling-and-composition condition. These results suggest that students displayed improved spelling outcomes if they received explicit instruction in spelling, regardless if the spelling instruction was combined with composition instruction. Students assigned to the composition-only and the spelling-and-composition conditions wrote significantly higher quality compositions compared to the students in the spelling-only and control condition. However, there was not a statistically significant difference between the composition quality of the composition-only and spelling-and-composition conditions. These results suggest that explicit instruction in composition improved compositional quality. Finally, the students in the composition only condition spelled fewer words correctly in the context of a writing composition in comparison to students in the spelling-only and the spelling-and-composition conditions. These findings suggest that explicit instruction in the alphabetic principle is necessary to promote accurate spelling in the context of writing.

Although Berninger and colleagues (2002) provided evidence of the efficacy of combining two important writing instructional components in an intervention, some limitations are important to consider. First, writing and spelling outcome measures were exclusively examined within the context of scores on nationally-normed, standardized measures. Treatment-specific effects between interventions with shared components may not be detected on these types of measures, which are designed to be sensitive to developmental changes over long periods of time, rather than to short-term instructional effects. Future studies should consider

evaluating spelling and writing performance using outcome measures that are more sensitive to proximal intervention effects. Second, instruction was provided by tutors with small groups of students removed from the general education classroom. Although the combined spelling and composition treatment was found to be efficacious, this may not be the case when implemented in the context of a large group in the classroom. Future studies should evaluate the efficiency and effectiveness of a similar intervention when implemented in a classroom setting. Finally, no measures of teacher or student acceptability of instruction were collected. As previously mentioned, it is important to consider student and teacher perceptions of academic interventions to ensure buy-in and implementation fidelity (Fuchs & Fuchs, 1992; Lindsley, 1992).

### **Performance Feedback**

A writing intervention that was previously studied in the context of the general education classrooms in conjunction with a spelling intervention is Performance Feedback. In general, performance feedback is conceptualized as information provided by an agent (e.g., teacher, peer, parent, or self) regarding features of one's performance (Hattie & Timperley, 2007). Performance Feedback interventions have been extensively researched in the area of writing, specifically in early elementary education. In one of the first studies, Eckert and colleagues (2006) examined the effectiveness of Performance Feedback on third-grade students' writing fluency. Students were randomly assigned to two groups (i.e., Performance Feedback or control condition). Each week, both groups were given a story-stem (i.e., "I found a note under my pillow that said...") and had 3 minutes to compose their story. Before writing their story, students in the Performance Feedback condition received individualized feedback on the number of words that they wrote in the previous session. This feedback consisted of the number of words the student wrote the session before, and a graphic indicator (i.e., upward or downward facing

arrows) depicting if this number was greater or less than the number of words that the student wrote prior to that. The control group received the same story-stems but did not receive any Performance Feedback. Students in both groups participated in eight sessions over the span of eight weeks. To assess writing quality, students' stories were evaluated by trained researchers for the number of words written, the number of letters written, and the number of words spelled correctly. Results indicated that the students in the Performance Feedback condition showed significantly more growth in all three dependent variables compared to the control condition.

In another study, Truckenmiller, Eckert, Coddling, and Petscher (2014) evaluated the effects of a Performance Feedback intervention on the writing fluency growth of general education students compared to a practice-only condition and an instructional control condition. This study expanded on previous studies as students' correct writing sequences were also measured in addition to total words written. Correct writing sequences is a metric that is more sensitive to students' writing performance, as it evaluates spelling, grammar, punctuation, and syntax. A total of 133 third-grade students were randomly assigned to one of three conditions (i.e., Performance Feedback, practice-only, instructional control). The Performance Feedback and practice-only conditions were given a story-stem and three minutes to compose a story. Students in the Performance Feedback condition received individualized feedback similar to the procedures described in study by Eckert and colleagues (2006). The students in the practice-only condition did not receive any feedback. Students in the instructional control condition received a similar instructional experience as the Performance Feedback condition; however, the area in which students received feedback was in another academic skill, mathematics. During the intervention, students in this condition were given computational mathematics problems that



spanned two minutes each. Individualized performance feedback on number of digits correct was provided to each student.

The results of a multilevel modeling analysis revealed that the students assigned to the Performance Feedback condition gained the most words per week (1.25 words) over the course of the intervention. However, the practice-only condition lost an average of 0.40 total words per week, and the instructional control condition gained an average of 0.35 words per week. In regard to correct writing sequences, results showed that the students assigned to the Performance Feedback condition gained more correct writing sequences per week compared to the instructional control conditions. However, contrary to one of the main study hypotheses, the practice-only condition did not gain more correct writing sequences than the instructional control condition. These findings suggest that the Performance Feedback intervention is more effective in improving third grade students' writing productivity and fluency in comparison to weekly writing practice. However, no explicit measure of spelling performance was assessed. Given that spelling is a key component in writing development (Berninger, 1999); it would be advantageous to explore the effectiveness of Performance Feedback on students' spelling performance in the context of a writing probe. Therefore, given the ease of implementation within the classroom context, it would be of interest for future studies to explore the combination of a Performance Feedback intervention with an explicit spelling intervention (i.e., Cover, Copy, Compare) on students' writing and spelling outcomes.

### **Purpose of Present Study**

High quality writing is an essential skill that will benefit students not only in the classroom, but also in the workplace. In order to produce high quality writing, students must possess adequate spelling skills. Spelling is a lower-level skill that must be mastered before

moving on to higher level processes in writing, such as planning and reviewing (Berninger, 1999). By third grade, students are learning to use higher level spelling skills, such as within-word patterns (Henderson & Templeton, 1986). However, given that developmentally-appropriate spelling instruction is neglected in the classroom (Fresch, 2003), a classroom-based spelling intervention that can be easily combined with an effective writing intervention has the potential to significantly improve students' spelling and writing performance. One writing intervention that was evaluated in combination with a spelling intervention is Performance Feedback. The results of the Williams (2017) study suggested that the combination of Cover, Copy, Compare and Performance Feedback was more effective in improving spelling outcomes (i.e., intervention target words) than a Performance Feedback Only intervention, however, there was no difference between the two intervention conditions in students' writing outcomes or on measures of spelling performance embedded within the writing outcome measure. Further, because the effectiveness of Cover, Copy, Compare in isolation was not examined in the Williams (2017) study, it is impossible to discern the relative contribution of this intervention on students' spelling and writing performance. This is important to explore as it has the potential to inform elementary classroom instruction in two interrelated skills, spelling and writing (Berninger, 1999).

The purpose of the present study is to examine the interventions in combination (i.e., Cover, Copy, Compare + Performance Feedback), as well as their independent (Cover, Copy, Compare Only and Performance Feedback Only) effectiveness on measures of students' spelling and writing performance using a randomized controlled trial. No study to date has compared the effectiveness of the combination of Performance Feedback and Cover, Copy, Compare with the effectiveness of the two interventions in isolation on elementary students' writing and spelling

outcomes in the context of the general education classroom. In addition, based on the results of Williams (2017), modifications to the Cover, Copy, Compare were added to strengthen the impact on students' spelling (e.g., increasing number of target words spelled correctly). As a result, the primary aim of the present study was to examine the effectiveness of Cover, Copy, Compare and Performance Feedback on the spelling and writing outcomes of general education, third-grade students. To address this aim, three research questions were posed:

- (1) What is the effectiveness of Cover, Copy, Compare and Performance Feedback on students' spelling performance in isolation and in the context of their writing?
  - a. On targeted measures of spelling, it was hypothesized that students assigned to the two conditions that utilized Cover, Copy, Compare would demonstrate greater spelling performance on trained and untrained words compared to students assigned to the Performance Feedback Only condition. Additionally, because prior research (Berninger et al., 2002; Jaspers, 2012) indicated that supplementing Cover, Copy, Compare with additional interventions did not further enhance students' spelling performance, it was hypothesized that no difference in spelling performance on trained and untrained words would exist between the two conditions that utilized Cover, Copy, Compare.
  - b. In the context of writing, it was hypothesized that students assigned to Cover, Copy, Compare + Performance Feedback will demonstrate significantly greater performance on measures of spelling within the context of a writing probe than students assigned to the Cover, Copy, Compare Only condition and the Performance Feedback Only condition. Because third-grade students are typically in the "within-word pattern" stage of spelling development

(Henderson & Templeton, 1986), it was hypothesized that students would identify common word patterns in their weekly spelling practice, and generalize these common word patterns to their writing samples, therefore, producing significantly greater spelling performance in the context of a writing probe compared to the other two conditions . Further, it was hypothesized that students in the Performance Feedback Only condition would demonstrate significantly greater spelling performance within the context of a writing probe than students assigned to the Cover, Copy, Compare Only condition. Based on previous research by Truckenmiller and colleagues (2014), Performance Feedback is an intervention that significantly improves students' correct writing sequences, which is a measure that incorporates spelling performance, in the context of a writing probe. No research to date has shown that Cover, Copy, Compare in isolation improves students' spelling performance in the context of a writing probe.

- (2) What is the effectiveness of Cover, Copy, Compare and Performance Feedback on students' writing performance?
- a. It was hypothesized that students in a Cover, Copy, Compare + Performance Feedback condition will demonstrate greater performance on the measure of writing (i.e., correct writing sequences in the context of a writing probe) compared to the students in the Cover, Copy Compare Only and the Performance Feedback Only conditions. Previous research has shown the efficacy of Performance Feedback in improving students' correct writing sequences (Truckenmiller et al., 2014), as well as the efficacy of Cover, Copy,

Compare in improving students' spelling performance (Jaspers et al., 2012), which is a component of the correct writing sequence metric.

(3) Do teachers and students perceive the Cover, Copy, Compare intervention and the Performance Feedback intervention as acceptable?

- a. It was hypothesized that students and teachers would rate both of the interventions as acceptable. Previous research has demonstrated both interventions to be acceptable by students (Eckert, Hier, Hamsho, & Malandrino, 2017; Williams, 2017). A previous study has shown that Performance Feedback is viewed as acceptable by teachers (Malandrino, 2017). To date, no study has evaluated teacher perceptions of Cover, Copy, Compare in the area of spelling. Given the ease of implementation, and previous research supporting positive perceptions from students (Williams, 2017), it is hypothesized the Cover, Copy, Compare will also be viewed as acceptable by teachers.

## **Method**

### **Participants and Setting**

Institutional Review Board approval was obtained from Syracuse University and the participating school district. Upon approval, third-grade general education students were recruited for participation from a moderately sized, urban public elementary school ( $n = 924$ ) in the northeast. The school had a large population of students eligible for free or reduced-priced lunch (79%), mostly consisted of White (39%) and Black or African American (35%) students and had a large proportion of English Language Learners (19%; nysed.gov, 2017). First,

informed consent was sent home to parents, requesting permission for their student to participate in the study. Then, students were required to provide written assent.

A total of 90 students were screened for eligibility (see Figure 1). Students were deemed ineligible if they were: (a) eligible for special education programming or Limited English Proficiency/English Language Learner status that would negatively impact their writing performance based on teacher report; (b) obtained a standard score below 40 on the WIAT Essay Composition subtest; or (c) obtained a standard score below 50 on the WIAT Alphabet Writing Fluency subtest (i.e., 0 letters written).

A total of 79 students from four, third-grade classrooms were eligible and participated in the study (see Table 1). Most of the students were female (58.2%) and identified their race as Black or African American (38.0%) or White (35.4%). A smaller percentage of students identified as Asian (7.6%), or Native Hawaiian or Other Pacific Islander (2.5%). In addition, the majority of the sample identified as Not Hispanic or Latino (70.9%). A smaller percentage of the students identified as Somali (10.1%), Hispanic or Latino (7.6%), Arab (3.8%), Hutu (3.8%), or Nepali (3.8%). A small percentage of students (6.3%) were eligible for special education services due to either a learning disability (6.3%) or a speech and language impairment (5.1%) but still met the inclusionary criteria. A total of 15 (19.0%) of students were identified as English Language Learners (ELL), but still met the inclusionary criteria. The average age of the students was 8 years, 3 months (range, 8 years, 2 months to 10 years, 0 months).

Eligible students were randomly assigned to one of three conditions: (a) Performance Feedback Only ( $n = 27$ ); (b) Cover, Copy, Compare Only ( $n = 26$ ); or (c) Cover, Copy, Compare + Performance Feedback ( $n = 26$ ). There were no statistically significant differences between the conditions with regard to sex,  $\chi^2(2, 79) = .20, p = .91$ , ethnicity,  $\chi^2(10, 79) = 6.35, p = .79$ , race,

$\chi^2(8, 79) = 4.22, p = .84$ , special education status,  $\chi^2(4, 79) = 0.91, p = .92$ , or English as a Second Language (ESL) status,  $\chi^2(2, 79) = 3.41, p = .18$ . There were no statistically significant differences between conditions with regard to classroom assignment,  $\chi^2(6, 79) = 1.39, p = .97$ . There was a statistically significant difference in the average age across conditions,  $F(2, 78) = 4.98, p = .009$ . Although the average ages across the Cover, Copy, Compare Only ( $M = 8$  years, 2 months), Performance Feedback Only ( $M = 8$  years, 2 months), and Cover, Copy, Compare + Performance Feedback ( $M = 8$  years, 6 months) conditions were fairly comparable, this statistically significant difference was due to a single student who was 10 years of age. Due to this significant age difference between the conditions, the major analyses were conducted with and without this student. Inclusion of this student did not impact the results, so this student was retained in the final analysis.

### **Research Assistants**

Doctoral-level school psychology graduate students served as the primary research assistants with the assistance of psychology undergraduate students who served as secondary research assistants. All research assistants were required to complete formal training in research ethics. The training consisted of the Social and Behavioral Focus and Responsible Conduct of Research courses through the Collaborative Institute Training Initiative (CITI) designed to ensure the protection of human research subjects. Research assistants received training in the administration and scoring of the dependent measures in addition to data entry and procedural integrity assessments (i.e., interscorer agreement). All research assistants were required to demonstrate 100% proficiency in scoring as well as conducting procedural checks prior to assisting with data collection.

## Procedures

The study included four phases: (a) eligibility; (b) pre-intervention; (c) intervention; and (d) post-intervention. Several measures were administered to determine eligibility and assess students' spelling and writing performance. All sessions were conducted in the students' general education classrooms for approximately 20 minutes. In general, one session per week was conducted.

**Eligibility phase.** All students were administered the Alphabet Writing Fluency subtest and the Essay Composition subtest of the Wechsler Individual Achievement Test- Third Edition (WIAT-III; Pearson, 2009). The WIAT- III is a standardized, norm-referenced test that is used to measure the academic skills of students ages 4 to 19. The Alphabet Writing Fluency subtest has been shown to have moderate test-retest reliability ( $r = .69$ ) among students eight to nine years of age, with a test-retest interval that averaged 13 days and ranged from 2 to 32 days (Pearson, 2009). It is moderately correlated ( $r = .68$ ) with the Written Expression composite of the WIAT-III (Pearson, 2009). The Essay Composition subtest demonstrated strong test-retest reliability ( $r = .88$ ) among students ages 8-9, with a test interval that averaged 13 days and ranged from 2 to 32 days. It is moderately correlated ( $r = .77$ ) with the Written Expression composite of the WIAT-III (Pearson, 2009).

For the Alphabet Writing Fluency subtest, students were provided with a blank sheet of paper and standard administration procedures were followed. Students were given 30 seconds to write as many letters of the alphabet as they can. For the Essay Composition subtest, students were given a sheet of paper that included a visually presented story prompt and standard administration procedures were followed. Students were read the visual story prompt and were given 10 minutes to plan and compose an essay.



**Pre-intervention phase.** During the pre-intervention phase of the study, eligible students were administered three measures: (a) Dolch Sight Word List; (b) Curriculum-Based Measurement in Spelling (S-CBM); and (c) Curriculum-Based Measurement in Written Expression (CBM-WE).

***Dolch Sight Word List.*** Students were administered all the third-grade level Dolch Sight Words ( $n = 41$ ) to determine the spelling words that were trained in the Cover, Copy, Compare intervention. In an effort to reduce student fatigue, students were administered the Dolch Sight Word List across two sessions, consisting of 20 and 21 words each, respectively. Students were given lined paper numbered 1 to 20 (or 21) and a spelling word was dictated every 7 seconds. This administration procedure was followed in order to be aligned with the administration procedures for the curriculum-based measurement in spelling probe (see *Curriculum-Based Measurement in Spelling*). No psychometric information is currently available. A total of 23 words were chosen as intervention words to be used in the Cover, Copy, Compare intervention based on the percentage of initial group accuracy (i.e., 80% or below; see Appendix A). Therefore, only the 23 words targeted in the Cover, Copy, Compare intervention were used in the subsequent analyses.

***Curriculum-Based Measurement in Spelling (S-CBM).*** A third-grade Curriculum-Based Measurement in Spelling (S-CBM; AIMSweb, 2002) probe was administered to assess students' spelling performance on grade-level, untrained words. Students were given lined paper and 17 spelling words were dictated every 7 seconds. Evidence supporting moderately high test-retest reliability across a 10-week period with 10 parallel forms was reported for S-CBM measures ( $r = .73$  to  $.92$ ; Marston, 1982). In addition, evidence supporting moderately high criterion validity ( $r$

= .80 to .86) for S-CBM measures in comparison to the Stanford Achievement Spelling subtest (Deno et al., 1980) was also reported.

***Curriculum-Based Measurement in Written Expression (CBM-WE).*** A Curriculum-Based Measurement in Written Expression (CBM-WE; AIMSweb, 2002) probe was administered to assess students' writing and spelling performance. In addition, four different CBM-WE probes were utilized within the context of Performance Feedback intervention (described below). During administration, the students were provided with a self-referenced story stem (e.g., "One night I had a strange dream...") followed by horizontal lines where the student wrote their story. The students had one minute to think about the story they will write and then three minutes to write their story. No additional instruction was provided. The narrative CBM-WE probes contain short sentence story starters that were previously examined for use with elementary-aged students of various backgrounds (McMaster et al., 2010). McMaster and colleagues found evidence for high alternate-form reliability ( $r = .82$  to  $.95$ ), high criterion validity ( $r = .40$  to  $.66$ ) and moderate standard errors of the estimate ( $SEE = 5.95$ ) with these CBM-WE probes.

**Intervention phase.** Students were randomly assigned to one of three intervention conditions and each intervention was administered over 4 sessions conducted over 6 weeks.

***Cover, Copy, Compare Only condition.*** Students assigned to this condition received a packet that included: (a) an identifying cover sheet; (b) a Cover, Copy, Compare worksheet (see Appendix B) based on the procedures developed by Skinner, McLaughlin, and Logan (1997) and adapted for spelling by Manfred, Derby, and Everson (2015); and (c) a "Spot the Difference" worksheet (see Appendix C). The Cover, Copy, Compare worksheet listed six intervention target words in the left column, and included six separate colored strips of paper to cover the first two

columns of each row (i.e., “the cover”). If the word was a homonym, an exemplar sentence was placed underneath the word in the first column. Intervention target words were derived from the most commonly misspelled words on the pre-intervention administration of the Dolch Sight Word List. Words were considered mastered when the students in the conditions reached 85% accuracy collectively. When an intervention target word was mastered by both of the conditions that consisted of the Cover, Copy, Compare intervention (i.e., 85% mastery criterion) a new word replaced the mastered word on the worksheet the following week. This percentage was chosen due to its alignment with educational standards associated with general classroom guidelines (75-85%) that are correlated to high quality instruction (Shapiro, 2010).

During each session, a procedural script was followed by the primary research assistant (see Appendix D) and students were instructed to complete the worksheet by: (a) looking at the printed intervention target word; (b) writing the intervention target word while looking at it; (c) covering the intervention target word with the colored strip of paper; (d) writing the intervention target word from memory; (e) uncovering the intervention target word; (f) comparing the newly written word to the printed intervention target word; and (g) repeating these procedures for each of the words on the worksheet. If students spelled a word incorrectly, they were told to put an “X” through the incorrectly spelled word and try again in the next blank space provided. If the word was spelled incorrectly a second time, the students were told to put an “X” through the second incorrectly spelled word and move on to the next word. Students were given three minutes to complete the worksheet. This time limit was chosen as previous research has found that students require less than 30 seconds per word when completing the intervention (Zannikos, 2012). At the conclusion of the intervention, students were administered a “Spot the Difference” filler activity. For three minutes, the students were instructed to find all the differences between

two pictures. This activity was administered following the Cover, Copy, Compare intervention in order to equate time across conditions.

***Performance Feedback Only condition.*** Each session, students were provided with a packet that contained the following contents: (a) identifying cover page; (b) individualized Performance Feedback page; (c) a CBM-WE probe; and (d) a “Spot the Difference” worksheet. The individualized Performance Feedback page included a box in the center of the page with a number inside that depicted the number of words the student wrote in the previous session (see Appendix E). Next to the box, there was an upward or downward facing arrow or an equal sign that denoted how their performance compared to the previous session. During each session, a procedural script was followed by the research assistant (see Appendix F) and students were provided with instructions on how to interpret the information. After explaining the Performance Feedback, the research assistant administered the CBM-WE probe. After the completion of the CBM-WE probe, students were administered the “Spot the Difference” activity for three minutes in order to equate time across conditions.

***Cover, Copy, Compare + Performance Feedback condition.*** Students assigned to this condition received a packet that included: (a) an identifying cover sheet, (b) a Cover, Copy, Compare worksheet, (c) an individualized Performance Feedback page, and (d) a CBM-WE probe. During each session, a procedural script was followed by the primary research assistant (see Appendix G) and the procedures were the same as those described for the Performance Feedback intervention and the Cover, Copy, Compare intervention. The “Spot the Difference” activity was not administered during this condition.

**Post-intervention phase.** Once the intervention ended, students were re-administered the Dolch Sight Word List, a S-CBM probe, and a CBM-WE probe by a research assistant that did

not administer the intervention. In addition, the Kids Intervention Profile (KIP; Eckert, Hier, Hamsho, & Malandrino, 2017) was administered to assess students' perceptions of the intervention(s) they received. The Kids Intervention Profile (KIP; Eckert, Hier, Hamsho, & Malandrino, 2017) is an 8-item measure that assesses students' perceptions of intervention acceptability. Boxes of increasing sizes are used in conjunction with a 5-point Likert-type scale that ranges from 'Not at All' to 'Very, Very Much'. The internal consistency (Cronbach's alpha = .79) and test-retest reliability ( $r = .70$ ) across a 3-week interval was determined to be adequate (Eckert, Hier, Hamsho, & Malandrino, 2017). Results of a principal components factor analysis indicated that the scale consists of two factors labeled "Overall Intervention Acceptability" and "Skill Improvement". Based on criteria established by the scale's authors, a total score greater than 24 represents an acceptable rating. In the present study, internal consistency of the KIP for the Performance Feedback intervention ( $\alpha = .79$ ) and the Cover, Copy, Compare intervention ( $\alpha = .87$ ) fell within acceptable levels.

In addition, teachers were asked to complete the Behavior Intervention Rating Scale (BIRS; Elliot & Treuting, 1991), which assessed perceptions of the acceptability and effectiveness of the interventions (i.e., Cover, Copy, Compare and/or Performance Feedback). This scale consists of 24 items that are listed on a 6-point Likert-scale, ranging from "strongly disagree" to "strongly agree". For the purposes of this study, the scale was modified so that questions related to problem behavior was be reworded to reflect difficulties in spelling and writing. Because modifications were made to the scale, the internal consistency was examined for the Performance Feedback intervention ( $\alpha = .98$ ) and the Cover, Copy, Compare intervention ( $\alpha = .88$ ).

## Dependent Measures

Outcomes on spelling and writing measures served as the dependent measures and were examined to determine the impact of the interventions on students' spelling and writing performance.

**Spelling performance.** To measure students' spelling performance, correct letter sequences were computed for the pre- and post- intervention Dolch Sight Word lists, S-CBM probes, and CBM-WE probes. To score correct letter sequences, procedures developed by Shinn and Shinn (2002) were utilized. A correct letter sequence is defined as a pair of letters correctly sequenced within a word. For example, the word *DOG* contains four possible correct letter sequences (i.e.,  $\wedge D \wedge O \wedge G \wedge$ ). In contrast, an incorrect letter sequence is defined when two letters are incorrectly sequenced within a word. For example, if a student spelled *DOG* as *DAWG*, three incorrect letter sequences would be recorded (i.e.,  $\wedge D \wedge A \wedge W \wedge G \wedge$ ).

**Writing performance.** In order to measure students' writing performance, correct writing sequences were compared on the pre- and post-intervention CBM-WE probes. Procedures developed by Shapiro (2004) were used for scoring correct and incorrect writing sequences. Specifically, each adjacent word in the students' writing was scored for accuracy based on spelling, capitalization, punctuation, and syntax.

## Experimental Design

A covariate adaptive randomization method was used to assign eligible students to one of three conditions: (a) Cover, Copy, Compare Only; (b) Performance Feedback Only; or (c) Cover, Copy, Compare + Performance Feedback. Consolidated Standards of Reporting Trials (CONSORT, 2018) was used to report participant allocation in the study (see Figure 1). Online software (i.e., Research Randomizer; Urbaniak & Plous, 2013) was used to generate a

randomization plan that sequentially assigns students to condition (regardless of classroom assignment) by considering students' baseline writing and spelling performance (i.e., average percentile score on pre-intervention S-CBM and CBM-WE probes) as well as race. This method controlled for the influence of students' initial writing and spelling performance while retaining relatively equal sample sizes across students' race.

An a priori power analysis was conducted using GPower (Erdfelder, Faul, & Buchner, 1996) to determine an adequate sample size for testing group differences between the three conditions. Sample size was calculated by setting  $\alpha$  equal to 0.05, power equal to 0.80, and an effect size of 0.60. The effect size was determined based on the results of previous studies (i.e., Eckert et al., 2006; Malandrino, 2017), which were conceptually and statistically similar to the present study. The results indicated that 25 third-grade students per condition would be sufficient, which results in a total sample size of 75 participants. A total of 79 third-grade students (27 in the Performance Feedback condition, 26 in the Cover, Copy, Compare condition, and 26 in the Cover, Copy, Compare + Performance Feedback condition) participated in this study, which is consistent with the estimates of the power analysis.

### **Procedural Integrity**

Primary research assistants conducted all sessions using procedural scripts detailing each step of the session. Secondary research assistants observed 80% of the intervention sessions to assess whether the procedures were implemented as described. In order to determine procedural integrity, the summed number of observed steps was divided by the total possible steps and multiplied by 100. Procedural integrity was exact across all sessions ( $M = 100\%$ ) and no deviations were reported.

## **Interscorer Agreement**

A total of 40% ( $n = 32$ ) of the pre- and post-spelling and writing measures were randomly selected and rescored. Interscorer agreement and kappa coefficients were calculated to examine the extent to which the two scorers agreed. Instances of disagreement between scorers were re-examined by the primary research assistant to make the final score determination. The mean percentage of interscorer agreement for correct letter sequences on the Dolch Spelling List was 98% (range, 91% to 100%) and the mean Kappa coefficient was 0.98 (range, 0.68 to 1.00). The mean percentage of interscorer agreement for correct letter sequences on the S-CBM probe was 98% (range, 96% to 100%) and the mean Kappa coefficient was 0.99 (range, 0.78 to 1.00). For correct letter sequences on the CBM-WE probe, the mean interscorer agreement was 98% (range, 94% to 100%) and the mean Kappa coefficient was 0.98 (range, 0.66 to 1.00). The mean interscorer agreement for correct writing sequences on the CBM-WE probe was 98% (range, 90% to 100%) and the mean Kappa coefficient was 0.98 (range, 0.76 to 1.00).

## **Results**

### **Data Preparation**

**Data input and consistency checks.** The primary research assistant, along with trained research assistants were responsible for entering data into a Microsoft Excel file. Another research assistant double-checked all imputed data to ensure accuracy. Data was transferred from Microsoft Excel to SPSS 26.0 (SPSS Inc., 2017). SPSS was used to perform all descriptive statistics in addition to the major statistical analyses.

**Missing data.** Prior to conducting the analyses, data were inspected for missing data. There were no missing data for demographic or baseline variables, however, the percentage of missing values for the spelling and writing post-intervention measures was 2.20% due to student



absenteeism. As a result, only 96% of the participants in the sample would have been available for analyses due to listwise deletion. Results from Little's (1988) test of Missing Completely at Random (MCAR) was not significant,  $\chi^2(17) = 23.71, p = .13$ . A non-significant Little's (1988) MCAR test suggests that there is no evidence to suggest that the data is not missing completely at random. In order to obtain a complete data set, multiple imputation was conducted (Shafer & Graham, 2002; Enders, 2010). The multiple imputation procedure in SPSS was conducted to generate five imputed datasets. Imputed values compared with observed values and results using listwise deletion were similar, so imputed results were used and are based on the pooled data.

### **Descriptive Analysis**

Descriptive statistics for the pre-intervention measures were computed and analyzed to determine whether differences existed between conditions. No significant differences were found between conditions on the number of correct letter sequences on the S-CBM probe ( $F(2, 78) = 1.01, p = .37$ ), the Dolch Spelling List ( $F(2, 78) = 0.55, p = .58$ ), or the CBM-WE probe ( $F(2, 78) = 0.02, p = .98$ ). Similarly, no significant differences between conditions were found on the number of correct writing sequences on the CBM-WE probe ( $F(2, 78) = 0.02, p = .98$ ; see Table 2).

### **Major Analyses**

To examine whether students' spelling and writing performance differed depending on intervention type, four one-way analyses of covariance (ANCOVA) were proposed. Pre-intervention scores were used as a covariate to control for individual differences in performance. Prior to conducting the ANCOVAs, the underlying assumptions were tested, including tests of linearity, normality, multicollinearity, homogeneity of regression slopes, and homoscedasticity. These assumptions were mostly upheld, aside from one instance in which the assumption of

linearity was violated for correct letter sequences on the S-CBM probe. To reduce errors associated with multiple comparisons, a Bonferroni correction of .01 was applied.

**Spelling performance.** In order to compare the effectiveness of the interventions on students' spelling performance, three ANCOVAs were conducted. No statistically significant differences were found between the conditions on the number of correct letter sequences on the Dolch Spelling List,  $F(2, 78) = 2.62, p = .08$ , the S-CBM probe,  $F(2, 78) = 0.48, p = .62$ , or the CBM-WE probe,  $F(2, 78) = 2.78, p = .07$ , after controlling for baseline performance. These results indicate that students in each condition did not significantly differ in their spelling performance on any of the spelling measures used in this study (see Figure 2).

Across conditions, students' initial spelling performance on the S-CBM probe ( $M$  correct letter sequences = 70.03) fell below the 10<sup>th</sup> percentile according to the spring normative outcomes for third-grade students (AIMSweb, 2017). At the conclusion of the study, students across conditions were performing at the 15<sup>th</sup> percentile ( $M$  correct letter sequences = 81.75) on the post-intervention S-CBM probe. The average rate of improvement (ROI) across conditions was 1.95 correct letter sequences per week.

Within conditions, significant improvements were observed in spelling outcomes. In the Performance Feedback Only condition, there was a significant difference in pre-intervention correct letter sequences ( $M = 93.26, SD = 33.80$ ) and post-intervention correct letter sequences ( $M = 102.70, SD = 30.53$ ) on the Dolch List,  $t(26) = -4.86, p = .000$ . There was not a significant difference between pre-intervention ( $M = 80.41, SD = 22.33$ ) and post-intervention correct letter sequences ( $M = 84.81, SD = 26.07$ ) on the S-CBM list,  $t(26) = -1.950, p = .062$ . There was a significant difference between pre-intervention ( $M = 79.59, SD = 38.63$ ) and post-intervention

correct letter sequences ( $M = 141.63$ ,  $SD = 71.74$ ) on the CBM-WE probe,  $t(26) = -5.26$ ,  $p = .000$ .

For the Cover, Copy, Compare condition, there was a significant difference in pre-intervention correct letter sequences ( $M = 87.15$ ,  $SD = 30.23$ ) and post-intervention correct letter sequences ( $M = 93.58$ ,  $SD = 30.58$ ) on the Dolch List,  $t(25) = -2.72$ ,  $p = .012$ ). There was a significant difference between pre-intervention ( $M = 73.36$ ,  $SD = 26.23$ ) and post-intervention correct letter sequences ( $M = 78.72$ ,  $SD = 22.72$ ) on the S-CBM list,  $t(25) = -2.45$ ,  $p = .022$ . There was a significant difference between pre-intervention ( $M = 78.85$ ,  $SD = 48.33$ ) and post-intervention correct letter sequences ( $M = 107.54$ ,  $SD = 51.25$ ) on the CBM-WE probe,  $t(25) = -2.71$ ,  $p = .012$ .

For the Cover, Copy, Compare + Performance Feedback condition, there was a significant difference in pre-intervention correct letter sequences ( $M = 81.85$ ,  $SD = 37.70$ ) and post-intervention correct letter sequences ( $M = 98.12$ ,  $SD = 25.49$ ) on the Dolch List,  $t(25) = -3.55$ ,  $p = .002$ ). There was a significant difference between pre-intervention ( $M = 73.21$ ,  $SD = 20.80$ ) and post-intervention correct letter sequences ( $M = 81.00$ ,  $SD = 19.98$ ) on the S-CBM list,  $t(25) = -3.60$ ,  $p = .002$ . There was a significant difference between pre-intervention ( $M = 80.60$ ,  $SD = 48.60$ ) and post-intervention correct letter sequences ( $M = 122.92$ ,  $SD = 64.04$ ) on the CBM-WE probe,  $t(25) = -5.22$ ,  $p = .000$ .

**Writing performance.** In order to compare the effectiveness of the three interventions on students' writing performance, one ANCOVA was conducted. No statistically significant differences were found between the conditions on the number of correct writing sequences on the CBM-WE probe,  $F(2, 78) = 2.57$ ,  $p = .08$ . These results indicate that students in each condition did not significantly differ in their writing performance on the CBM-WE probe (see Figure 2).

Across conditions, students' initial writing performance on the CBM-WE probe ( $M$  correct writing sequences = 14.00) was at the 10<sup>th</sup> percentile according to the spring normative outcomes for third-grade students (AIMSweb, 2017). At the conclusion of the study, students across conditions were performing at the 25<sup>th</sup> percentile ( $M$  correct writing sequences = 19.77) on the post-intervention CBM-WE probe. The average rate of improvement (ROI) across conditions was 0.96 correct writing sequences per week.

Within conditions, significant improvements were observed on writing outcomes. In the Performance Feedback Only condition, there was a significant difference in pre-intervention correct writing sequences ( $M = 13.96$ ,  $SD = 7.96$ ) and post-intervention correct writing sequences ( $M = 23.56$ ,  $SD = 15.05$ ) on the CBM-WE probe  $t(26) = -3.65$ ,  $p = .001$ . In the Cover, Copy, Compare Only condition, there was not a significant difference in pre-intervention correct writing sequences ( $M = 13.69$ ,  $SD = 9.95$ ) and post-intervention correct writing sequences ( $M = 16.81$ ,  $SD = 11.32$ ) on the CBM-WE probe,  $t(25) = -1.66$ ,  $p = .109$ . In the Cover, Copy, Compare + Performance Feedback condition, there was a significant difference between pre-intervention correct writing sequences ( $M = 14.19$ ,  $SD = 11.13$ ) and post-intervention correct writing sequences ( $M = 18.65$ ,  $SD = 13.32$ ) on the CBM-WE probe,  $t(26) = -2.32$ ,  $p = .029$ .

### **Student Acceptability Outcomes**

Students' acceptability ratings on the Kids Intervention Profile (KIP; Eckert et al., 2015) were examined descriptively. Based on the acceptability threshold established for the KIP (i.e., scores > 24), the total acceptability ratings for Performance Feedback intervention ( $M = 30.17$ ) and the Cover, Copy, Compare intervention ( $M = 30.64$ ) indicated that both interventions were perceived favorably. Ratings on the Skill Improvement Factor were similar for the Performance

Feedback intervention ( $M = 7.62$ ) and the Cover, Copy, Compare intervention ( $M = 7.71$ ; see Table 3).

### **Teacher Acceptability Outcomes**

Teachers acceptability ratings ( $n = 3$ ) on the Behavior Intervention Rating Scale (BIRS; Elliot & Treuting, 1991) suggested that the two teachers that received the Performance Feedback intervention in their classrooms indicated high ratings on all three factors (Acceptability  $M = 5.13$ ,  $SD = 0.75$ ; Effectiveness  $M = 4.07$ ,  $SD = 0.71$ ; Time of Effectiveness  $M = 4.50$ ,  $SD = 0.74$ ). Similarly, the two teachers that received the Cover, Copy, Compare intervention in their classrooms indicated high ratings on all three factors (Acceptability  $M = 4.60$ ,  $SD = 0.57$ ; Effectiveness  $M = 4.21$ ,  $SD = 0.51$ ; Time of Effectiveness  $M = 4.00$ ,  $SD = 0.00$ ; see Table 3).

### **Discussion**

Spelling skills are a key component of writing proficiency and directly related to the quality of a written composition (Berninger, 1999; Graham, 1983). However, explicit and developmentally-appropriate spelling instruction is currently neglected in elementary school classrooms (Berninger, 1999; Fresch, 2003). The purpose of the present study was to evaluate and compare the independent and combined effectiveness of two empirically-based interventions that target the spelling (i.e., Cover, Copy, Compare) and writing (i.e., Performance Feedback) performance of third-grade students. Given the existing literature supporting the use of Performance Feedback in improving students' writing performance (Eckert et al., 2006; Hier & Eckert, 2014), the empirical evidence of Cover, Copy, Compare in improving students' spelling performance (Schermerhorn & McLaughlin, 1997; Jaspers et al., 2014), and the emerging literature suggesting the effectiveness of combining both interventions (Williams, 2017), the present study aimed to replicate these findings among general education students using a group

administration procedure. Results of the study's main aims indicated that there were no statistically significant differences between the three conditions on any of the spelling or writing outcome measures examined in this study.

### **Improvements in Spelling Performance**

Students across all three conditions performed similarly on all post-intervention spelling measures. Results of this study failed to support the hypothesis that students who received a Cover, Copy, Compare intervention would demonstrate greater spelling performance than students assigned to the Performance Feedback Only condition on targeted measures of spelling. In addition, results of this study did not support the hypothesis that students in the Cover, Copy, Compare + Performance Feedback condition would demonstrate significantly greater performance on measures of spelling in the context of a writing probe compared to students assigned to the Cover, Copy, Compare Only and the Performance Feedback Only conditions. However, as hypothesized, there were no differences in the spelling performance for students in the Cover, Copy, Compare Only and the Cover, Copy, Compare + Performance Feedback conditions on targeted measures of spelling.

One factor associated with the lack of differences between conditions on the trained words from the post-intervention Dolch Sight Word List was due to the students' pre-intervention performance. Initially, students wrote an average of 90.36 correct letter sequences of the possible 127 correct letter sequences. Thus, students were already spelling the 23 trained words with 71% accuracy. As a result, because of the high proportion of students spelling the words accurately may have limited the possibility of differences (i.e., ceiling effect) at post-intervention.

Another possible explanation for the lack of differences between conditions could be attributed to the method of interchanging words targeted in the Cover, Copy, Compare intervention. In this study, targeted words were removed, and novel words were added when students assigned to the two conditions that received the intervention collectively reached 85% accuracy. Although this percentage aligns with guidelines correlated with high quality instruction (75% to 85% accuracy; Shapiro, 2011), it is possible this threshold was not sufficient for students reaching mastery of the trained words before novel words were introduced in the intervention. As a result, it may have been more appropriate to set the spelling mastery threshold to the higher than the recommended percentage range (i.e., 95%) in order for students who were struggling in the acquisition of the trained words to gain more exposure prior to removing the words from the Cover, Copy, Compare intervention.

Finally, the absence of generalization programming may have contributed to the lack of difference between the conditions on the post-intervention Dolch Sight Word List. ‘Generalization’ refers to the transfer of a trained response across time, stimuli, or behaviors (Stokes & Baer, 1977). Students who received the Cover, Copy, Compare intervention were presented words in a written format and they were required to copy the word, memorize it, and then write it from memory. On the post-intervention Dolch Sight Word List, students were required to write the dictated word on lined paper. In order for students to spell the trained words correctly on the post-intervention Dolch Sight Word List, stimulus generalization was required. That is, students must be able to use the trained skill in response to novel stimuli (Haring & Eaton, 1978). The current study utilized a “train and hope” strategy, which assumed students would generalize trained skills independently across stimuli (Haring & Eaton, 1978; Stokes & Baer, 1977). However, it has been argued that in order to promote the generalization of a trained

response to diverse stimuli, generalization tactics (i.e., exploit functional contingencies, train diversely, or incorporate functional mediators) should be implemented (Stokes & Osnes, 1999). In the present study, one way to address this concern was to have the words in the Cover, Copy, Compare intervention be read to the students as they studied the modeled word. No generalization tactics were explicitly targeted in the context of the Cover, Copy, Compare intervention. Therefore, this may account for why students were unable to successfully generalize the trained words from the Cover, Copy, Compare intervention to the post-intervention Dolch Sight Word List.

A similar pattern of findings was found on the untrained words contained on the post-intervention S-CBM probe. Students in the Performance Feedback Only condition performed similarly to the conditions that received the Cover, Copy, Compare intervention, disconfirming the hypothesis that students assigned to the two conditions that utilized Cover, Copy, Compare would demonstrate greater spelling performance on this measure. However, as hypothesized, there was no difference in performance between the students in the Cover, Copy, Compare Only and Cover, Copy, Compare + Performance Feedback conditions on untrained words on the S-CBM probe.

There are a few possible explanations for these findings. First, as mentioned in the discussion of the previous Dolch Sight Word List results, explicit generalization programming was not incorporated in the context of the Cover, Copy, Compare intervention. In order for students in the conditions that received the Cover, Copy, Compare intervention to generalize common word patterns from the trained words used in the intervention to the words on the post-intervention S-CBM probe, both stimulus and response generalization programming must occur. That is, students must be able to use the trained skill in response to novel stimuli and they must



be able to modify the learned skill in response to a novel demand (Haring & Eaton, 1978). In the Instructional Hierarchy model introduced by Haring and Eaton (1978), stimulus generalization must be achieved before moving on to programming response generalization. As observed in the previous finding on the post-intervention Dolch Sight Word List, it is apparent that stimulus generalization did not occur, making it impossible for students to achieve response generalization on the post-intervention S-CBM probe.

A second factor that could account for a lack of differences between the conditions that utilized a Cover, Copy, Compare component and the Performance Feedback condition is that although students in third-grade are likely to be functioning in the within-word pattern stage of spelling development (Henderson & Templeton, 1986), the untrained words on the S-CBM probe were not chosen based on shared within-word patterns of the targeted Dolch Sight Word List words. According to the Instructional Hierarchy (Haring & Eaton, 1978), in order to promote generalization, common word patterns between words should have been identified and explicitly trained to mastery and fluency in order for students to show greater performance on the S-CBM probe. Further, spelling is a skill that requires explicit instruction, especially for elementary-aged students who are functioning in the within-word pattern stage of spelling development (Wansek et al., 2006). The untrained words on the S-CBM probe were not explicitly taught to students within the Cover, Copy, Compare intervention, therefore, it is probable that students who received the Cover, Copy, Compare intervention would perform similarly to the students that did not receive the Cover, Copy, Compare intervention as none of these students received explicit training on these words and no generalization programming occurred.

Consistent with the previously discussed findings, there were no statistically significant differences between the conditions on measures of spelling within the context of the post-

intervention writing probe. There are a few possible explanations for this finding. As previously discussed, no explicit generalization programming occurred in the context of the Cover, Copy, Compare intervention, therefore, it is unlikely that the students were able to generalize trained words and/or common word patterns to the post-intervention writing probe. As theorized by Haring and Eaton (1978), students must progress through the Instructional Hierarchy in a linear fashion. Response generalization, or adaptation, is the last step in the instructional hierarchy. Before reaching the ability to generalize a response, this theory posits that the student must be able to use the skill on a novel stimulus with success (i.e., stimulus generalization). The Dolch Sight Word List required students to correctly spell dictated words they were exposed to in a different format (i.e., written on the Cover, Copy, Compare worksheet). As previously discussed, no differences between the conditions that utilized a Cover, Copy, Compare component and the condition that did not incorporate Cover, Copy, Compare occurred, suggesting that this stage of the instructional hierarchy was not met.

Although no differences were found between conditions on correct letter sequences within the context of the post-intervention writing probe, the results approached statistical significance ( $p = .08$ ). An examination of the descriptive results suggested that, on average, students assigned to the Performance Feedback Only condition had the most correct letter sequences on the post-intervention writing probe ( $M = 141.63$ ) compared to the students in the Cover, Copy, Compare + Performance Feedback condition ( $M = 120.50$ ) and the Cover, Copy, Compare Only condition ( $M = 107.53$ ). Although unexpected, there are a few possible explanations for these findings. First, each week, students who were assigned to the Performance Feedback Only condition were not required to switch between two interventions that focused on two different, albeit related, academic domains. It is possible that students in the Cover, Copy,

Compare + Performance Feedback intervention experienced fatigue, therefore, resulting in less letter sequences written or more frequent spelling errors due to cognitive flexibility required by combining the two interventions. Several research studies have shown a link between cognitive fatigue and decreased task switching abilities (i.e., cognitive flexibility; Lorist et al., 2009; Lorist et al., 2000; Van der Linden, Frese, & Meijman, 2003, Van der Linden, Frese & Sonnentag, 2003), ultimately resulting in a “switch cost” (i.e., task directions change, resulting in a decline in performance).

Because students in the multicomponent intervention were required to switch from Cover, Copy, Compare to Performance Feedback immediately, it is possible that these students’ performance was suppressed on measures of spelling within the context of a writing probe compared to students in the Performance Feedback Only and the Cover, Copy, Compare only conditions due to the demands of task-switching. Prior research evaluated the effectiveness of combining Cover, Copy, Compare with another intervention (i.e., sentence definition; Jaspers et al., 2012). Students assigned to the Cover, Copy, Compare only condition and students assigned to the Cover, Copy, Compare + sentence definition condition both significantly improved on post-intervention measures of spelling, but students assigned to the Cover, Copy, Compare + sentence definition condition did not outperform students in the Cover, Copy, Compare only condition on these measures. As a result, the effect of task-switching may also have impacted the results reported by Jaspers and colleagues (2012).

It is not surprising that an examination of the descriptive results indicated that students in the Cover, Copy, Compare Only condition wrote the least amount of correct letter sequences as these students were not exposed to the Performance Feedback intervention, and as discussed below, wrote fewer letter sequences. Because Performance Feedback is an intervention that has

been shown to be effective in improving students' writing productivity (i.e., total words written; Eckert et al., 2006), the students that did not receive the Performance Feedback intervention did not write as many words as the students who did receive the intervention. As a result, the more words the students wrote, the likelihood for more correct letter sequences increased. Because students assigned to the Performance Feedback Only condition wrote, on average, more words than the students in the other conditions, they generated more letter sequences.

Although no between-conditions differences were observed on spelling outcomes, there were within-condition improvements across measures. Students from all three conditions significantly improved in their correct letter sequences on the Dolch Spelling List and the CBM-WE probe from pre- to post-intervention. For the S-CBM probe, only students in the Cover, Copy, Compare Only and the Cover, Copy, Compare + Performance Feedback conditions significantly improved from pre- to post-intervention. It was surprising that students assigned to the Performance Feedback Only condition significantly improved across spelling measures as they did not receive explicit spelling instruction.

### **Improvements in Writing Performance**

The hypothesis that students who received the Cover, Copy, Compare + Performance Feedback intervention would significantly outperform students in the Performance Feedback and Cover, Copy, Compare interventions in isolation on post-intervention writing measures was not supported by the results of the current study. Students assigned to the Performance Feedback Only condition wrote the most correct writing sequences on the post-intervention writing probe, followed by students assigned to the Cover, Copy, Compare + Performance Feedback condition, and then the Cover, Copy, Compare Only condition. However, these differences were not

statistically significant, which suggests that students across conditions performed similarly on the post-intervention writing measure.

There are a few possible explanations for the results of the present study. As previously discussed in relation to the spelling outcomes, one factor that could have influenced the results is the effect of task-switching. Although not statistically significant, students assigned to the Performance Feedback Only condition demonstrated the highest number of correct writing sequences on the post-intervention writing probe. The students in this condition were not required to switch from the Cover, Copy, Compare worksheet to the writing probe each week, therefore, these students were able to focus solely on their writing. Previous research has shown that elementary-aged children, in comparison to adolescents and adults, perform poorly on task-switching, often resulting in incorrect responses and increased response time (Murphy, Foxe, & Molholm, 2015). Given that the prefrontal regions involved in task-switching develop throughout childhood, with some neural correlates of task-switching not fully developed until adolescence (Crone, Donohue, Honomichl, Wendelken, & Bunge, 2006), this may explain why the third-grade students assigned to the multicomponent intervention did not show significantly greater performance on the writing measure compared to third-grade students assigned to one of the two single- component interventions.

It is important to note that this finding is somewhat inconsistent with previous research examining Performance Feedback in combination with Cover, Copy, Compare. In the study by Williams (2017), students in the Cover, Copy, Compare + Performance Feedback condition wrote more correct writing sequences than students in the Performance Feedback Only condition, although it was not statistically significant. However, there was one procedural difference, in the Williams (2017) study, students received the Performance Feedback

intervention prior to the Cover, Copy, Compare intervention whereas in the current study, students received the Cover, Copy, Compare intervention prior to the Performance Feedback intervention. Therefore, students in the current study who were assigned to the Performance Feedback + Cover, Copy, Compare condition may have experienced cognitive fatigue after switching from the Cover, Copy, Compare intervention to the Performance Feedback intervention, resulting in decreased performance on the writing probe. Cognitive fatigue has not only been associated with decreased task performance (Lorist et al., 2009; Lorist et al., 2000; Van der Linden, Frese, & Meijman, 2003, Van der Linden, Frese, & Sonnentag, 2003), but also sub-optimal planning and increased response time (Van der Linden, Frese, & Meijman, 2003). These executive functions are imperative for students to demonstrate their writing skills on the post-intervention writing probe and may be an explanation for the results that students in the multicomponent intervention did not perform significantly greater on the post-intervention measure of writing.

Another possible explanation for this finding is the absence of generalization of common words and word patterns from the Cover, Copy, Compare intervention to the post-intervention writing probe. It was hypothesized that students in the Cover, Copy, Compare + Performance Feedback condition would outperform the students assigned to the Cover, Copy, Compare Only and Performance Feedback Only conditions on the number of correct writing sequences on the post-intervention writing probe. Correct writing sequences is a writing measure that takes into account spelling, grammar, capitalization, and punctuation (Shapiro, 2004). By targeting both spelling and writing skills, the number of correct writing sequences on the post-intervention writing probe was predicted to increase for the students in the Cover, Copy, Compare + Performance Feedback condition compared to the students receiving the single-component

interventions. However, as previously discussed in the context of the spelling results, in order for students to generalize targeted words and word patterns from the Cover, Copy, Compare intervention to the post-intervention writing probe, stimulus generalization and response generalization must be specifically programmed into the Cover, Copy, Compare intervention (Haring & Eaton, 1978). Contrary to the hypothesis, students assigned to the Performance Feedback Only condition wrote the most correct writing sequences on the post-intervention writing probe, although there was not a statistically significant difference between the three conditions. The students in the Performance Feedback Only intervention were not required to generalize the targeted skill (i.e., writing fluency) across stimuli or responses. The post-intervention writing probe was identical to the weekly probes administered to the students who received the Performance Feedback intervention each week. Therefore, this factor may be associated with students in the Performance Feedback Only condition performing slightly higher compared to the students in the Cover, Copy, Compare + Performance Feedback and Cover, Copy, Compare Only conditions in terms of correct writing sequences in the context of the post-intervention writing probe.

Although there were not between-condition differences, there are some important within-group improvements that were observed. Students assigned to the Performance Feedback Only condition and students assigned to the Cover, Copy, Compare + Performance Feedback condition made significant gains in correct writing sequences from pre- to post-intervention. This result was expected as students in these conditions received the Performance Feedback intervention, which has been shown to significantly improve students' writing performance (Eckert et al., 2006).

### **Intervention Acceptability**

The third aim of the present study evaluated the perceptions of the Cover, Copy, Compare and Performance Feedback interventions by teachers and students. Results of the descriptive analysis confirmed that Performance Feedback and Cover, Copy, Compare would be rated as ‘acceptable’ by teachers and students. For both interventions, teachers had favorable views across three factors of the BIRS (i.e., Time of Implementation, Perceived Effectiveness, Overall Acceptability). This is an encouraging result, as teachers are more likely to implement interventions in their classroom if the interventions are perceived favorably in these domains (Elliot & Treuting, 1991; Lindsley, 1992). Similarly, students also rated both interventions favorably. It is important to gather information regarding students’ perceptions in addition to teacher perceptions, as students are the direct consumers of the interventions (Shapiro & Goldberg, 1990). When students view an intervention as acceptable, they are more likely to demonstrate increased academic outcomes (Eckert et al., 2017; Mautone et al., 2009).

### **Limitations**

There are some limitations that should be considered when interpreting the results of the current study. The first limitation to consider is the mastery criteria of target words in the Cover, Copy, Compare intervention. As previously mentioned, words were removed when students collectively reached 85% accuracy on the Cover, Copy, Compare worksheet. This guideline was chosen based on recommendations set by Shapiro (2011). However, it may have been more appropriate to set the spelling mastery threshold higher than the recommended percentage range (i.e., 95%) in order for students who were struggling in the acquisition of the trained words to gain more exposure prior to removing the words from the Cover, Copy, Compare intervention.



Another limitation in the current study relates to lack of explicit generalization programming in the Cover, Copy, Compare intervention. The current study utilized a “train and hope” strategy, which assumes that students will generalize taught skills independently (Haring & Eaton, 1978; Stokes & Baer, 1977). Given the lack of generalization observed in the present study, it appears that additional generalization programming should have been incorporated including: (a) stimulus generalization (i.e., training students to generalize targeted words and to the Dolch Sight Word List), (b) response generalization (i.e., training students to generalize common word patterns to the S-CBM probe), and (c) stimulus and response generalization (i.e., training students to generalize targeted words and word patterns to the post-intervention writing probe).

Finally, the study population was limited to third-grade students in an urban elementary school, most of which received a free or reduced-price lunch. Therefore, the generalizability of these results is limited to samples of similar demographics.

### **Directions for Future Research**

There are a number of areas for future research. The first area includes exploring the feasibility of teacher implementation of the interventions in combination as well as in isolation. In an article addressing the “research-to-practice gap”, Carmine (1997) identified three issues that contribute to the divide between research and practical implementation. These issues include: trustworthiness; (b) usability; and (c) accessibility. Trustworthiness of education research by teachers is dependent on the scientific rigor, sound methodology, and technical considerations of the study. The current study was an adequately powered, randomized controlled trial, which is the gold-standard in intervention research design (Hariton & Locascio, 2018). Usability refers to the likelihood that the research findings will be implemented by those

who provide services to students (i.e., teachers). In order to be useable, findings must be clearly written and be relevant to topics that are of importance to teachers. Findings from acceptability measures from the current study indicate that teachers view the interventions implemented as an appropriate intervention to target students' writing and spelling performance, and that they would be willing to implement the interventions in their classrooms. However, the teachers did not have the opportunity to implement the interventions, therefore, the true perception of usability by classroom teachers of the interventions is largely unknown. Finally, accessibility refers to the ease teachers can obtain research findings and extract necessary findings to reach a certain goal. Future research should not only include teachers in the implementation of the interventions, but also be cognizant of how findings of high-quality research studies are presented, and where they are disseminated in order to ensure teachers are able to successfully access and implement these evidence-based practices in their classrooms.

The results of the current study did not support the hypothesis that the multi-component intervention is more effective than the interventions in isolation immediately after implementation. However, students in all three conditions improved on post-intervention measures of spelling and writing performance. Future research should explore the extent to which these gains maintain over time, and if these effects are consistent across groups. In one study that evaluated maintenance effects of the Performance Feedback intervention, Hier and Eckert (2014) found limited maintenance effects of writing gains on 2-, 4-, and 6- week maintenance probes compared to students assigned to a practice only condition. Cover, Copy, Compare, however, has been shown to produce maintenance effects most likely due to the high rate of learning trials which allows students to engage in over-learning, which has shown to increase maintenance (Ivarie, 1986). A number of studies have shown maintenance in spelling

gains in students that receive a Cover, Copy, Compare intervention (Moser et al., 2010; Conley et al., 2004; Zannikos, 2018). Future research should examine the maintenance effects of the multicomponent intervention on both spelling and writing gains, as the maintenance effects observed in previous Cover, Copy, Compare studies may further improve students' correct writing sequences as spelling is taken account of in this metric.

Finally, to fully examine the generalizability of these findings, this study should be replicated with a different population of third-grade students (i.e., students of a different socioeconomic status in different geographical locations). It would also be beneficial to evaluate the effects of the interventions with students at varying grade levels to examine if the interventions have more of an impact depending on the level of spelling skills (i.e., the alphabetic principle versus the within-word pattern principle versus the meaning principle).

### **Conclusion**

A large percentage of elementary-aged students in the United States are performing below the proficient level in the area writing (Aud et al., 2012). A key component in improving writing quality is the acquisition of proficient spelling skills (Berninger, 1999). Writing and spelling are two important academic skills that are closely related. Unfortunately, spelling and writing instruction is limited in classrooms across the country, and a call for efficient and effective spelling and writing interventions is warranted (Fresch, 2003). The present study sought to examine the effectiveness of two evidence-based interventions in combination as well as in isolation (i.e., Cover, Copy, Compare and Performance Feedback) on third grade students' spelling and writing performance. Results of the current study indicated that although all of the students that received the Cover, Copy, Compare intervention and the Performance Feedback intervention demonstrated improvements in writing and spelling, the combined Cover, Copy,

Compare + Performance Feedback intervention did not result in increased gains in these areas compared to the interventions in isolation. These results suggest that the combination of the Cover, Copy, Compare intervention and the Performance Feedback intervention did not result in an effective multicomponent intervention. Therefore, the interventions demonstrate the same effectiveness on their respective targeted outcomes (i.e., spelling and writing) in isolation as well as in combination. Future research should examine manipulations of these interventions to include teacher implementation as well as program for generalization and maintenance effects.

## Appendix A

## Intervention Target Words

Intervention Target Word	Session Introduced	Initial Group Mastery	Session Mastered	Final Group Mastery
Laugh	1	80%	1	86%
Shall	1	74%	1	100%
Carry	1	67%	1	96%
Eight	1	59%	1	88%
Own	1	54%	1	92%
Warm	1	54%	2	98%
Together	2	53%	2	94%
Try	2	41%	2	96%
Bring	2	49%	2	92%
Clean	2	49%	2	96%
Hold	2	47%	2	96%
Keep	3	47%	3	96%
Light	3	46%	3	90%
Done	3	45%	3	92%
Hurt	3	45%	3	90%
Only	3	45%	3	96%
Drink	3	44%	3	92%
Full	4	42%	4	97%
Draw	4	41%	4	94%
Better	4	40%	4	94%
Pick	4	39%	4	91%
Far	4	36%	4	97%
Seven	4	33%	4	91%

## Appendix B

## Cover, Copy, Compare Student Worksheet

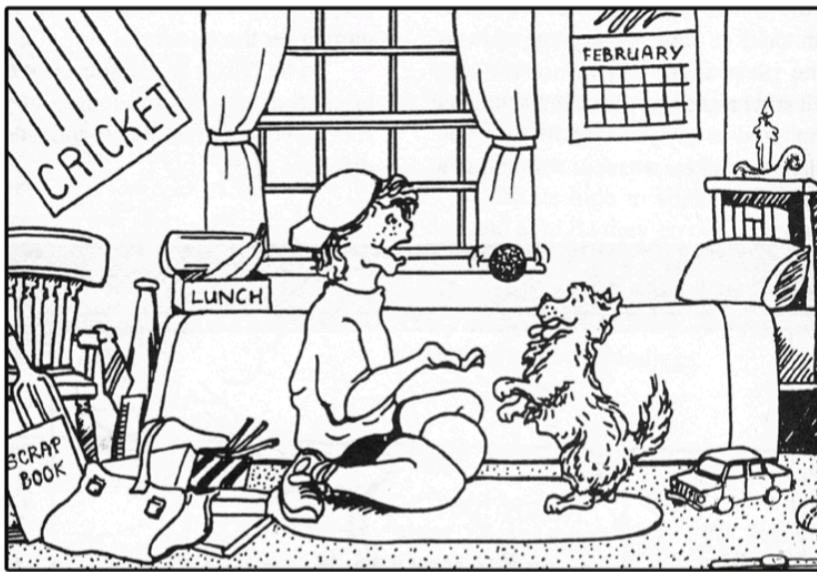
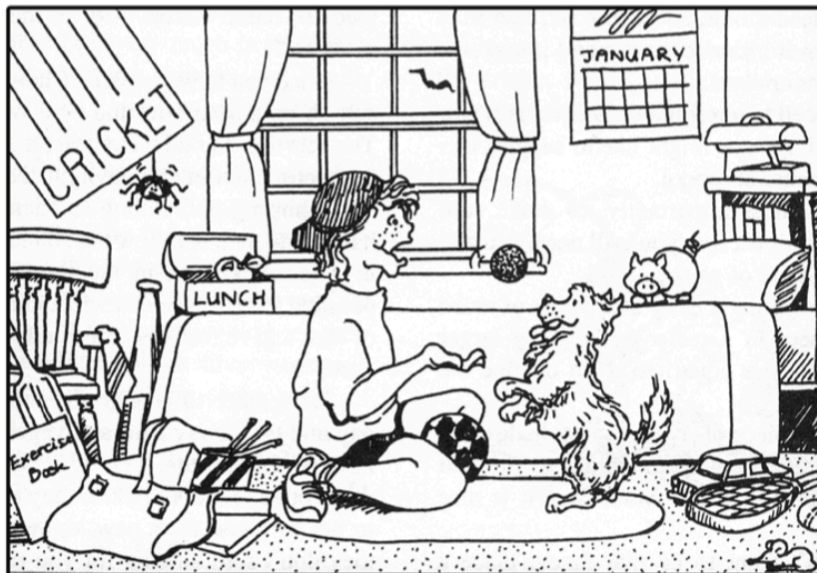
Word	Copy	Write from Memory	Try Again
Because			
Only			
Picture			
Game			
Queen			
About			

Appendix C

“Spot the Difference” Worksheet

Name: \_\_\_\_\_

There are ten differences, can you spot them all?



## Appendix D

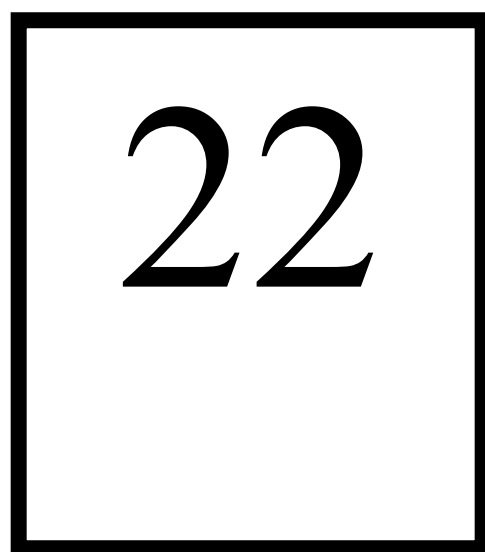
### Cover, Copy, Compare Intervention Script

State to the students: “Please turn to the first page of your packet. You will see a worksheet with colored pieces of paper on it. Please listen carefully as I go over the instructions. Follow along on your worksheet. On your worksheet, you will see a colored strip of paper that is stapled over the left hand side of your page. Lift the slip of paper and look at the first word in the first box. Silently say the word to yourself. While looking at the word, copy in the second box (*research assistant should point to the first blank space*). If you incorrectly copy the word, erase and try again. Now, you will use the strip of paper (*research assistant should point out the strip of paper*) to cover the printed and written word. In the third box under the words “Write from Memory”. No peeking. Now, lift up the strip of paper and compare your answer to the correct spelling of the word. If you spelled the word correctly, you will move on to the next word. If you spelled the word incorrectly, put an “X” through the incorrectly spelled word and try again in the last box under “Try Again”. If you spell the word incorrectly again, put an “X” over it and move on to the next word. Does anyone have any questions before we begin? You will have 3 minutes to go through the worksheet. Complete as much as you can.”



## Appendix E

## Individualized Performance Feedback



## Appendix F

### Performance Feedback Intervention Script

State to the students: “Please turn to the first page of your packet, which has a stop sign in the middle of the page. Today, I want you to write a short story. You will have some time to think about the story you will write and then you will have some time to write it. Turn to the next page of your packet. This page has a funnel with some numbers, letters, and pictures going into it at the top of the page. The box in the middle of the page (*research assistant should point to the box*) tells you how many you wrote last week. Next to the box you will see an arrow. If the arrow is pointing up towards the sky, that means you wrote more words since the last time I worked with you. If the arrow is pointing down towards the floor, that means you wrote fewer words since the last time I worked with you. If you have an equal sign instead of an arrow, that means you wrote the same number of words as you did the last time I worked with you. Every week when we work with you, we are going to tell you how you are doing with your writing. Now, I want you to write another story. I am going to read a sentence to you first, and then I want you to write a story about what happens next. You will have some time to think about the story you will write and then you will have some time to write. Please turn to the next page of your packet. This page has a thought bubble at the top of the page. For the next minute think about writing a story that begins with this sentence: ‘I was talking to my friends when all of a sudden...’ Remember, take time to plan your story. A well-written story usually has a beginning, a middle, and an end. It also has characters that have names and perform certain actions. Use paragraphs to help organize your story. Correct punctuation and capitalization will make your story easier to read. Please do not write the story. Just think of a story that begins with sentence: ‘I was talking to my friends when all of a sudden...’ *The research assistant should begin the stopwatch and time the*

*students for 1 minute. After 30 seconds, state: “You should be thinking about ‘I was talking to my friends when all of a sudden...” After 1 minute, state to the students: “Okay, stop thinking, turn to the next page of your packet and raise your own pencil high in the air. This page has a large pencil at the top. When I tell you to start, please begin writing your story. Remember, if you don’t know how to spell a word, you should try your best to sound it out. It is important that you do your best work. If you fill up the first page, please turn to the next page and keep writing. Do not stop writing until I tell you to. Do your best work. Okay, you can start writing”.* *The research assistant should begin the stopwatch and time the students for 3 minutes.*

## Appendix G

## Cover, Copy, Compare + Performance Feedback Intervention Script

State to the students: “Please turn to the first page of your packet. You will see a worksheet with colored pieces of paper on it. Please listen carefully as I go over the instructions. Follow along on your worksheet. On your worksheet, you will see a colored strip of paper that is stapled over the left hand side of your page. Lift the slip of paper and look at the first word in the first box. Silently say the word to yourself. While looking at the word, copy in the second box (*research assistant should point to the first blank space*). If you incorrectly copy the word, erase and try again. Now, you will use the strip of paper (*research assistant should point out the strip of paper*) to cover the printed and written word. In the third box under the words “Write from Memory”. No peeking. Now, lift up the strip of paper and compare your answer to the correct spelling of the word. If you spelled the word correctly, you will move on to the next word. If you spelled the word incorrectly, put an “X” through the incorrectly spelled word and try again in the last box under “Try Again”. If you spell the word incorrectly again, put an “X” over it and move on to the next word. Does anyone have any questions before we begin? You will have 3 minutes to go through the worksheet. Complete as much as you can.” After 3 minutes, state to the students: “Stop, please turn to the next page of your packet, which has a stop sign in the middle of the page. Today, I want you to write a short story. You will have some time to think about the story you will write and then you will have some time to write it. Turn to the next page of your packet. This page has a funnel with some numbers, letters, and pictures going into it at the top of the page. The box in the middle of the page (*research assistant should point to the box*) tells you how many you wrote last week. Next to the box you will see an arrow. If the arrow is pointing up towards the sky, that means you wrote more words since the last time I worked with you. If the

arrow is pointing down towards the floor, that means you wrote fewer words since the last time I worked with you. If you have an equal sign instead of an arrow, that means you wrote the same number of words as you did the last time I worked with you. Every week when we work with you, we are going to tell you how you are doing with your writing. Now, I want you to write another story. I am going to read a sentence to you first, and then I want you to write a story about what happens next. You will have some time to think about the story you will write and then you will have some time to write. Please turn to the next page of your packet. This page has a thought bubble at the top of the page. For the next minute think about writing a story that begins with this sentence: 'I was talking to my friends when all of a sudden...' Remember, take time to plan your story. A well-written story usually has a beginning, a middle, and an end. It also has characters that have names and perform certain actions. Use paragraphs to help organize your story. Correct punctuation and capitalization will make your story easier to read. Please do not write the story. Just think of a story that begins with sentence: 'I was talking to my friends when all of a sudden...' *The research assistant should begin the stopwatch and time the students for 1 minute. After 30 seconds, state: "You should be thinking about 'I was talking to my friends when all of a sudden..." After 1 minute, state to the students: "Okay, stop thinking, turn to the next page of your packet and raise your own pencil high in the air. This page has a large pencil at the top. When I tell you to start, please begin writing your story. Remember, if you don't know how to spell a word, you should try your best to sound it out. It is important that you do your best work. If you fill up the first page, please turn to the next page and keep writing. Do not stop writing until I tell you to. Do your best work. Okay, you can start writing". The research assistant should begin the stopwatch and time the students for 3 minutes.*

Table 1

*Student Demographic Information (N = 79)*

Characteristics	Conditions								$X^2$	$p$
	Total Sample <sup>a</sup>		Performance Feedback <sup>b</sup>		Cover, Copy, Compare <sup>c</sup>		Cover, Copy, Compare + Performance Feedback <sup>d</sup>			
	%	(n)	%	(n)	%	(n)	%	(n)		
Sex									0.20	.905
Female	58.20	(46)	55.60	(15)	61.50	(16)	57.70	(15)		
Male	41.80	(33)	44.40	(12)	38.50	(10)	42.30	(11)		
Race									4.22	.836
Asian	7.60	(6)	11.10	(3)	3.80	(1)	7.70	(2)		
Black or African American	38.00	(30)	40.70	(11)	38.50	(10)	34.60	(9)		
Native Hawaiian or Other Pacific Islander	2.50	(2)	3.70	(1)	3.80	(1)	0.00	(0)		
White	35.40	(28)	37.00	(10)	34.60	(9)	34.60	(9)		
Ethnicity									6.35	.785
Arab	3.80	(3)	3.70	(1)	3.80	(1)	3.80	(1)		
Hispanic or Latino	7.60	(6)	3.70	(1)	7.70	(2)	11.50	(3)		
Hutu	3.80	(3)	3.70	(1)	7.70	(2)	0.00	(0)		
Nepali	3.80	(3)	3.70	(1)	3.80	(1)	3.80	(1)		
Not Hispanic or Latino	70.90	(56)	66.70	(18)	69.20	(18)	76.90	(20)		
Somali	10.10	(8)	18.50	(5)	7.70	(2)	3.80	(1)		
Special Education Eligibility									0.91	.923
Specific Learning Disability	6.30	(5)	7.40	(2)	3.80	(1)	7.70	(2)		
Speech or Language Impairment	5.10	(4)	3.70	(1)	7.70	(2)	3.80	(1)		
English as a Second Language (ESL) Student									3.41	.182
ESL	19.00	(15)	22.20	(6)	26.90	(7)	7.70	(2)		
No ESL	81.00	(64)	77.80	(21)	73.10	(19)	92.30	(24)		
	<i>M</i>	<i>(SD)</i>	<i>M</i>	<i>(SD)</i>	<i>M</i>	<i>(SD)</i>	<i>M</i>	<i>(SD)</i>	F	$p$
Age	8.31	0.45	8.20	0.35	8.20	0.33	8.52	0.56	4.98	.009

<sup>a</sup> $n = 79$ , <sup>b</sup> $n = 27$ , <sup>c</sup> $n = 26$ , <sup>d</sup> $n = 26$ .

Table 2

*Students' Average Scores on Pre-Intervention and Post-Intervention Measures of Spelling and Writing*

	Pre-Intervention						Post-Intervention					
	Performance Feedback Condition		Cover, Copy, Compare Condition		Cover, Copy, Compare + Performance Feedback Condition		Performance Feedback Condition		Cover, Copy, Compare Condition		Cover, Copy, Compare + Performance Feedback Condition	
	<i>M</i>	<i>(SD)</i>	<i>M</i>	<i>(SD)</i>	<i>M</i>	<i>(SD)</i>	<i>M</i>	<i>(SD)</i>	<i>M</i>	<i>(SD)</i>	<i>M</i>	<i>(SD)</i>
Dolch Spelling List Correct Letter Sequences	81.96	(31.08)	89.92	(36.87)	90.81	(34.32)	98.48	(23.24)	100.84	(30.03)	98.29	(29.07)
CBM-S Probe Correct Letter Sequences	80.41	(22.33)	72.62	(25.98)	71.81	(24.95)	84.81	(26.07)	77.92	(22.63)	79.85	(21.83)
CBM-WE Probe Correct Letter Sequences	79.59	(38.63)	78.85	(48.33)	77.85	(49.65)	141.63	(71.74)	107.53	(51.25)	120.50	(63.95)
CBM-WE Probe Correct Writing Sequences	13.96	(7.96)	13.96	(9.95)	14.19	(11.13)	23.56	(15.05)	16.81	(11.32)	19.72	(13.32)

*Notes.* S-CBM = Curriculum-Based Measurement in Spelling, CBM-WE = Curriculum-Based Measurement in Written Expression

Table 3

*Descriptive Results of the Teacher and Student Acceptability Outcomes*

	Performance Feedback Intervention		Cover, Copy, Compare Intervention	
	<i>M</i>	<i>(SD)</i>	<i>M</i>	<i>(SD)</i>
Students' Ratings on the KIP				
Total KIP Score	30.17	(8.00)	30.64	(6.73)
Factor 1: Overall Intervention Acceptability	23.02	(5.18)	22.46	(6.18)
Factor 2: Skill Improvement	7.62	(2.13)	7.71	(2.23)
Teachers' Ratings on the BIRS				
Total BIRS Score (Overall Acceptability)	4.77	(0.74)	4.44	(0.50)
Factor 1: Acceptability	5.13	(0.75)	4.60	(0.57)
Factor 2: Effectiveness	4.07	(0.71)	4.21	(0.51)
Factor 3: Time	4.50	(0.71)	4.00	(0.00)

*Notes.* KIP = Kids Intervention Profile; BIRS = Behavior Intervention Rating Scale



Figure 1. Participant flow chart following Consolidated Standards of Reporting Trials guidelines

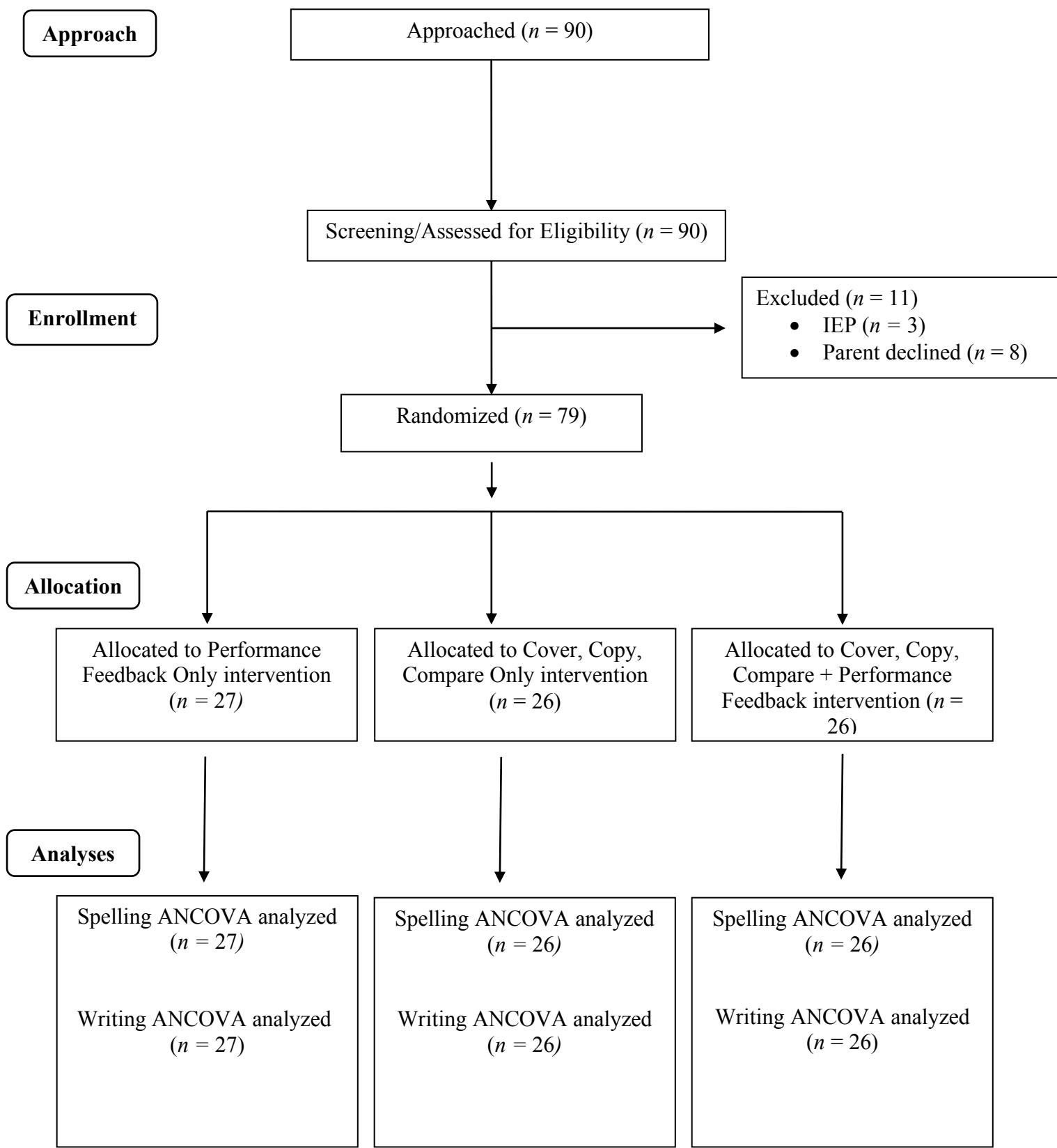
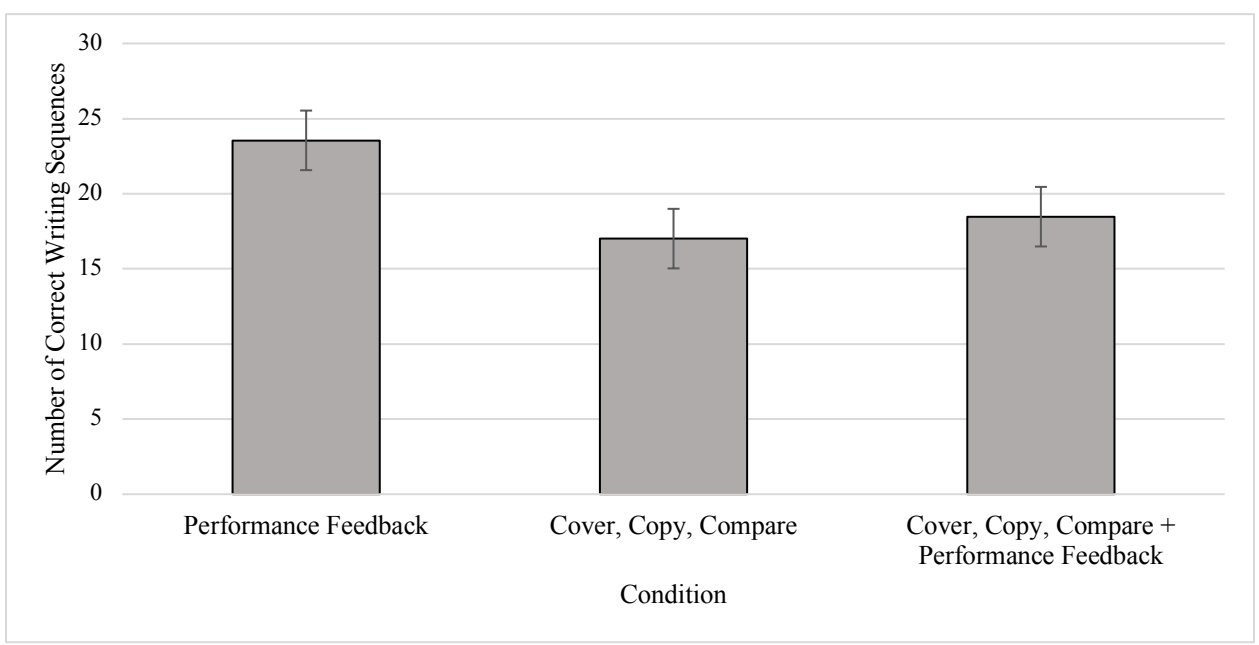
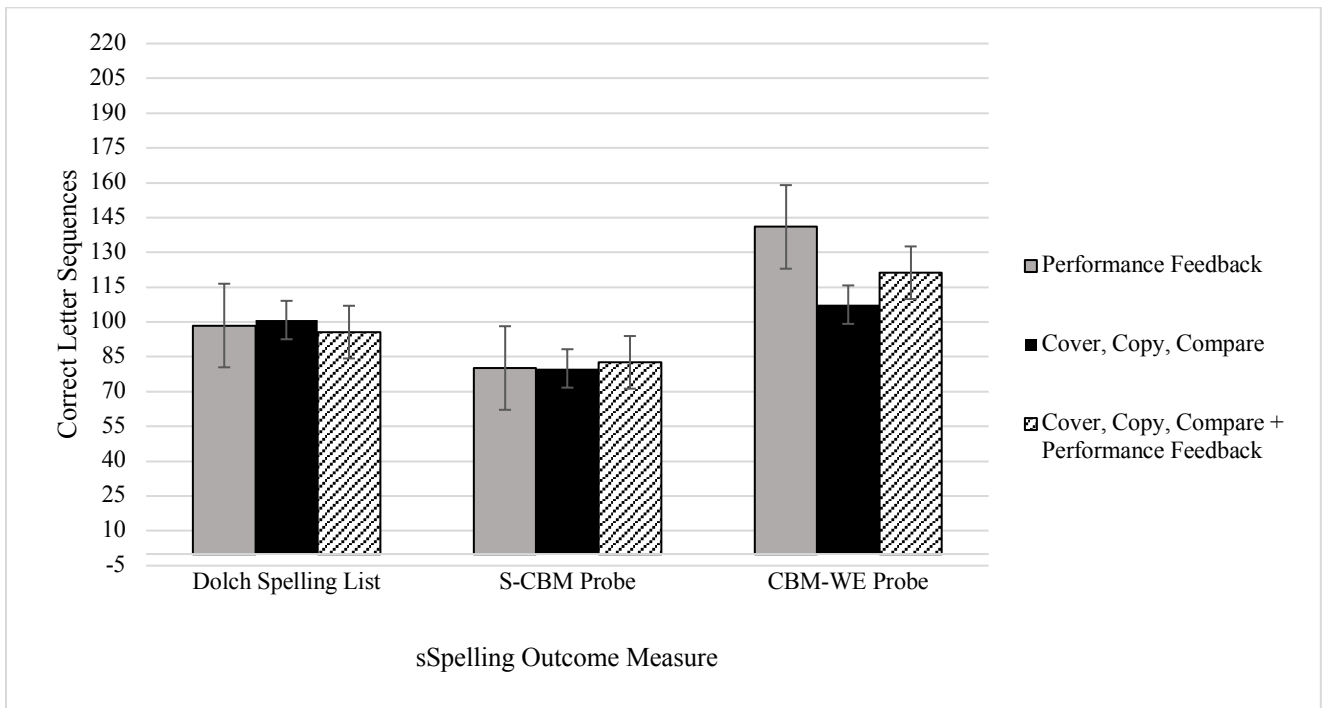


Figure 2. Top panel illustrates the adjusted mean scores by condition on the spelling outcomes. Bottom panel illustrates the adjusted mean scores by condition on the writing outcome.



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