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Teaching phoneme segmentation and blending: a comparison of two methods

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TEACHING PHONEME SEGMENTATION AND BLENDING: A COMPARISON OF TWO METHODS

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Abstract

Phonemic segmenting and blending is seen as one of the most critical skills necessary for the development of good reading skills in beginning readers. Research has shown that teaching phonemic skills results in improved reading for both trained (familiar) and untrained words when compared to teaching word-recognition reading strategies. Within the field of phonemic awareness teaching, results have been mixed as to the most effective methods of teaching phonemic skills, but it is generally agreed that explicit instruction in both segmenting and blending is better than instruction focusing on onset/rime or rhyming methods. The purpose of the current study is to compare two methods for explicitly teaching phonemic awareness. In the study, participants were taught to read nonsense words by either being presented with intact words and taught to segment and blend the individual phonemes making up the word, or by being presented with individual phonemes first, followed by the intact word through introduction of phonemes only, ending in the whole word. Hypothesized results are that teaching segmenting and blending in the context of the whole-word will result in better generalization to non-studied nonsense words than being taught blending in the context of initial presentation of separate phonemes before blending.

Introduction

Within the field of reading research, it is generally agreed that before a student can understand the meaning of a specific text, he or she must first be able to decode the printed word (Levy & Lysynchuk, 1997). While an individual's ability to decode text is in part idiosyncratic (that is, some students appear to develop good reading skills faster than others), most children require some level of direct instruction to learn the skills required to decipher a printed word. Adams (1990) found that a student should be familiar with at least 80% of the words on a page before being able to fluently read a passage. This initial lexicon should, optimally, be learned in the early years of schooling (Levy & Lysynchuk, 1997). Indeed, for children who do not develop this initial lexicon, future reading problems, including a classification of a Specific Learning Disability (SLD), are likely. More specifically, those children that show a discrepancy between intelligence as measured by intelligence tests and ability as measured by direct reading tests are classified as having SLD, or, more specifically, dyslexia (American Psychological Association, 2000).

Dyslexia is not usually viewed as the result of visual defects or visual memory defects (e.g., word reversal, visual acuity), nor is it a language-based deficit (Velluntino et al., 1996). Most researchers agree that reading requires multiple skills to correctly decipher text, and that it is therefore not possible to identify any single skill deficit that results in poor reading skills (Adams, 1990). Researchers do generally agree, however, that dyslexia can be seen as developing through a series of stages, one directly causing the next, as in a "snowball effect." First, individuals show problems with early reading skills. These early reading skill deficits lead to problems with reading fluency. These fluency problems lead to later problems with comprehension as reading texts become more difficult in later grades (Velluntino et al., 1996). Thus, deficits in phonological awareness (e.g., rhyme, alliteration, segmenting, blending, manipulation, etc.) can cause long-term reading difficulties for individuals. A phoneme is the smallest echoic unit of a language that conveys meaning. While phoneme segmentation and blending skills training does not always lead to successful reading outcomes (Torneus, 1984), reading failure is predicted for individuals who cannot easily manipulate the 44 phoneme sounds that form the basis of the English language (Daly, Chafouleas, Persampieri, Bonfiglio, & LaFleur, 2004). That is, while phonemic skills don't necessarily translate into being a good reader, lack of phonemic skills usually leads to poor reading outcomes.

B. F. Skinner outlined the behavioral process governing phonemic responding in his 1957 work *Verbal Behavior*. In his text, Skinner describes the phoneme as the smallest response of the textual display that is brought under stimulus control (Skinner, 1957). Echoic units, as described by Skinner (1957) are the smallest segmentations of sounds that the ear receives when hearing words. The word "dog" has three echoic units: /d/ /o/ /g/. "Chip" would also have three echoic units: /ch/ /i/ /p/. Skinner offers the example of the ability of chemists to easily pronounce long chemical names because of a history of reinforcement that has led to fluency with the larger echoic units whereas a layperson does not have this history of reinforcement and thus lacks the experience to pronounce those larger echoic units fluently. Similarly, good readers have a larger history of reinforcement for producing echoic units (phonemes) than poor readers, thus resulting in greater fluency in reading than those with a shorter history of reinforcement for phoneme production (Daly et al., 2004). Teaching phonemic awareness, then, can be seen as a method for teaching skills necessary for gaining reinforcement during reading trials. While it may not provide every student with the ability to access reinforcement when available during reading trials (that is, some students may have problems with reading that go beyond phonemic awareness or competing reinforcers in the environment may out-compete reinforcement for reading), teaching and reinforcing phonemic awareness does allow students to access reinforcement at the very earliest stages of reading.

The National Reading Panel (2000) reported that a student's ability to segment and blend phonemes into words is critical to becoming a successful reader. Furthermore, Carr and Levy (1990) found that a child's sensitivity to phoneme sounds is a powerful predictor of reading success. This is supported by research that examined the reading habits of fluent and poor readers. For example, poor readers have been found to depend on contextual cues to decipher the content of a reading passage (Adams, 1990), while fluent readers attend to every letter (and, therefore, every phonemic unit) (Adams, 1990). Many studies have shown that phonemic skills can be differentially reinforced to teach these necessary skills (Catania, 1998). It is therefore possible to improve student reading performance through careful reinforcement of correct phonemic usage and probes for generalization of these skills to untrained phonemic combinations in the form of words (Catania, 1998). Many studies have shown that phonemic skills can be taught, either in one-on-one interventions (Daly et al., 2004), interventions with small groups (Bonfiglio, Daly, Persampieri, & Andersen, 2006), and class-wide instruction (Daly, Johnson, & LeClair, 2009). While all of these studies demonstrated that phonemic skills can be taught through differential reinforcement of correct phonemic usage, it is less clear what is the best way to teach these skills in terms of both initial acquisition of skills and generalization to untrained combinations of phonemes.

Daly and colleagues (2004) compared methods of teaching word identification by teaching either whole-word recognition (i.e., whole words were modeled for the student and the student repeated the words until fluency for those words was demonstrated) or by teaching phonemic units of words until both phonemic units and whole-word reproduction was achieved. Their results indicated that students learned the words more quickly using the phonemic blending and segmenting skills. Perhaps more importantly, students showed greater generalization to new, untrained words following phonemic segmenting and blending training than with whole-word-identification training. That is, by teaching students to break down new words into phonemes, and by teaching the relation of these phonemes to the word as a whole, students were taught valuable decoding skills. Despite these findings and others, whole-word teaching was dominant in the United States until fairly recently (Levy & Lysynchuk, 1997).

One issue studied by Ball and Blachman (1991) was whether or not learning initial letter names and sounds was sufficient to decode printed words, or if it is necessary to teach segmenting and blending skills in addition to letter names/sounds. In their study, ninety students were placed into one of three groups: a group that was taught only letter names and sounds, a group that was taught letter names and sounds as well as segmenting and blending skills, and a no-instruction control group. Their results indicated that those who were taught specifically to segment and blend scored statistically better on later reading measures than the other two groups.

Cunningham (1988) compared different methods of teaching phoneme segmentation by examining the difference between teaching phoneme segmentation explicitly or implicitly. For the group receiving explicit instruction, students were taught not only how to segment and blend words using combination of skill instruction and practice drills, but also were taught how phonemes worked within words. That is, they were taught *why* segmenting and blending were important. The other group received only "skill and drill" phoneme teaching without being explicitly taught how these skills relate to word reading. The results of the study indicated that students receiving explicit instruction scored better on reading measures than those that received only implicit instruction.

Within the field of phonemic teaching, many methods of phoneme segmentation have been compared for speed of acquisition and generalization. Muter, Snowling, and Taylor (1994) used a cue-word method to teach decoding by having a cue word that rhymed with the target word (thus segmenting words into onset/rime, with the rime, or final phoneme, matching the cue word). They found that this method did help students identify words, but only when the cue word was present. That is, the results did not support generalization to untrained words in different contexts (i.e., no cue-word present). In general, decoding skills for the target words themselves are necessary to reliably decode novel words (Ehri & Robbins, 1992).

Torgeson, Morgan, and Davis (1992) compared reading ability for forty-eight students following phonemic training that consisted of either blending only (that is, children were taught to blend phonemes into words) or segmenting and blending in combination. The results of this study indicated that children scored better on reading tests following training in both segmenting and blending.

Other studies comparing whole word, onset/rime, or complete phonemic segmentation have produced idiosyncratic results. For some children, for example, the onset/rime segmentation was more effective than complete segmentation, whereas other students benefitted more from complete phonemic segmentation (Bruck & Treiman, 1992). Levy and Lysynchuk (1997) compared teaching onset, rime, and full segmentation to whole-word reading strategies and found that all methods outperformed whole-word training in terms of speed of acquisition. Also, maintenance scores were high during follow-up for those students who met initial learning criteria, suggesting that all three segmentation strategies were effective in promoting retention of skills. Furthermore, a linear contrast of segmentation training versus whole-word training showed superior generalization following segmentation training, with no statistical differences in generalization when comparing the type of segmentation training (Levy & Lysynchuk, 1997). It is still unclear, therefore, which method of teaching segmentation skills produces the best result in terms of generalization to unknown words.

As previously stated, Daly and colleagues (2004) found that full phonemic segmentation was superior to whole-word training in terms of generalization. In their study, students were taught segmentation skills for nonsense words by first being presented with each phoneme individually, then the whole word. For example, if the target nonsense word was "wab," students were first shown (and taught to repeat) "w" then "a" then "b," and finally were presented with "wab" and were taught to blend all three phonemes to say the entire word. During the whole-word condition, only "wab" would have been shown and the students taught to repeat the whole word. Generalization was measured by showing students untrained, real words that contained similar phonemes to the nonsense words studied. For example, if the studied nonsense word was "deb" the test-generalization word would be "bed." One limitation to this method is the unequal level of responding in the two conditions. In this case, the students makes 4 responses during phonemic segmentation (each phoneme and the whole word) compared to one response during the whole-word control condition, thus resulting in potentially more learning trials being delivered during the segmentation condition relative to the whole-word condition. Another limitation is that by testing generalization using real words, the experimenter has no control over an individual's prior history with the word. For example, though they may not have initially been able to read "bed," their personal history of hearing and seeing the word may influence how quickly they begin recognizing the word.

The purpose of the current study is to compare methods of teaching segmentation skills using methods outlined by Daly and colleagues (2004), while addressing some of the limitations of the original study by equating reinforcement opportunities between conditions and controlling for individual histories by testing for generalization using non-trained nonsense words rather than "real" words. During training, students will be taught to either blend individually presented phonemes into whole words following the protocol outlined in segmentation condition of the study by Daly and colleagues (2004), or to segment phonemes in the context of the whole-word before blending these phonemes. Thus, in both conditions, the participant has four opportunities to respond and receive reinforcement. It is hypothesized that both conditions will result in generalization of skills to untrained words, and that because whole-word segmenting involves the same methods as full-segmentation *and* it does so in the context of a complete word, generalization should take place more quickly due to the additive effects of the two methodologies combined in this condition. Also, because the whole-word segmenting condition contains instruction in both segmenting and blending in that it involves visually breaking down the word into phonemes before blending them, students should perform better than the full-segmentation group where only the blending of individually presented phonemes is taught (Torgeson, Morgan, & Davis, 1992).

Materials and Methods

Participants and Setting. This study included 4 participants, Amy, Beth, Char, and Diane, all of whom were 5 years old, female, and attended a private school for girls, All participants were nominated by their teacher or school reading specialist after demonstrating a difficulty in early reading skills. All participants demonstrated familiarity with letter sounds but were unable to correctly sound out CVC nonsense words. All sessions took place in the school where the participants were currently enrolled, with training occurring in isolation from the rest of the participants' class.

Materials. Materials used in this study were nonsense words consisting of consonant-vowel-consonant (CVC) letters. The CVC words generated contained phonemes already known to the participant, and did not form a "real" word when read either forwards or backwards. For example, the CVC nonsense word "tav" was not used, as its inverse "vat" is a real word. All words (both conditions and generalization test conditions described below) and individual phonemes (for the full-segmentation condition described below) were placed on 3" X 5" index cards.

Dependent Variable. The dependent variable measured was the number of untrained generalization words read correctly following training.

Experimental Design and Procedures. An A/B/C/B/C design with counterbalancing across participants was used to evaluate the results. That is, following an initial Baseline A phase, one participant received full-segmentation then whole-word segmentation, while the next participant received whole-word segmentation training followed by full-segmentation training. Pretreatment baseline data was collected to measure participants' ability to read generalization words prior to receiving either training condition.

Pre-Experimental Screening. Participants were presented with each letter of the alphabet individually and asked to say "what sound does it make." If the student initially only named the letter, she was reminded to say the letter's *sound* not what it is called. Correctly identified letter sounds were placed in one pile while those not identified correctly (or at all) within 5s following presentation (or those letters continually named-only) were placed in another pile. CVC words were created based on phonemic sounds with which the students had demonstrated familiarity. Eight initial CVC words were generated for training, with four words each used for the two training conditions.

Full-Segmentation Condition. Procedures for this condition were similar to those employed by Daly et al. (2004) and served as the control condition as the benefits of this procedure have already been documented. Students received 3 min training on the four CVC words. During training sessions, each letter was presented individually with the student repeating each phoneme sound before the full word was presented and the student blended the phonemes into the whole word. During the first trial, the experimenter modeled the correct reading of phonemes and then full word, with the student repeating after each step. Following this initial presentation, the student independently said each phoneme sound then the whole word. Any mistakes (or no response within 5 s following presentation of any stimulus) resulted in immediate corrective feedback until the student repeated the sounds correctly. Participants were praised for correct responding. All four words were instructed in this manner for the duration of the 3 min training session, with words shuffled between presentations.

Word-Segmentation Condition. This condition served as the test condition. Procedures were identical to the full-segmentation condition described above, however in this condition only the final CVC word was displayed. The experimenter held his finger below each letter of the CVC word and had the student repeat the phoneme sound of each letter. Following this, the experimenter ran his/her finger under the whole word to signal the student to blend these phonemes and say the entire word. As in the other condition, training sessions lasted 3 min, with the initial trial including the experimenter modeling correct responding for the student. Mistakes or non-responses were immediately corrected until the student correctly emitted the correct response. Correct responding resulted in praise being delivered.

Generalization/Test Condition. Immediately following training in both conditions, student performance on non-trained generalization words was measured. During each condition, 12 CVC words were presented. Four words were the inverse of the words studied during that condition, four words were the inverse of the words trained in the other condition, and four words were CVC words related to but not identical to the trained words (e.g., central vowel the same). In this case, generalization was measured for words directly related to training, generalization for words trained in other conditions, and generalization to completely untrained but related phonemic sounds was measured. By comparing generalization across conditions using the same CVC words, we assessed generalization without the potential confound of idiosyncratic responses to specific words. No feedback was given for correct or incorrect responding, and non-responding within 5s of stimulus presentation resulted in an "incorrect" score.

Interobserver Agreement and Treatment Integrity. Interobserver agreement (IOA) was assessed by having a second trained observer independently record participant responses during generalization probes. IOA was calculated by dividing the number of agreements by the number of agreements plus disagreements and multiplying by 100. For Amy, IOA was collected for 35% of generalization probe sessions, and total agreement was 98%. For Beth, IOA data was collected for 32% of probes and total agreement was 100%. For Char, IOA was collected for 36% of probes and total agreement was 95%. For Diane, IOA was collected for 38% of probe sessions and total agreement was 98%.

Treatment integrity (TI) was assessed by having a second trained observer score the therapist on protocol implementation during both training and generalization probes. The second observer scored whether or not the experimenter complied with each step of the protocol. The number of steps correctly implemented was divided by the number of steps correct and incorrect, and then multiplied by 100. TI measures were collected for 35% of sessions and overall TI was 100%. For Beth, TI data were collected for 32% of sessions and overall TI was 100%. For Char, TI data were collected for 36% of sessions and overall TI was 100%. For Diane, TI data were collected for 38% of sessions and overall TI was 100%.

Results and Discussion

Results for Amy are displayed in Figure 1. This chart visually depicts cumulative words read correctly in each of the five phases. During Baseline sessions, Amy did not correctly read any of the generalization words. In the first Whole Word phase, Amy correctly read words related to the Whole Word study method, words related to the Full Segmentation study method, and words unrelated to either method. Responding during this phase did show more words read correctly related to the Whole Word study method than either of the other two groups of generalization words, with roughly twice as many words read correctly (i.e., 12) than the Full Segmentation method (i.e., 7). During the first Full Segment phase, Amy continued to correctly read words across all studied groups (and unrelated words). Rates of responding did become relatively equal for the two sets of words related to the study techniques as opposed to the set of words unrelated to study techniques. This pattern of responding remained consistent across the following two phases. Ultimately, Amy correctly read roughly the same number of words related to either the Whole Word or Full Segment teaching methods, with 52 words read correctly related to the Whole Word technique and 51 words read correctly related to the Full Segment technique. In total, 19 words were read correctly that did not relate to either the Whole Word or Full Segment teaching method. Across all 4 phases, Amy's results indicated that her she read more words correctly that were directly related to the study method used in that phase (i.e. differential responding).

Beth's results are depicted in Figure 2. Overall, we saw a similar pattern of responding as shown in Amy's results. Beth did not read any words correctly during Baseline. Amy began reading words correctly that were related to the Full Segment

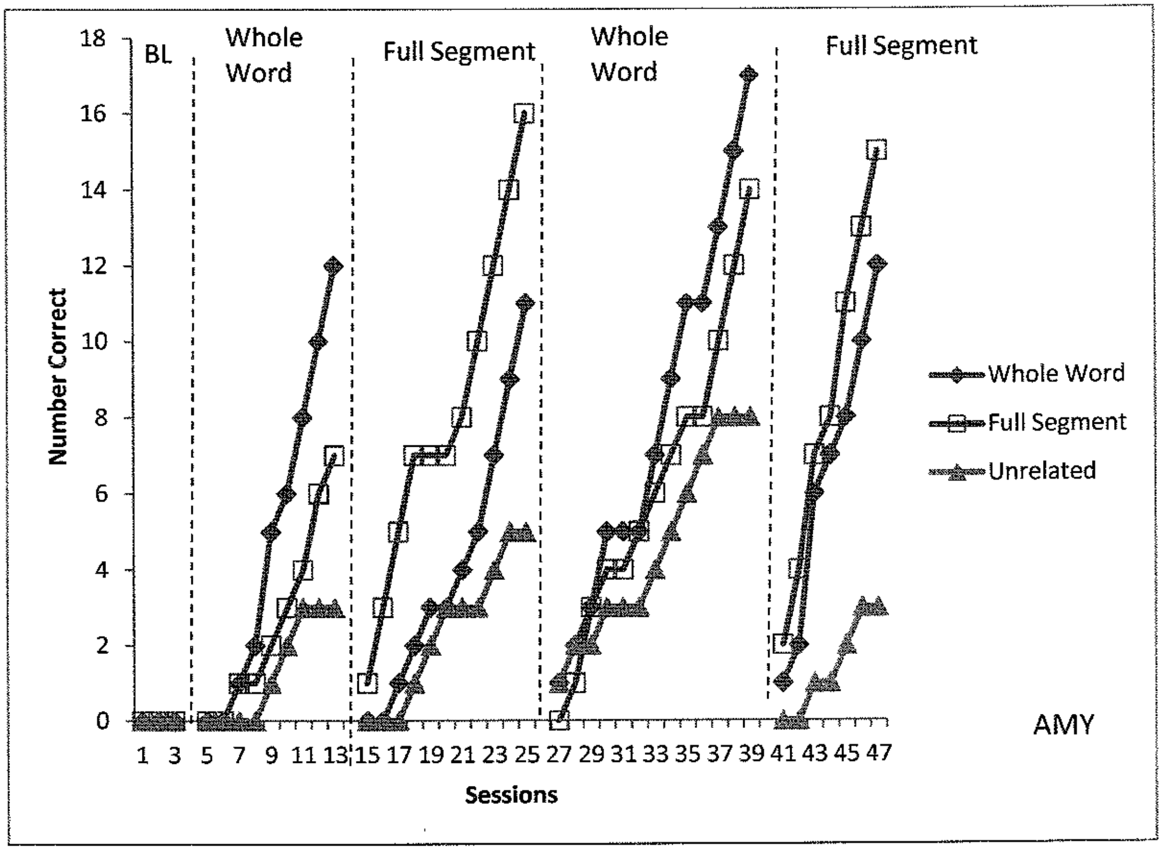

Figure 1. This figure depicts the cumulative number of generalization words correctly read by Amy. The "Whole Word" group contains words related to words trained in Phases 1 and 3. The "Full Segment" group consists of generalization words related to words trained in Phases 2 and 4. The "Unrelated" group refers to generalization words unrelated to words trained in either condition.

teaching method during the first Full Segment phase. Unlike Amy's results, no words related to the Whole Word method or unrelated words were read correctly during this phase. During the first Whole Word phase, Beth continued to read words related to the Full Segment method correctly, but we did also see words read correctly related to the Whole Word method. No words read correctly during this phase were unrelated to studied words. During the second Full Segment phase, Beth continued to correctly readwords from both study methods at a roughly equal rate. Beth did begin reading

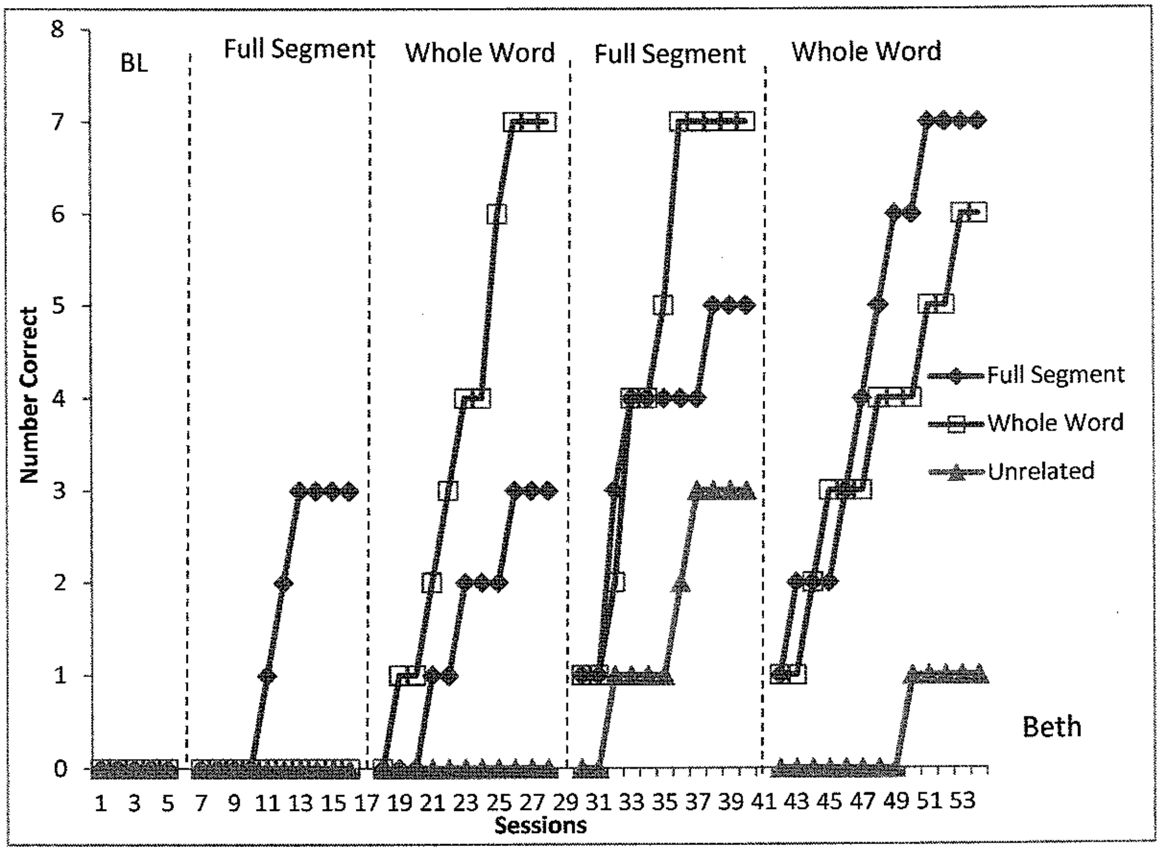

Figure 2. This figure depicts the cumulative number of generalization words correctly read by Beth. The "Full Segment" group contains words related to words trained in Phases 1 and 3. The "Whole Word" group consists of generalization words related to words trained in Phases 2 and 4. The "Unrelated" group refers to generalization words unrelated to words trained in either condition.

unrelated words correctly during this phase, but the number correct was less than those read correctly that were related to study methods. This pattern of responding continued in the second Whole Word phase. Ultimately Beth correctly read 20 words related to the Whole Word study method, 18 words related to the Full Segment method, and 4 words unrelated to either method. For the first 2 non-baseline phases, Beth's responding was similar to Amy's in that more words were read correctly that were related to the words studied for that phase. While there was differential responding for the last 2 phases, the words read correctly did not match the words studied directly in that phase, but rather the words related to the other study method.

Results for Char are shown in Figure 3. During Baseline Char did not read any words correctly during generalization tests. This pattern of responding continued for the first Full Segment and Whole Word phases. During the second Full Segment phase, Char correctly read one word related to the Full Segment teaching method. During the second Whole Word phase, Char read 1 word correctly that was related to the Whole word Phase and 3 words related to the Full Segment teaching method. Ultimately, Char correctly read 4 words related to the Full Segment teaching method, 1 word related to the Whole Word teaching method, and 0 words unrelated to either method.

Results for Diane are depicted in Figure 4. Diane also read 0 words correctly during Baseline. During the first Whole Word phase, Diane read 3 words correctly that were related to the Whole Word study method. Diane did not correctly read any words related to the other teaching method or words unrelated to a teaching method. During the first Full Segment phase, Diane did not correctly read any words related to the Whole Word study method, but she did correctly read 4 words related to the Full Segment teaching method. As in the previous phase, no unrelated words were read correctly. As in the first Whole Word phase, results of the second Whole Word phase show that Diane read more words correctly that were related to the Whole Word study method than those related to the Full Segment technique. During this phase, Diane also correctly read 3 words unrelated to study techniques. During the second Full Segment phase, Diane again correctly read more words related to the Full Segment technique than the technique unrelated to the phase or words unrelated to study techniques. As in the previous phase

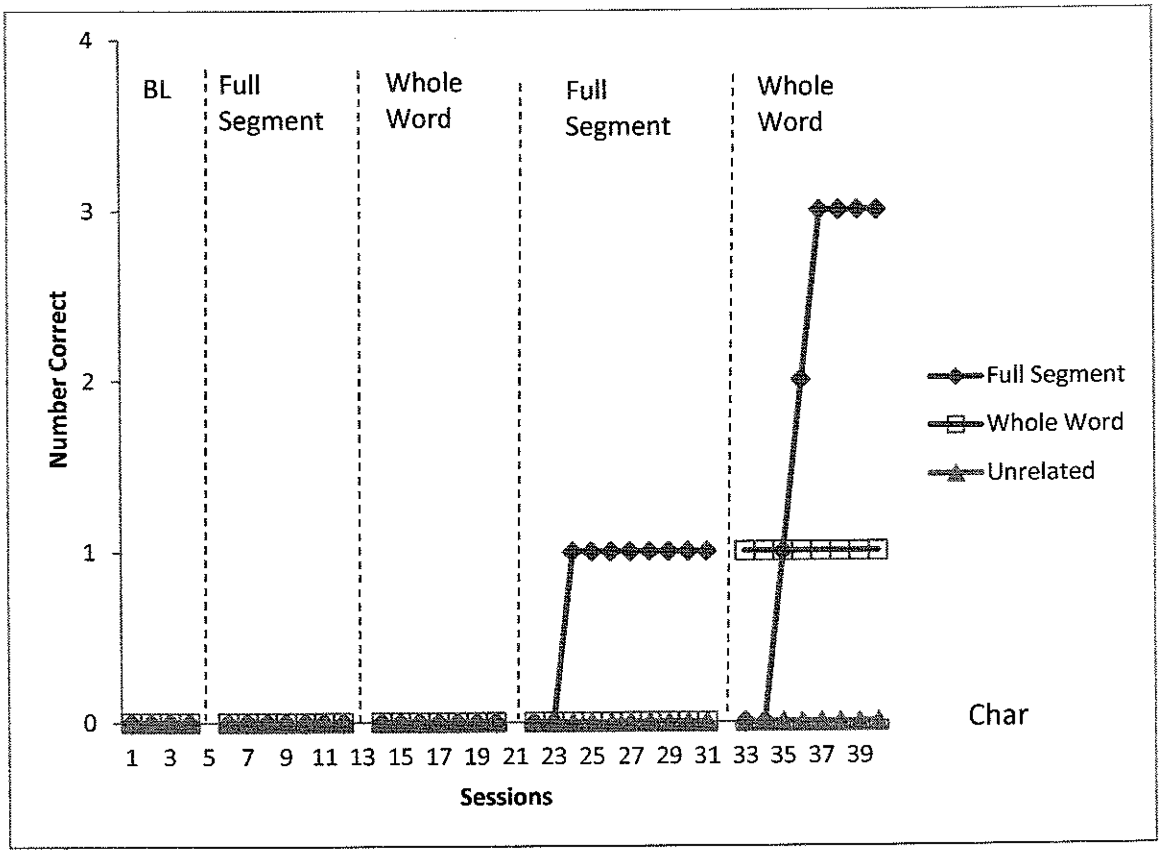

Figure 3. This figure depicts the cumulative number of generalization words correctly read by Char. The "Full Segment" group contains words related to words trained in Phases 1 and 3. The "Whole Word" group consists of generalization words related to words trained in Phases 2 and 4. The "Unrelated" group refers to generalization words unrelated to words trained in either condition.

(second Whole Word phase), Diane did correctly read words from all three groups (i.e., Whole Word, Full Segment, and Unrelated). Ultimately, Diane correctly read 9 words related to the Whole Word study technique, 11 words related to the Full Segment technique, and 5 words unrelated to either technique. Overall these results were similar to the pattern seen in Amy's results. For each non-baseline phase, Diane read more words correctly that were directly related to the words studied for that phase. This consistent differential responding continued across all 4 non-baseline phases.

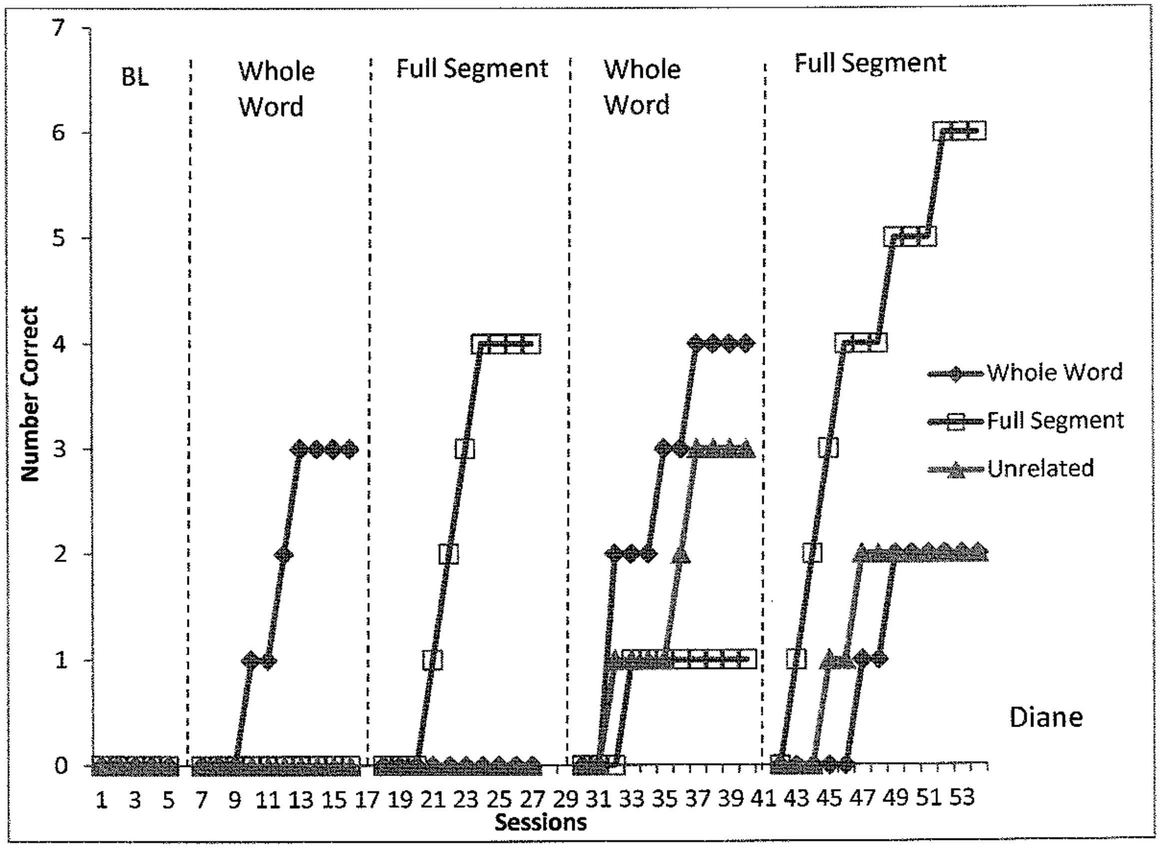

Figure 4. This figure depicts the cumulative number of generalization words correctly read by Diane. The "Whole Word" group contains words related to words trained in Phases 1 and 3. The "Full Segment" group consists of generalization words related to words trained in Phases 2 and 4. The "Unrelated" group refers to generalization words unrelated to words trained in either condition.

Summary and Conclusions

In the current study we compared two different methods of teaching phonemic segmenting and blending to Kindergarteners having difficulty in reading novel words. We conducted 3-min study sessions using either a whole word (that was broken down into phonemes and then reconstructed) or a fully segmented word (phonemes presented in isolation and then the whole word). We then compared these methods using the participant's ability to correctly read words related to the study method for that phase, words related to the study method for other phases, and words unrelated to words used in either study method as a point of comparison. Overall, results were not consistent across participants, both in terms of total words read correctly and whether or not the correctly-read words related to the teaching method for that phase. All participants did show a marked increase in words read correctly relative to baseline, and three out of four participants showed correct reading of words unrelated to study methods. All participants read more words correctly that were related to the words studied versus words unrelated to studied words. Because all tests words were untrained (though two thirds of them were related to trained words), these findings are consistent to those of Daly and colleagues (2004) in that by teaching segmenting and blending skills, students were more likely to be able to read novel, untrained words.

Based on the results, neither Full Segmentation nor Whole Word teaching method is superior to the other, but both methods are effective in increasing the participant's ability to read novel words. Three out of four (excluding Amy) participants only read generalization words correctly following teaching of related words during training sessions. Amy, on the other hand, began to correctly read words related to other teaching methods as well as unrelated words during the initial teaching phase. This could be due to many reasons. Amy was receiving extra tutoring sessions on phonemic awareness during the school day (outside of session). In addition, her mistakes appeared to often be due to carelessness (e.g., not fully attending to the cards) in addition to a skill deficit. For example, Amy would often miss a word that she had previously gotten correct.

In addition to different patterns of responding, there was considerable variability in the number of generalization words read correctly. Char, for example, read a total of 5 words correctly across all word types and phases. Amy, on the other hand, read almost 120 words correctly across all types and phases. Beth and Diane, in the middle, read a total of 42 and 48 words correctly, respectively. These results demonstrate the idiosyncratic nature of learning across the four participants. While the results of the present study are inconclusive in terms of which teaching method, if either, is superior, future studies may achieve more conclusive results following some methodological changes.

One issue that may be refined in future studies is that of experimental design. While a reversal design was used in the present study, future studies may find that another type of design (e.g., multielement) might demonstrate greater differentiation between data paths. A reversal design was used in this case to ensure that each teaching method would have time to elicit effects for the specific words studied during that phase, as well as to avoid carryover effects when switching conditions. The differences in teaching conditions may not have been dramatic enough, however, resulting in, from the participants' perspecitives, their experiencing the same teaching methodologies. If a multielement design is used in future studies, greater differentiation (e.g., card signals) between study type may be used to differentiate the teaching techniques, as well as greater differentiation in words studied. Another limitation of the current study is that the use of the reversal design naturally leads to greater practice of one set of related generalization words versus another. While this was dealt with by counterbalancing conditions across participants, the use of a multielement design might control for this difference.

As mentioned above, a second issue that may be refined in future studies is that of the words used during teaching and generalization tests. In the current study, the words studied in the Whole Word and Full Segmentation conditions were very similar (sharing several of the same letters). The difference in words in these conditions versus the Unrelated generalization words may have contributed to the pattern of similar responding for studied words across teaching techniques and lower responding for unrelated words (where the central vowel was different). Greater differences between words used in teaching and test conditions may result in greater differentiation between the two test conditions.

Future studies may also want to control for phoneme segmentation and blending instruction and practice outside of session. For all participants of the current study, the amount of outside-session instruction and practice is unknown, and any contributions this practice may have had on the results is also unknown. If it is impractical to avoid outside-session teaching, efforts should be made to quantify exactly how much extra-practice participants are receiving in order to assess its impact on results.

Overall, we found that both methods of teaching phonemic segmenting and blending increased students' ability to read related, but not identitcal, CVC words. In general, students read more generalization words correctly that were related to the words studied within each phase. Also, we found that students read more CVC words correctly that were directly related to study words than words that were not related.

References

Adams, M. J. (1990). *Beginning to read: Thinking and learning about print.* Cambridge, MA: The MIT Press.

American Psychiatric Assosciation (2000). *Diagnostic and statistical manual of mental disorders* (4th ed., text revision). Washington, DC: author.

Ball, E. W., & Blachman, B. A. (1992). Does phonemic awareness training in kindergarten make a difference in early word recognition and developmental spelling? *Reading Research Quarterly, 26,* 49-66.

Bonfiglio, C. M., Daly, E. J., III, Persampieri, M., & Andersen, M. (2006). An experimental analysis of the effects of reading interventions in a small group reading instruction context. *Journal of Behavioral Education, 15,* 92-108.

Bruck, M., & Treiman, R. (1992). Learning to pronounce words: The limitations of analogies. *Reading Research Quarterly, 27,* 375-388.

Carr, T. H., & Levy, B. A. (1990). *Reading and its development: Component skills approaches.* New York: Academic.

Catania, A. C. (1998). *Learning* (4th ed.). Upper Saddle River, NJ: Prentice-Hall.

Cunningham, A. E. (1988). Explicit versus implicit instruction in phonemic awareness. *Journal of Experimental Child Psychiatry, 50,* 429-444.

Daly, E. J., III., Chafouleas, S. M., Persampieri, M., Bonfiglio, C. M., & LaFleur, K. (2004). Teaching phoneme segmenting and blending as critical early literacy skills: An experimental analysis of minimal textual repertoires. *Journal of Behavioral Education, 13,* 165-178.

Daly, E. J. III., Johnson, S., & LeClair, C. (2009). An experimental analysis of phoneme blending and segmenting skills. *Journal of Behavioral Education, 18,* 5-19.

Ehri, L. C., & Robbins, C. (1992). Beginners need some decoding skill to read words by analogy. *Reading Research Quarterly, 27,* 13-26.

Levy, B. A., & Lysynchuk, L. (1997). Beginning word recognition: Benefits of training by segmentation and whole word methods. *Scientific Studies of Reading, 1,* 359-387.

Muter, V., Snowling, M., & Taylor, S. (1994). Orthographic analogies and phonological awareness: Their role and significance in early reading development. *Journal of Experimental Psychology and Psychiatry, 35,* 293-310.

National Reading Panel. (2000). *Teaching children to read: An evidence-based assessment of the scientific research literature on reading and its implications for reading instruction.* From http://www.nih.gov/publications/nrp/smallbook.htm.

Skinner, B. F. (1957). *Verbal behavior.* Acton, MA: Copley.

Torgeson, J. K., Morgan, S. T., & Davis, C. (1992). Effects of two types of phonological awareness training on word learning in kindergarten children. *Journal of Educational Psychology, 84,* 364-370.

Torneus, M. (1984). Phonological awareness and reading: A chicken and egg problem? *Journal of Educational Psychology, 76,* 1346-1358.

Vellutino, F. R., Scanlon, D. M., Sipay, E. R., Small, S. G., Pratt, A., Chen R., et al. (1996). Cognitive profiles of difficult-to-remediate and readily remediated poor readers: Early intervention as a vehicle for distinguishing between cognitive and experiential deficits as basic causes of specific reading disability. *Journal of Educational Psychology, 88,* 601-638.

Appendix A: Assent Form

ASSENT TO PARTICIPATE IN RESEARCH

1. My name is Michael Schafer. I am from Louisiana State University.
2. We are asking you to take part in a research study because we are trying to learn more about how children learn to read.
3. If you agree to be in this study you will be asked to tell me what sounds letters make. You may also be asked to read some words.
4. If you agree to take part in the study, nothing bad will happen to you if you get the answers right or wrong.
5. If you agree to take part in the study, you may learn to read new words and to read faster. You will also get a small prize after each reading practice session.
6. Your parents have given their permission for you to take part in this study. Even though your parents said "yes," you can still decide not to do this.
7. If you don't want to be in this study, you don't have to. Nothing bad will happen if you don't want to be in the study. Even if you say "yes" now, you can always change your mind and not be in the study later.
8. You can ask any questions that you have about the study.
9. Signing your name at the bottom means that you agree to be in this study.

____
Signature of Subject

______________________________ _______________
Printed Name of Subject Date

Study Exempted By:
Dr. Robert C. Mathews, Chairman
Institutional Review Board
Louisiana State University
203 B-1 David Boyd Hall
225-578-8692 | www.lsu.edu/irb
Exemption Expires: 1-17-2015

DATE OF IRB APPROVAL:
IRB NUMBER:
PROJECT EXPIRATION DATE:
This information will be provided upon IRB approval.

Page 1 of 1

Appendix B: Consent Form

January 10,21012

Dear Parent or Guardian:

I am Michael Schafer, a doctoral student of Dr. George Noell from the School Psychology Department at Louisiana State University. I request permission for your child to participate in a research study to be used for my master's thesis. I am conducting a research project comparing different ways of teaching children to read.

We hope to use what we learn from the study to improve methods of teaching early reading skills to beginning readers.

The study consists of the following activities:

1. We will ask your permission for your child to take part in teaching sessions over the course of a total of about 4 to 6 weeks. Each teaching session will last about 15 to 30 minutes.
2. These sessions may include having your child pick out letter sounds of words they do not know, then blend the sounds to read the whole word.
3. Your child will earn small rewards (pencils, erasers, etc.) for participating.

The project will be explained in terms that your child can understand, and your child will participate only if he or she is willing to do so.

Only Dr. Noell and I will have access to information from your child. At the conclusion of the study, your child's name will not be used and no identifying information will be given regarding your child's responses.

Participation in this study is voluntary. Your decision whether or not to allow your child to participate will not affect his or her classroom activities. Even if you give your permission for your child to participate, your child is free to refuse to participate. If your child agrees to participate, he or she is free to end participation at any time. You and your child are not waiving any legal claims, rights, or remedies because of your child's participation in this research study.

Should you have any questions or desire further information, please feel free to contact

Michael Schafer, M.S.
Principal Investigator
Department of School Psychology
Louisiana State University
Baton Rouge, LA 70803
225-578-7792
Michael.j.schafer@gmail.com

Dr. George Noell
Department of School Psychology
Louisiana State University
Baton Rouge, LA 70803
225-578-7792
gnoell@lsu.edu

Keep this letter after completing and returning the signature page to me.

If you have any questions about your rights as a research subject, please do not hesitate to contact me.

DATE OF IRB APPROVAL:
IRB NUMBER:
PROJECT EXPIRATION DATE:

Initial_____

Sincerely,

Richard Schaefer

Department of School Psychology

DATE OF IRB APPROVAL:
IRB NUMBER:
PROJECT EXPIRATION DATE:

Initial_____ Page 2 of 3

Please indicate whether or not you wish to allow your child to participate in this project by checking one of the statements below, signing your name and returning it to me. Sign both copies and keep one for your records.

_____ I do grant permission for my child to participate in Michael Schafer's study.

_____ I do not grant permission for my child to participate in Michael Schafer's study.

________________________________ Signature of Parent/Guardian

________________________________ Printed Parent/Guardian Name

________________________________ Printed Name of Child

________________________________ Date

Study Exempted By:
Dr. Robert C. Mathews, Chairman
Institutional Review Board
Louisiana State University
203 B-1 David Boyd Hall
225-578-8692 | www.lsu.edu/irb
Exemption Expires: 1-17-2015

DATE OF IRB APPROVAL:
IRB NUMBER:
'ROJECT EXPIRATION DATE:

Initial_____

Appendix C: IRB Exemption Form

Application for Exemption from Institutional Oversight

LSU
Institutional Review Board
Dr. Robert Mathews, Chair
131 David Boyd Hall
Baton Rouge, LA 70803
P: 225.578.8692
F: 225.578.6792
irb@lsu.edu
lsu.edu/irb

Unless qualified as meeting the specific criteria for exemption from Institutional Review Board (IRB) oversight, ALL LSU research/ projects using living humans as subjects, or samples, or data obtained from humans, directly or indirectly, with or without their consent, must be approved or exempted in advance by the LSU IRB. This Form helps the PI determine if a project may be exempted, and is used to request an exemption.

– Applicant,Please fill out the application in its entirety and include the completed application as well as parts A-E, listed below, when submitting to the IRB. Once the application is completed, please submit two copies of the completed application to the IRB Office or to a member of the Human Subjects Screening Committee. Members of this committee can be found at http://www.lsu.edu/screeningmembers.shtml

– A Complete Application Includes All of the Following:
- **(A)** Two copies of this completed form and two copies of part B thru E.
- **(B)** A brief project description (adequate to evaluate risks to subjects and to explain your responses to Parts 1&2)
- **(C)** Copies of all instruments to be used.
  - *If this proposal is part of a grant proposal, include a copy of the proposal and all recruitment material.
- **(D)** The consent form that you will use in the study (see part 3 for more information.)
- **(E)** Certificate of Completion of Human Subjects Protection Training for all personnel involved in the project, including students who are involved with testing or handling data, unless already on file with the IRB. Training link: (http://phrp.nihtraining.com/users/login.php.)
- **(F)** IRB Security of Data Agreement: (http://www.lsu.edu/irb/IRB%20Security%20of%20Data.pdf)

1) Principal Investigator: George Noell, Ph.D **Rank:**

Dept: PSYC **Ph:** 225-937-7278 **E-mail:** gnoell@lsu.edu

2) Co Investigator(s): please include department, rank, phone and e-mail for each

Michael Schafer, Grad student, PSYC Dept.
404-543-4897 michael.j.schafer@gmail.com

IRB# E5808 LSU Proposal # ____
⊗ Complete Application
⊗ Human Subjects Training

3) Project Title: Teaching Phoneme Segmentation and Blending: A Comparison of Two Methods

Study Exempted By:
Dr. Robert C. Mathews, Chairman
Institutional Review Board
Louisiana State University
203 B-1 David Boyd Hall
225-578-8692 | www.lsu.edu/irb
Exemption Expires: 1-17-2015

4) Proposal? (yes or no) ____ **If Yes, LSU Proposal Number** ____

Also, if YES, either
⊗ **This application completely matches the scope of work in the grant**
OR
○ **More IRB Applications will be filed later**

5) Subject pool (e.g. Psychology students)

*Circle any **"vulnerable populations" to be used:** (children <18) the mentally impaired, pregnant women, the ages, other). Projects with incarcerated persons cannot be exempted.

6) PI Signature [signature] **Date** 1/11/2012 (no per signatures)

**** I certify my responses are accurate and complete.** If the project scope or design is later changes, I will resubmit for review. I will obtain written approval from the Authorized Representative of all non-LSU institutions in which the study is conducted. I also understand that it is my responsibility to maintain copies of all consent forms at LSU for three years after completion of the study. If I leave LSU before that time the consent forms should be preserved in the Departmental Office.

Screening Committee Action: Exempted ✓ Not Exempted ____ Category/Paragraph 1

Reviewer Mathews **Signature** [signature] **Date** 1/18/12

Vita

Michael Schafer is originally from New Orleans, Louisiana. He graduated with a B.A. in English from Loyola University of New Orleans in 1995. Michael Spent eight years in Atlanta, Georgia working at The Marcus Institute, where he gained experience working with children with developmental disabilities who suffer from extreme behavioral, learning, and feeding issues. Michael received a Master's degree in Educational Psychology from Georgia State University in 2009, shortly after joining the LSU School Psychology program in 2008. Michael's interests continue to center around working with children with developmental disabilities, both in school and home settings, but his experience in the LSU graduate program has widened his area of interest to include typically developing children who suffer from academic and behavioral issues.