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Teaching Children to Fluently Decode Nonsense Words in Lists: Generalized Effects to Oral Reading Fluency of Connected Text

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Abstract

The present study examined the generalized effects of training children to fluently blend nonsense words containing target vowel teams on their reading of untrained real words in lists and passages. Eight second-grade students participated. Nonsense words containing each of 3 target vowel teams (*aw, oi,* and *au*) were trained in lists, and generalization was assessed to untrained real words in lists, untrained real words in target passages, and novel real words in generalization passages. A multiple probe design across vowel teams revealed a) generalized increases in accuracy and fluency on all trained word list for all eight students and these were maintained on subsequent word list probes, b) generalized increases in accuracy and fluency on *aw* words for all students on either target or generalization passages, but for half or less of the students on *oi* words. Increases were seen prior to training on both *oi* and *au* vowel teams, which weakened the demonstration of experimental control. Implications of these results for fluency training in phonics as an alternative strategy for promoting generalized oral reading fluency are discussed.

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Candace Werder

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Teaching Children to Fluently Decode Nonsense Words in Lists: Generalized Effects to Oral Reading Fluency of Connected Text

Literacy continues to be a concern in American society. This concern was justified in the latest report by the National Center for Education Statistics (NCES; Lee, Grigg, & Donahue, 2007), which indicated that over half of all fourth and eighth graders were reading at or below a "basic" reading level (67% and 69%, respectively). According to the NCES, reading at the "basic" level involves "partial mastery of prerequisite knowledge and skills that are fundamental for proficient work at a given grade" (NCES, p 6). Data from previous years suggest that low levels of reading achievement have been consistent over time, and have worsened for children from culturally diverse and low socioeconomic status backgrounds (Lee, Grigg, & Donahue, 2007). According to the NCES report, reading levels have remained relatively stable since 1992.

In 2007 the NCES also published their findings from a 2003 national assessment of adult literacy within the United States. Results from their assessment indicated that individuals reading below a proficient level tended to experience lower levels of educational status, greater difficulties obtaining employment, and lower employment wages. These individuals also tended to have a greater reliance on public assistance. In addition to the effects that low literacy can have on education and employment, research has also shown that illiteracy can have a direct affect on one's health status. Health literacy refers to the set of skills needed to function within the health care environment. DeWalt, Berkman, Sheridan, Lohr, and Pignone (2004) reviewed studies that examined reading ability and health outcomes. Studies included in the review measured reading ability using one of three measures, the Wide Range Achievement Test (WRAT), the Rapid Estimate of Adult Literacy in Medicine (REALM), and the Test of Functional Health Literacy in Adults (TOFHLA). Findings from their review indicated that individuals reading at low levels as indicated by these assessments were approximately 1.5 to 3 times more likely to suffer adverse health outcomes related to knowledge about health and health care, hospitalization, global measures of health, and some chronic diseases.

Developmental Progression of Reading Competence

Reading competence begins to develop early in life. Typically during the preschool years children begin to develop a number of foundational skills. These skills include knowledge of graphemes (i.e., the letter names of the alphabet), knowledge of grapheme-phoneme correspondences (i.e., the letter sounds that correspond with the letter symbol, e.g., the letter *b* makes the /b/ sound), phonological awareness (i.e., the knowledge that words are made up of sound segments) semantics (i.e., word knowledge), syntax (i.e., knowledge of word order and grammatical rules), and conceptual knowledge (Storch & Whitehurst, 2002).

Storch and Whitehurst conducted a longitudinal study to examine progression of the relationship between code-related and oral language precursors to reading and reading development. Their sample included 626 4-year olds enrolled in Head Start programs from four cohorts. Selected children were then followed from preschool through fourth grade. Code-related precursors examined in the study included knowledge of graphemes, grapheme–phoneme correspondences, and phonological awareness. Oral language precursors examined included semantic or word knowledge, syntactic knowledge, and conceptual knowledge. At six points during the study, children were also assessed for literacy and language skills. Finally, two domains of reading (accuracy and comprehension) were assessed beginning at the end of first grade when the children began formal instruction in reading and continuing through to fourth grade.

Structural equation modeling was used to map the relationships between code-related skills, oral language skills, and reading achievement (i.e., reading accuracy and comprehension). Results of this study indicated that in very young children (preschool and kindergarten) both code-related and oral language skills were significant predictors of reading accuracy and reading comprehension. Additionally it was determined that reading accuracy and reading comprehension were highly correlated. As students began receiving formal instruction in grades 1 and 2, there was a weakening of the relationship between the code-related and oral language related skills. During this time, the researchers saw a direct, stronger relationship between the code-related skill set and reading. However, there continued to be a high correlation between reading accuracy and comprehension. Results also indicated that success in the early elementary years was predominantly determined by level of print knowledge and phonological awareness with which a child entered first grade.

During later elementary school years (third and fourth grades) reading accuracy and reading comprehension differentiated into two separate abilities. There was also a differentiation of the effects of the code-related and oral language skill sets on the two reading ability subsets, with code-related skills continuing to be more strongly correlated with reading accuracy, but oral language skills emerging as more strongly correlated with reading comprehension.

The developmental progression identified in Storch and Whitehurst (2000) highlights the importance of code-related skills to the development of reading. These findings also support research reviewed by Snow, Burns and Griffin (1998). According to Snow, Burns and Griffin (1998), students will experience great difficulty, even failure, at developing fluent reading without the acquisition of specific prerequisite skills early on in their reading instruction; prerequisite skills refer to the basic skills needed in order to perform a target behavior accurately.

They too indicated that letter knowledge and phonological awareness were key skills that should be acquired during the pre- kindergarten and kindergarten years.

As indicated above, letter knowledge and phonological awareness have been strongly related to future success in reading. Phonological awareness in particular has been a major focus of research, which has shown that students' success in learning to read is highly correlated with their success in acquiring phonological awareness skills (Ehri et al., 2001) Phonological awareness involves the ability to recognize that spoken words are made up of smaller sound units. A child who has developed good phonological awareness is able to recognize the different sounds that make up a spoken word, the syllables that make up a word, and also recognize rhyming words. Ehri et al. (2001) presented results from the meta-analysis conducted by the National Reading Panel (2000) which reviewed 52 studies that provided training in the phonological awareness skill of phonemic awareness (PA), used PA instruction, and measured the effects on reading skill. PA is a subcategory of phonological awareness, as it refers to the ability to focus on and manipulate the smallest units of sound (i.e., phonemes) which make up words through activities such as phoneme blending and segmenting (Daly et al., 1999; Liberman et al., 1974). Studies included in the meta-analysis had to fit five specific criteria. First, they had to use an experimental or quasi- experimental design with a control group. Second, they had to be published in a refereed journal. Third, they had to test the hypothesis that PA improved reading performance over alternative forms of instruction or no instruction. Fourth, they had to provide PA instruction that was not combined with any other instructional methods. Fifth, they had to present statistical results that allowed the reviewers to calculate effect sizes. Participants in the studies reviewed were grouped based on grade level; preschool, kindergarten, first grade and second through sixth grades. Participants were then categorized by their reading development; normal developing, at-risk for developing reading difficulties (indicated by low PA or low reading abilities), and reading disabled (RD) (already developed reading problems characterized as reading below grade level despite average intelligence). Children within the reading disabled group were mainly second through sixth graders, with the exception of three first grade cases.

Results of the meta-analysis indicated that overall phonemic awareness instruction had a large effect on PA acquisition (d = .86). There was moderate transfer to reading (d = .53), decoding skills (d = .56), and reading comprehension (d =.34). PA instruction also transferred to spelling with an overall reported effect size of d = .59. At-risk and normal readers had a greater effect from instruction than disabled readers with effect sizes of (d = .95), (d =.93) and (d =.62) respectively. With respect to the type of instruction used, results indicated that training using phoneme blending and segmenting produced the largest effect sizes for phonemic awareness outcomes (.81), reading outcomes (.67), and spelling outcomes (.79). Using Phoneme blending and segmenting during PA instruction, especially with the addition of letter manipulatives, showed the greatest transfer to early reading with an effect size of .61.

Ehri et al., 2001 reviewed a second meta-analysis conducted by the National Reading Panel, looking at the effects of systematic phonics instruction on the development of reading. Phonics instruction refers to a method of teaching reading that focuses on the acquisition of letter-sound correspondences and how they are used in reading and spelling (Harris & Hodges, 1995). Similar to the PA meta-analysis, this analysis also looked at students in the kindergarten, first grade, and second through sixth grades. The meta-analysis examined 38 experiments, from which they conducted 66 comparisons of treatment (systematic phonics instruction) versus control (unsystematic or no phonics instruction) conditions for their effects on learning to read.

Reading outcome measures used within the meta-analysis included decoding of real words, decoding of pseudowords, reading miscellaneous words, spelling words, reading text orally, and comprehending text. Students within the study were categorized by reading development; normal developing, at-risk for developing reading difficulties (indicated by low PA or low reading abilities), reading disabled (RD) (already developed reading problems characterized as reading below grade level despite average intelligence), and low achieving (children above first grade with below average reading performance paired with below average cognition). Overall results of this meta-analysis indicated that phonics instruction had a moderate effect on reading (effect size of .41). Effects were larger when instruction occurred before the first grade (d = 0.55), but were still present after the first grade (d = .27). More specifically, results indicated that phonics instruction lead to greater increases in accurate decoding for both beginning (preschool through first grade) and older (second grade through sixth grade) readers, with effect sizes of .98 and .49 for regular words, and .67 and .52 for pseudowords, respectively.

The ability to decode words is an important skill in the early stages of acquiring reading skills, and is useful throughout the life span for skilled readers when they encounter less familiar words (Baron, 1979; Doctor & Coltheart, 1980; Ehri & Wilce, 1979; Stanovich, 1982a, 1982b). As seen in the meta-analysis on phonics instruction discussed above, the use of phonics training (PT) techniques during reading instruction have a moderate effect on the development of decoding skills. This makes sense considering that to successfully decode a word, an individual needs to possess the necessary skills to translate the letters or syllable units into their sounds and then blend these sounds (Ehri & Robbins, 1992; Wagner & Torgesen, 1987).

Teaching Blending Skills to Children

Several recent studies have directly examined the use of phonics training (PT) strategies to teach phoneme blending and phoneme segmenting skills. One such study by Daly et al. (2004) used an ABAB withdrawal design to examine the effects of training a small number of nonsense words using either phoneme segmenting and blending or sight word training on generalization to real word reading with two male first grade students. Both students were referred by their classroom teachers, and were reported as demonstrating reading difficulties.

During the sight word condition, students were required to read nonsense words as one unit. Once each of the four words was trained, the experimenter shuffled the flashcards and chose two new words, which the student read independently. When the student read a word incorrectly, the experimenter modeled the correct response and had the student repeat the modeled response.

During the segmenting portion of the phoneme segmenting and blending condition, students were presented with phonemes one at a time on flashcards and were required to read the phoneme aloud before moving to the next phoneme. During the blending activity, students were required to blend all the sounds into one word together along with the experimenter. As in the sight word condition, when the student read a word incorrectly the experimenter modeled the correct response and had the student repeat the modeled response. Each experimental condition was followed by an assessment procedure, during which participants were required to read at least 12 real words, four of which matched (i.e., had the same syllable pattern) the nonsense words they read previously. Results showed that both students correctly read more real words during the phoneme segmenting and blending condition versus the sight word condition (i.e., 16 and 23 v. 1 and 9).

A follow-up study conducted by Daly, Johnson and LeClair (2009) provided additional evidence for the effectiveness of phoneme segmenting and blending training procedures. This study involved four first grade students. Using a multiple probe design across “themes”, two experiments were conducted to assess the effectiveness of phoneme blending and segmenting training as part of regular class instruction (Experiment 1) and as a supplemental, individualized intervention (Experiment 2). During Experiment 1, teachers were given four “themes” that they would be teaching to their students. Each “theme” contained specific consonants and vowels that would be instructed. Themes were taught over a three week period with a new phonics skill being introduced each week. Phonics rules were demonstrated during large group instruction and practiced during small group and independent seatwork activities. Each of the four students was assessed three times per week for number of nonsense words read correctly. Results of Experiment 1 showed that in general the students were responsive to the phoneme training activities, with improvements in the number of nonsense words read correctly seen in all but one student. Experiment 2 was conducted as a follow- up to the first experiment with the one student who did not respond to regular class instruction. The procedure for Experiment 2 was identical to Experiment 1, with added supplemental instruction conducted by the experimenters. Results from Experiment 2 supported the use of phoneme segmenting and blending training as an effective supplemental intervention for improving nonsense word reading accuracy. The target student showed increases in the number of nonsense words read correctly for each intervention, and maintenance after the intervention was removed.

As highlighted previously, using the phonics training (PT) techniques of blending can produce significant increases in students’ decoding of real and nonsense words. However there is one major limitation of the two studies described above. Neither study examined whether students were able to successfully transfer the decoding skill to reading words within the context of connected text. Oral reading fluency (ORF) is one critical skill that is often deficient in poor readers. There has been much discussion surrounding the actual definition of oral reading fluency (ORF). However, the general consensus is that the construct includes the oral translation of text into words with accuracy, automaticity, and prosody (Hudson, Oullen, Lane, & Torgesen, 2009). The majority of discussion has been focused on determining how to conceptualize each component, determine its role in reading development, and highlight its function as a tool for improving reading comprehension.

Oral Reading Fluency

Speed and accuracy have commonly been the focus in the definitions of ORF (Adams, 1990). It has been suggested that slow word reading is actually debilitating to the reader's comprehension because it leads to an increased strain on working memory making it difficult to, or even preventing the reader from, thinking about the text while reading (Perfetti, 1985). The underlying aim of increasing oral reading fluency, as defined above, is to increase the automaticity with which units of words are decoded into recognized words, allowing for smoother connection of these words within text, and ultimately understanding of the meaning of the text (Harris & Hodges, 1995; LaBerge & Samuels, 1974; Logan, 1997). This definition remains as one of the most commonly considered definitions in the field of reading. However, it is important to highlight other definitions that exist in the literature.

In a review conducted by Kuhn, Schwanenflugel, Meisinger, Levy and Rasinski (2010), the authors examined four definitions that were developed for ORF. Each definition took a slightly different perspective on the role that accuracy, automaticity, and prosody play in reading development. The first definition was in line with the definition proposed by Adams (1990), which considers accuracy and automaticity to be the major determinants of fluency (Fletcher, Lyon, Fuchs, & Barnes, 2007). As highlighted above, this definition focuses on the speed at which words can be correctly read, with little focus on whether appropriate prosody is being used. Students are considered fluent when they can read with a high number of words correct per min. The second definition presented considered prosody as the determinant for fluency. This definition focuses on correct phrasing, adherence to the author's syntax, and expressiveness (National Assessment of Education Progress [NAEP]; Daane, Campbell, Grigg, Goodman, & Oranje, 2005; Pinnell et al., 1995). Within this definition students are considered fluent when they can read with prosody, with less emphasis placed on the speed of reading. A third definition that was proposed is that of fluency as skilled reading. Within this definition the focus is on the reader's ability to decode and comprehend text simultaneously (Samuels, 2006). Students are considered fluent when they are able to read with comprehension, which comes automatically once the student decodes a word. The fourth definition presented was that of "fluency as a bridge to comprehension" (Chard, Pikulski, & McDonagh, 2006; Pikulski & Chard, 2005). Within this definition, fluency is considered to be the connecting element between decoding and comprehension. Students are considered fluent when they are able to read with good comprehension and prosody, which comes once decoding has been achieved.

Kuhn et al. (2010) developed a fifth definition of fluency that incorporated many of the elements found within the definitions that they reviewed. Their definition states:

> "Fluency combines accuracy, automaticity, and oral reading prosody, which, taken together, facilitate the reader's construction of meaning. It is demonstrated during oral reading through ease of word recognition, appropriate pacing, phrasing, and intonation. It is a factor in both oral and silent reading that can limit or support comprehension. (p. 240)"

The present review will focus on using speed and accuracy as the defining factors that determine ORF, with the belief that as ORF improves so too does the readers comprehension of the text. This theory has been commonly used and supported in the research, for example Levy, Abello and Lysynchuk (1997) observed improved ORF of text following training to increase fluent decoding of selected words within the text in isolation. Additionally they observed an improvement in reading comprehension when ORF of text reached a set level (less than one second per word). A second study by Klauda and Guthrie (2008) looked at the relationship of three components of reading fluency, word level (i.e., fluency at reading words in isolation), syntactic level (i.e., fluency at reading sentences and phrases), and passage level (i.e., fluency at reading passages as a whole), on reader's comprehension. The study was conducted with 278 regular education fifth-grade students. Results indicated that word recognition speed (i.e., the rate at which one can decode words) explained about 43% of the variance in comprehension. When all three fluency components (word level, syntactic level, and passage level), were considered together, they explained 57% of the variance seen in comprehension. Results of the study also indicated that there is a bi-directional relationship between fluency and comprehension.

Strategies for Increasing Students' Oral Reading Fluency

A focus of research over the last two decades has been to develop effective interventions to improve student's oral reading fluency (e.g., Daly & Martens, 1994; O'Shea, Sindelar, & O'Shea, 1987; Rashotte & Torgesen, 1985), with more recent research focusing on more efficient, small-group strategies (e.g., Begeny & Martens, 2006; Klubnik & Ardoin, 2010). One intervention that has received considerable attention in research is the use of repeated readings (RR). RR involves having the student reread a single short passage multiple times, up to seven, before assessing for oral reading fluency. A meta-analysis conducted by Chard et al. (2002) presented data from 24 studies spanning 25 years examining the effects of RR on oral reading fluency in elementary-aged children identified as learning disabled. Results of the meta-analysis indicated that RR had an average effect size of .71 as a technique for improving oral reading rate, accuracy, and comprehension. The results seen in the meta-analysis by Chard et al., (2002) support previous findings by a similar meta-analysis conducted by the National Reading Panel (2000), which looked at the effects of repeated reading and guided oral reading instruction on reading achievement. Results of this analysis indicated that interventions containing an oral RR component were effective at improving oral reading fluency on trained passages.

Daly, Martens, Dool and Hintze (1998) used a brief experimental analysis to select interventions for improving oral reading fluency, which they measured as number of words read correctly per minute (WCPM). The study involved three general education students. The experiment examined four intervention techniques; contingent reinforcement for rapid reading (CR), repeated readings (RR), listening passage preview (LPP), and phrase drill (PD) error correction. Each treatment was applied to instructional passages, and treatments were administered in isolation and in combination depending on the hypothesized cause of the problem the student was experiencing. If no improvements were seen in the generalization passages, treatment was applied to these as well. With the exception of one student, results indicated that the greatest improvements in fluency occurred in conditions that contained an RR component.

A number of studies beginning in the 1980's showed that adding a modeling component to the RR procedure enhanced effectiveness above the use of RR alone (Rose, 1984a; Rose, 1984b; Rose, 1984c; Rose & Sherry 1984). These findings led to the addition of a Listening

Passage Preview (LPP) component to the RR procedure as an effective modeling technique for reading (Daly et al., 1999; Rose & Beattie, 1986). The most effective LPP procedure provides modeling for reading of the target passage by a fluent reader while the child follows along, prior to the child reading independently (Rose & Beattie, 1986). The success of LPP paired with RR as a technique for improving oral reading fluency can be attributed to the presentation of multiple opportunities to respond with modeling and feedback. This is believed to allow the printed words to acquire stimulus control of the target behavior of reading the words correctly (e.g., Daly, Martens, Barnett, Witt, & Olson, 2007) As stimulus control increases, so too does automaticity of behavior, and with that oral reading fluency.

Eckert et al. (2002) examined the effects of pairing LPP with repeated readings along with either contingent reinforcement or corrective feedback on increasing students' oral reading fluency. The study involved six elementary-school students in either first, second, or third grades. The experiment examined four intervention techniques; antecedent intervention (AI), antecedent intervention and contingent reinforcement (AI+CR), antecedent intervention and performance feedback (AI+PF), antecedent intervention, performance feedback, and contingent reinforcement (AI+PF+CR). Comparisons were made among the interventions and between the interventions and a baseline (BL) condition. During the BL condition participants read a novel passage. Passages within this condition functioned as generalization passages, and determined whether intervention resulted in generalized oral reading fluency (ORF). The AI intervention involved LPP and RR of text. The CR intervention involved presenting students with a prize for beating their score on a post-test reading of a passage. The PF intervention involved setting performance goals for reading and graphing progress following each reading of passages. Each treatment was applied to instructional passages for each child, with the exception of one male student who did not receive the AI condition. Treatments were alternated in a multielement design, sequentially for two of the students and randomly for the remaining four students. Results indicated that under the AI all participants made increases in their oral reading fluency compared to baseline. Increases in WCPM were not seen in the BL condition, which indicates that within the present study the interventions used did not promote generalized ORF.

Promoting Generalized Oral Reading Fluency

As discussed above, intervention strategies have been successful at improving student's oral reading fluency on trained passages. However, results have been mixed concerning whether these strategies lead to generalization of ORF to novel texts (e.g., Ardoin et al., 2008). In the study conducted by Eckert et al. (2002), the gains made in ORF did not transfer to the untrained material and similar results have been seen in other studies, (e.g., Chafouleas et al., 2004).

Generalized ORF is a form of stimulus generalization in that it requires the individual to respond in the same way to stimuli that have been altered or presented in a different context. With respect to reading words, in order for stimulus generalization to occur the individual must develop a stimulus class which encompasses printed words (i.e., when they encounter a printed word they will use their decoding skills to read the word). A stimulus class refers to a group of stimuli, in this case words, to which the individual produces the same response, in this case decoding. Given that it is impossible to provide training for every word that the individual may encounter, the goal is to provide training with a sufficient number of examples that allow for stimulus class formation (Codding & Poncy, 2010; Daly, Martens, Barnett, Witt, & Olson, 2007). Due to the variability in the types of words one encounters, (i.e., syllable types, and syllable numbers) it is crucial to train sufficient stimulus variability to ensure that an individual can correctly perform the decoding skill when presented with any decodable word. One cannot expect an individual who has only learned to correctly decode closed syllable words, example “bat”, to be able to automatically decode words from all the syllable types (i.e., final “e”, open syllables, vowel teams, “r” controlled, and final “le”) or multisyllabic words. This is why training stimulus variability both within each syllable type and among the syllable types is important to truly promote generalized performance of decoding.

Training stimulus variability has been used successfully to increase generalized mathematics fluency for multiplication math facts. Using a multiple probe design across problem sets, Codding and Archer (2010) used incremental rehearsal to teach multiplication math facts to a 12-year-old girl. Incremental rehearsal refers to an intervention which uses drill and practice of known and unknown items (Burns 2005). Prior to the beginning of the intervention, the student was assessed for known and unknown math facts. The student was then administered a seventh grade general outcome measure (GOM) AIMSweb math probe as a pre-test to measure her performance on seventh grade material. A second GOM math probe was administered at the conclusion of the intervention as a post-test.

For intervention sessions the experimenter used an incremental rehearsal procedure that involved randomly selecting one unknown math fact and nine known math facts. The student was presented with the unknown fact with the answer read aloud, and was required to repeat the fact along with the answer. This was followed by the experimenter performing the same action with the first of the known math facts. This sequence was repeated using the first unknown math fact followed by the next known math fact until all nine known math facts had been presented. At the completion of the sequence the unknown math fact moved into the position of the first known math fact, with the last known math fact dropping out of the sequence. A new unknown math fact was then introduced into the sequence. The intervention was discontinued once the sequence was completed, or three errors occurred. Once the intervention sequence was discontinued the student was then required to complete two or three probes selected from a pool of six; problem set A probe, problem set B probe, problem set C probe, fraction probe, word problem probe or subskill mastery (SSM) probe. Each problem set probe targeted 10 different multiplication facts, the fraction probes were created using the 30 unknown facts, the word problems were created using multiplication fact 3 to 9 and the SSM probes contained basic multiplication facts 3 to 9.

Results of the intervention indicated that incremental rehearsal led to positive results with increases in accuracy and rate seen across all the problem sets, along with maintenance once the intervention was removed. Similar results were seen with the SSM, fraction, and word problem probes with the student reaching mastery levels of performance, both in accuracy and rate during the final sessions. Pre-post performance on the GOM probe was also positive with a 21 digits correct increase from baseline. The findings from this study support the use of incremental rehearsal as an effective means of increasing fluency in computation skills. Additionally it also illustrates that generalization across similar stimuli was obtained after achieving fluent performance across the set of skills taught.

Training stimulus variability has also been shown to be a difficult task involving the careful selection of stimuli in order to be successful. One study conducted by Poncy et al. (2010) used a multiple baseline design to examine the effect of three procedures (two fluency-based and one strategy-based) on promoting generalization of fluent responding on 12 addition facts to 12 related subtraction facts with three fourth grade students. Following baseline, students were first given a fluency-building intervention which focused on the 12 addition facts. The intervention was aimed at increasing students' digits correct per minute (DCPM) using a combination of explicit timing, goal-setting, and performance feedback with rewards. Once students had reached a mastery level of 40 DCPM on the addition facts, generalization to the 12 subtraction facts was assessed. If no generalization occurred, the strategy-based conceptual lesson was added. The conceptual lesson focused on teaching part-part-whole relationships. For example the experimenter taught the students that if 5 + 3 = 8 then you know that 8 – 3 = 5. The goal was to give students the tools to use their prior knowledge of the addition facts to solve the subtraction facts. Once students were able to apply the learned skill, they were then administered the subtraction facts sheet to determine whether generalization occurred. If no generalization was seen, a cloze format intervention was added. Students in this phase completed addition problems in cloze format in an attempt to provide additional practice using the conceptual-based strategy they were taught previously. In the cloze format, the problem provides the answer but leaves out one of the addends (e.g., __ + 3 = 8)

Overall results of this study indicated that the fluency-building addition procedure was successful at increasing fluent performance of the trained addition facts. However, none of the interventions were successful at promoting generalization to the subtraction facts, which was the ultimate goal of the study. These results highlight how intricate an issue training to promote generalization is, and emphasizes the necessity of training stimuli that are directly and easily connected with the desired response when attempting to train stimulus variability.

Several techniques that have been used to train stimulus variability and promote generalized ORF include training to a fluency threshold, training using high word overlap (HWO) passages, and multiple exemplar (ME) training. Training to a fluency threshold involves allowing the individual to practice using a learned skill to a specific fluency criterion before having the individual use the skill in a novel circumstance. Dowhower (1987) worked with 89 typically developing beginning second grade students who were considered to be transition readers (i.e., in the beginning stages of transitioning from accurate decoding to fluent reading). Students were repeatedly administered the beginning section of a story until they were able to read that section at or above a rate of 100 WCPM. Once students had reached this fluency criterion, they were given the second section of the story to read. Results indicated that students were able to read the second section of the story with greater speed and accuracy following the repeated readings of the first section of the story to criterion. Similar results were found in a study conducted by Bonfiglio et al. (2004) in which the experimenters compared the effects of three interventions on students ORF. Upon analysis of their results they discovered that the students who demonstrated an oral reading rate of 100 WCPM or higher showed generalization effects to novel material. Results of these studies suggest that training to a fluency threshold may be an important consideration when attempting to promote generalization.

Another technique that has shown potential is the use of ME training. ME training involves teaching a range of stimuli and responses that one would expect the individual to encounter in the natural environment. Silber and Martens (2010) examined the effects of ME training on the oral reading fluency of 111 first and second grade students by comparing two interventions, one using LPP/RR of the entire intervention passage and the other using LPP/RR on representative key words and sentence structures of the intervention passage (ME training). The experimenters used a combined between-subjects (condition) and within-subjects (pre- and post-test) design. They compared gain scores from pre-test to post-test to examine the effectiveness of three experimental conditions; ME instruction, LPP/RR, and a time and attention control. Additionally the ME and LPP/RR instruction techniques were also compared for their relative learning rates (i.e., the fluency gains that were made per min of instruction time). Results from this study indicated that both the LPP/RR condition and the ME condition produced significantly high gains on the trained and generalization passages when compared to the control condition. Additionally the ME condition resulted in significantly higher learning rates (i.e., was more efficient) than the LPP/RR condition.

The use of HWO passages in training has also been used as a technique for promoting generalized ORF. HWO passages are passages containing a high percentage, typically 80%, of the same words that appear in the passage on which students are trained. Ardoin, McCall and Klubnik (2007) examined the effects of using a ME training procedure using HWO passages in a study comparing RR of one passage and modified RR of two HWO passages on the oral reading fluency of six third grade students. Using an alternating treatment design, students were evaluated on 12 generalization passages, with RR being implemented on even-numbered sessions and ME being implemented on odd-numbered sessions. Oral reading fluency was measured using WCPM. During the RR of one passage condition, students were required to read a target passage at or above a set WCPM criterion and with less than a set number of errors. Students who were able to achieve these criteria were rewarded with a token, which could be exchanged for prizes. Students were then required to read a novel HWO passage four times following a LPP of the target passage. Error correction in the form of phrase drill (PD) and segmenting and blending was provided at the end of each reading. After the fourth reading, students' oral reading fluency was assessed on the original, target passage. During the RR of HWO passages condition, the same procedures were carried out with the exception of the RR component. Instead of reading the same passage four times following LPP, the student read two HWO passages two times each prior to assessment on the initial passage. Results showed significant gains in WCPM for the RR of one passage condition over each repeated reading of passages. These gains transferred to the HWO generalization passages, with performance on these passages being higher than on the initial reading of the trained passages. The RR of HWO passages condition produced gains in WCPM, however these gains were lower than the repeated readings of one passage condition

The techniques described above were effective at promoting generalization of ORF to novel text. However they focus on training stimulus variability at a word level (i.e., sight word reading.) Another strategy that can be used to train stimulus variability is to teach the individual a technique to read unknown words (i.e., decoding) and then have students practice this technique with multiple exemplars of words. Once stimulus variability has been properly trained using sufficient exemplars for each syllable type and using multisyllabic words, students may be able to use the decoding skill effectively with decodable unknown words that they encounter.

Promoting Generalized Decoding

A recent study conducted by Martens, Werder, Hier, and Koenig (in press) attempted to train stimulus variability using the method described above for words containing three target vowel teams. Using a multiple probe design across vowel teams, Martens et al. trained three second grade students to a fluency criterion on word lists using a blending task and measured transfer to the decoding of novel words with the same syllable patterns in isolation, and to both similar and novel words with the same syllable patterns in passages.

During the blending activity, students were trained in words containing one of three target vowel teams, *au, oi or aw*. Training consisted of instruction in the vowel combination rule and a blending task using one known and three unknown target words. The experimenter visually presented the sound segments of each word on separate index cards and modeled the pronunciation of each segment followed by blending of the words into a whole word. The student was then instructed to repeat the sound segments and correctly blend the sounds as modeled by the experimenter. This process was repeated until the student was able to correctly blend the target word three consecutive times. Once students could correctly blend a word, the experimenter moved on to the next word on the word list and repeated the same steps outlined above. This procedure was done for each of the four target words assigned to the particular training session.

Immediately following the completion of PT activities, students completed a word list assessment which involved reading the four trained words along with four untrained, generalization words containing the same vowel combination used in the training session. The WCPM score achieved during this assessment was used along with a “beat your score” contingency during the retention word list assessment conducted 2 days later. Once students met a fluency criterion for reading the word list retention probe, they were administered passage reading probes.

During passage reading probe sessions, students were required to read 12 modified AIMSweb passages featuring words with the target vowel combinations, 4 passages with *au* words, four passages with *oi* words, and four passages with *aw* words. These probe readings were originally scheduled to take place at four points during the study, once at baseline and then each time the students reached the fluency criterion on one of the vowel combinations following training. However, due to the limited number of novel, untrained words, the experimenters were required to administer the passage reading probes when no more word list trainings could be conducted.

Both accuracy and fluency measures of student performance on both word lists and passages were used as dependent measures in the study. Fluency measures included WCPM on the word list retention probes and WCPM on the passage reading probes. Accuracy measures included the percentage of correctly read words on the word list retention probes and the percentage of correctly read words containing the target phonics skills on the passage reading probes. Results from this study indicated that all three students showed generalized increases in oral reading fluency on passages containing both trained and novel target words. Additionally students showed increases in the percentage of target words that were read correctly in the passages.

As highlighted in Martens et al. (in press), using the PT technique of phoneme blending can produce significant increases in students' decoding of real words in isolation. Additionally, this study provided preliminary evidence that practice using the blending skill to a fluency criteria may lead to positive gains in the correct use of that skill within text containing the same and novel words as those used during PT However the study was limited by the failure of two participants to reach the word list fluency criterion before running out of untrained words.

Purpose of the Study

The purpose of the present study was to examine the effects of using the PT technique of phoneme blending with nonsense words on students' decoding of real words in isolation and in passages. This study was a replication and extension of Martens et al. (in press), and attempted to address the limitation of having too few words for training by using nonsense words. As highlighted earlier, Daly et al. (2004) used nonsense words in their phoneme segmenting and blending training sessions and generalization of the decoding skill was seen in the form of accurate reading of untrained real words.

Like Martens et al. (in press), the present study used the PT activities of phoneme blending to train decoding of words using modeling, opportunities to respond, and error correction. Unlike the previous study, however, training was conducted using nonsense words and as such presented participants with a more difficult generalization task, namely to read real words both in isolation and in passages. Also similar to Martens et al., students were trained to a fluency criterion which was assessed on a combination of the trained nonsense words and untrained real words. This study required students to demonstrate generalization of their decoding skills to novel words in isolation. Students were then assessed for further generalization of their decoding skills to reading passages containing real words similar to those seen in training. This required students to demonstrate generalization of their decoding skills to reading in context and to build their oral reading fluency rate.

It was first hypothesized that following training in decoding nonsense words, students would generalize their use of the trained decoding skill to read similar untrained real words in isolation (i.e., on word lists) with greater accuracy (Hypothesis 1) and fluency (Hypothesis 2). This would be reflected by an upward trend in the percentage of target words read correctly and the number of words read correctly per min once training in that specific vowel team has begun. Once training has been completed, it was expected that accuracy and fluency levels achieved during training would be maintained. This was assessed using probe assessments, which occurred at the completion of training on each vowel team. It was also expected that accuracy and fluency on untrained vowel teams would remain at baseline levels during these probe assessments until training in that specific vowel team had occurred. My next set of hypotheses stated that after attaining the criterion reading rate on word lists, students would generalize the trained decoding skill by showing increased accuracy (Hypothesis 3) on untrained target real words and increased fluency on all words (Hypothesis 4) within passages. This would be reflected by an immediate increase in the percentage of target words read correctly and the number of words read correctly per min on passages associated with the trained vowel team compared to baseline readings of these passages. These increases would be maintained on subsequent probe readings after training on that specific vowel team has been removed and subsequent vowel teams have been trained. It was also expected that the percentage of target words read correctly and the number of words read correctly per min on passages containing untrained vowel teams would remain at baseline levels until training in that specific vowel team has occurred. As is common with single-case experimental designs, it was expected that all hypothesized effects would be replicated both within (i.e., across vowel teams) and across participants.

For the purpose of this study the words used in training all contained vowel teams. Students were recruited during the spring and fall term to increase their probability of showing deficits in the acquisition of vowel teams. According to the New York State P-12 Common Core Learning Standards for English Language Arts & Literacy (NYSED.gov), students tend to be first introduced to vowel teams in the fall semester of their first grade year. One expects students to have acquired this skill by the end of the fall, and to be working on fluently recognizing the vowel teams when presented in isolation by the end of first grade. In contrast, students who are slow to acquire their vowel teams may carry deficits into the second grade where exposure will continue but in the context of words and text. These are the students that were recruited for the present study as they would have benefited from extra support to acquire and build fluent recognition of vowel teams in the context of words and text.

Method

Participants and Setting

Participants included eight second grade students, one African American male (Zack), two African American females (Natalie and Olivia), three Caucasian females (Heather, Lisa, and Pam), and two Hispanic females (Jessica and Katherine) ranging in age from 7 years 8 month to 8 years 4 months. Students were recruited from three regular education classrooms within two public elementary schools. The first school was a predominantly African American (86%), urban public elementary school of about 455 students in Central New York. The second school was a predominantly Caucasian (48%), urban public elementary school of about 399 students in Central New York. The students were recruited during the spring term at the first school (Natalie and Olivia) and the fall term at the second school (Zack, Heather, Lisa, Pam, Jessica and Katherine).

An initial pool of 25 students, nine from the first school and 16 from the second, were identified by their teacher(s) as having difficulty in reading. Students were selected from this initial pool based on below grade level performance (see below) on the Dynamic Indicators of Early Literacy Skills (DIBELS; Good & Kaminski, 2002) along with low accuracy levels on various vowel teams presented in isolation and within words using an adaptation of the procedure reported in the Road to Reading series (Blachman & Tangel, 2008) (see below). Fifteen students met the criteria of below grade level DIBELS and low accuracy on the screened vowel teams and were given letters of consent to be signed by their guardians and returned. Eight of these students returned signed consents giving them permission to participate in the study. None of the participants were diagnosed with either a reading disability or a behavior disorder (i.e., Attention Deficit Hyperactivity Disorder), were retained at grade level, or were receiving special education or speech and language services. All students were solely English speakers.

Experimental sessions were approximately 15 min and were conducted during the reading period. Sessions were conducted individually at a classroom desk and chair in a quiet location in the hallway of the school. Informed consent was obtained for all students participating in the study, and included written informed consent from parents and verbal assent from students.

Experimenters and observers were both undergraduate and graduate students who had volunteered to participate in data collection. Prior to the beginning of the study, experimenters were trained in the experimental procedures to 100% accuracy. Experimenters were considered ready to proceed to data collection once they demonstrated perfect accuracy during one administration of the experimental procedures to the primary investigator.

Materials and Assessment Procedures

Vowel team screening assessment. Prior to the start of the study, students were screened to assess their accuracy levels in the recognition of sound(s) associated with the vowel teams *aw*, *au*, and *oi* using an adaptation of the procedures developed by Blachman and Tangel (2008). The vowel team screening protocol is presented in Appendix A. Experimenters were equipped with 5 by 7 inch index cards containing each of the target vowel teams, each of four target words associated with a vowel team, scoring sheets, clip boards, and pencils. Protocols containing step-by-step instructions were also provided to each experimenter to follow during the screening assessment.

Each child was presented with an index card containing one of the target vowel teams, and was instructed to “tell me the sound that these letters make”. Each vowel team was presented once, resulting in a total of 3 trials. The experimenter recorded whether the student was able to produce the sound(s) associated with the target vowel teams for each trial on a scoring sheet. There was no feedback or error correction during this procedure.

Immediately after each vowel team presentation, the experimenter presented a list of four words containing the target vowel team. Words were selected from the phonetically regular word (PRW) list provided in the Road to Reading series (Blachman & Tangel, 2008). The experimenter presented each word one at a time on an index card and instructed the student to "tell me what word this is". The experimenter marked incorrectly read words. Errors included incorrect pronunciation of the word, pausing for more than 3 s on a particular word, refusal to read a word, and asking for assistance from the experimenter.

Students were considered eligible for inclusion in the study based on their inability to produce the presented vowel team in isolation and within the context of words, which was determined by two or less of the four words pronounced correctly. The students showing low accuracy on the same three vowel teams were selected.

Curriculum-based measurement (CBM) screening probes. Prior to the start of the study, CBM probes (Shapiro, 2004) were used to find students' instructional reading levels using placement criteria proposed by Fuchs and Deno (1982). Each child was administered three reading probes, each containing between 130 and 150 words. Probes were selected from the AIMSweb database (http://www.aimsweb.com/) of CBM reading probes at second, third and fourth grade reading levels. All probes were narrative passages, typed in Times New Roman 14 point with pictures omitted.

According to Fuchs and Deno (1982), students are at a frustrational level when they read less than 40 words correct per min (WCPM) with more than 4 errors on a second grade passage.

Students are considered at an instructional level when they can read a passage between 40 and 60 WCPM with four or fewer errors. Mastery level is assigned when the student can read a second grade passage with over 60 WCPM and four or fewer errors.

For the purposes of this study, students were selected based on their reading at a high frustrational level on the passages screened, which corresponds to reading between 30 and 40 WCPM with four or more errors. This criterion placed participants at a low enough fluency level so as to benefit from a fluency-based intervention, and also helped ensure that they would benefit from instruction in decoding. Based on the screening results, a common frustrational level was identified for all eight students.

For the CBM screening, students were given a copy of the passage and asked to "do their best reading" while reading aloud for 1 min. The experimenter recorded WCPM for each passage by counting the total number of words read in 1 min and then subtracting the number of errors made. Errors included omitting words, saying the wrong word, reading suffixes such as "-ed" or "-s" incorrectly, or pausing for more than 3 s on a particular word and asking for assistance from the experimenter (Shapiro, 2004). Two copies of each passage were made for each student; an examiner's copy that included a word count at the end of each sentence, and a second copy that was re-typed verbatim for the students to read. Experimenters were also equipped with pencils and stop watches for recording purposes. Protocols containing step-by-step instructions were provided to each experimenter to follow during the intervention.

AIMSweb experimental probes. Twelve passages from the AIMSweb database of CBM reading probes (http://www.aimsweb.com/) were rewritten so as to contain a high occurrence of the target vowel combinations used in the intervention (i.e., at least 80% of the sentences within the passage contained the target vowel combination) (Martens et al., in press). The 12 experimental passages are presented in Appendix A. Students were screened on the 12 rewritten AIMSweb passages using the CBM screening procedure outlined above. Of the 12 passages, four contained the vowel combination *aw*, four contained the vowel combination *au*, and four passages contained the vowel combination *oi*. For each vowel combination, two passages contained target words that were assessed in the word list training (WLT) sessions (target passages) and two contained generalization words that were not assessed during WLT (generalization passages). The mean WCPM across students at screening, the percentage of sentences containing a target word, and the number of unique target words in each passage are summarized in Table 1.

Word list phonics training (WLT). The experimenter created one and two-syllable nonsense words containing the target phonics skills being trained (e.g.,. "daw" and "zawsome.") Across all three vowel teams the nonsense words were matched in terms of onsets and rimes (e.g., if the word "hawd" appeared on the *aw* list, the *oi* and *au* list contained the words "hoid" and "haud"). The purpose of this was to control for word difficulty across the vowel teams. In addition, one- and two-syllable real words that contained the target phonics skill being trained were selected from an online dictionary source (www.morewords.com). Prior to the beginning of training, all real words were screened to determine which were known and unknown by the students. To assess for generalization, three different categories of words were compiled for each target phonics skill; (a) nonsense words trained using the PT blending procedures, (b) real words from the target passages plus additional words that did not appear in any passages that were assessed on the word lists, and (c) real words from the generalization passages that were not assessed on word lists. During each WLT session, four nonsense words were trained and these four words plus four untrained real words were assessed. As noted above, words appearing in the generalization passages were never assessed on word lists. Each set of four trained and four untrained words contained a ratio of one known to three unknowns based on the results of previous trainings. The ratio of known nonsense words to unknown nonsense words was rebalanced at the start of each subsequent training session. Combining known and unknown task elements has been shown in previous research to decrease task difficulty, promote retention, and increase student attention and engagement (e.g., Gickling & Armstrong, 1978; MacQuarrie, Tucker, Burns, & Hartman, 2002; McCurdy, Skinner, Grantham, Watson, & Hindman, 2001). Within the studies referenced above the experimenters used ratios containing a higher percentage of known to unknown words. In the present study, a higher unknown ratio was used, however even at this ratio interspersing known words was still expected to decrease task difficulty and increase student attention and engagement.

High frequency word fluency screening. Students' fluency on lists of known, high-frequency words was assessed to create a fluency criterion for moving students from WLT to assessment with the passage reading probes. Words on the high frequency word list were obtained from the classroom teacher(s), and were words that the students were expected to have mastered in the 1st grade. Students were presented with a list of 20 high frequency words (HFW), which they could read from sight. Students were instructed to read the list three times as fast as they could with a short break between each reading. The median WCPM across the three readings was taken as each child's optimal word list reading rate, and 50% of that rate was arbitrarily adopted as the fluency criterion for WLT. This fluency criterion was chosen based on the desire to find a criterion that was both attainable for the students, but also functional in terms of increasing generalization of the skill. The present criterion was used in the study conducted by

Martens et al., (in press) and showed potential of fitting both the criteria of attainability and functionality.

Experimental Design and Procedures

A multiple probe design across vowel teams was used to assess whether the phonics training procedure influenced students' generalized oral reading fluency on word lists and passages.

Baseline. Baseline data were taken from the students' oral reading fluency (WCPM) during initial readings of the 12 selected passages. Students were given each passage and asked to read orally for 1 min while the experimenter marked WCPM. At the end of the 1 min reading, the experimenter stopped marking WCPM and instructed the students to stop reading (see Appendix A for the baseline passage reading protocol).

Word list phonics training (WLT). Training in nonsense words containing the target vowel team began with instruction in the vowel combination rule by the experimenter presenting the vowel team on an index card and modeling pronunciation of the vowel team (see Appendix A for the WLT protocol). The student was then required to correctly repeat this pronunciation three consecutive times. Students then participated in a blending task using one known and three unknown nonsense words. The experimenter visually presented the sound segments of each word on separate index cards and said, "These are the sounds …" pointing at each segment as it was pronounced. The experimenter then orally blended the sounds and said, "When put together these sounds make the word…" Index cards containing onset and rime phonemes were white, whereas index cards containing the target vowel combination in isolation or in words were color coded to aid in discrimination of the vowel teams. The coloring served as an extra stimulus prompt which cued the student into what sound they should be producing. The experimenter then instructed the student to “repeat after me: (sound segments here) makes (whole word here),” (e.g., the experimenter showed two sound cards containing the sound segments /b/ /aw/and say “These are the sounds /b/ /aw/, when put together they make the word “baw.” “Repeat after me: /b/ /aw/ makes “baw”). The student was then required to correctly orally blend the nonsense word as demonstrated by the experimenter. If the word was correctly blended, the student was then required to repeat the correct blend three consecutive times. If the word was incorrectly blended the experimenter modeled the correct blend again and the student was then required to repeat the correct blend three consecutive times. This process was repeated until the student was able to correctly blend the target word three consecutive times. Once students could correctly blend a word, the experimenter moved on to the next nonsense word on the word list and repeated the same steps outlined above. This procedure was done for each of the four nonsense words assigned to the particular training session.

Immediately following the completion of phonics training, each student completed a word list assessment which involved reading the four trained nonsense words along with four untrained real words containing the same vowel combination (refer to Appendix A). Words were presented in random order on 5 by 7 inch flashcards attached with Velcro© to a black board in two rows of four. The WCPM score achieved during this assessment was used as the “beat your score” contingency during a retention word list assessment.

At the beginning of each training session (with the exception of the first day of training), students were assessed using the same words from the immediate word list assessment on the prior day of training. The order of words was randomized prior to the assessment. The purpose of this assessment was to determine whether students were able to demonstrate accurate decoding following a 1 to 2-day retention interval, with 2-day retentions occurring when the session was completed on a Friday. Students were considered to be fluent in using the decoding skill when they were able to read the word list at 50% of their WCPM on known HFW with one or fewer errors. Once students met criterion for reading the word list retention probe, they were administered two additional word list probes for the two vowel teams that were not being used in training to assess their reading accuracy and fluency on these. This was followed by administration of the passage reading probes. Following completion of training on the first vowel combination, students then began training on the second vowel combination and continued to receive word list and passage probes for the vowel teams not trained.

It should be noted that only two students received training in all three of the vowel teams. Five of the remaining students only received training in the first two vowel teams and the last student was only trained on the first vowel team. The reason for this was that the study was stopped once the end of the school term was reached. Also an experimenter error occurred during training for Katherine, who continued to receive training for three additional sessions after reaching criterion.

Passage Reading Probes. During passage reading probes sessions, students were required to read all 12 of the AIMSweb passages featuring words with the target vowel combinations (refer to Appendix A). These probe readings were scheduled to take place at four points during the study, once at baseline and then each time the students reached the fluency criterion on one of the vowel combinations following training. To reduce fatigue, only four passages were probed each session. For each passage reading probe, students were given a passage and asked to read orally for 1 min while the experimenter marked WCPM. At the end of the 1 min reading, the experimenter will stop marking WCPM and allow the student to complete the sentence. Immediately following the first reading, the experimenter repeated the procedure with the second, third, and fourth passages. The same procedure was followed on the next two subsequent days until all 12 passages had been probed. Target and generalization passages were always alternated, and probes were administered in a running sequence of *aw, oi*, and *au* always beginning with the vowel team that was just trained. Thus, if *oi* was just trained, target and generalization probes were administered in sequence for *oi, au*, and *aw*.

Dependent Measures

Both accuracy and fluency measures of student performance on both word lists and passages were used as dependent measures in the current study. Fluency measures included WCPM on the word list retention probes and WCPM on the passage reading probes. Accuracy measures included the percentage of correctly read nonsense and real words on the word list retention probes and the percentage of correctly read real words containing the target phonics skills on the passage reading probes.

Procedural Integrity and Interscorer Agreement

Procedural integrity and interscorer agreement were assessed for all (100%) of the letter-sound correspondence screenings by having a trained experimenter observe the administration of the screening and score the percentage of steps completed correctly and the percentage agreement for correct words. Procedural integrity was calculated as the number of agreements on steps correctly completed divided by the total number of agreements plus disagreements multiplied by 100%. Procedural integrity was 100%. Interscorer agreement for WCPM was conducted on a vowel team-by-vowel team basis and word-by-word basis, and calculated as the number of scoring agreements divided by the total number of agreements plus disagreements multiplied by 100%. Interscorer agreement was calculated at 98%.

Procedural integrity was assessed during 66% of all WLT and passage probe sessions. One trained observer recorded the number of steps that were completed correctly on the protocol by the experimenter. Procedural integrity was calculated as the number of agreements on steps correctly completed divided by the total number of agreements plus disagreements multiplied by 100%. Procedural integrity was calculated at 100% across the sessions observed. Each experimenter was assessed for interscorer agreement on WCPM on both the word lists and post-training passage reading probes. Interscorer agreement was assessed during 66% of all sessions. Interscorer agreement for WCPM was conducted on a word-by-word basis and calculated as the number of scoring agreements divided by the total number of agreements plus disagreements multiplied by 100%. Interscorer agreement was calculated at 96% across the sessions observed.

Results

Data Analysis

Data were graphed for each child under the WLT and passage reading conditions using WCPM and the percentage of correctly read target words. Treatment effects were then evaluated using visual inspection and calculation of the percentage of nonoverlapping data (PND) between subsequent passage probes and the initial baseline passage probes. Visual inspection of single-case experimental design data is a conservative approach to evaluating treatment effects because it requires clear immediate changes in level of the dependent variables between the conditions being compared when evaluated against variability and trend in each condition (Baer, 1977). Moreover, to be convincing, clear, immediate changes in level should be replicated both within (i.e., across vowel teams) and across all participants in the study. Also necessary for a convincing demonstration of experimental control is a clear increase in levels of the dependent variables from the first data point of the condition believed to increase performance onward throughout all sessions of that condition.

PND was obtained by calculating the percentage of data points in each subsequent passage probe condition that did not overlap with the highest baseline data point in the initial baseline passage probe condition. According to Scruggs and Mastropieri (2001), PND values above 90% indicate a very effective intervention, values between 70% and 90% an effective intervention, values from 50% to 70% a questionably effective intervention, and values under 50% no effect. In the present study the PND values were restricted due to the small number of passage probes used. Based on this there were only three possible PND values when comparing conditions, 0%, 50% and 100%, that could be obtained. For the purpose of this study a value of 100% was considered a large effect, 50% a small effect, and 0% no effect.

Generalized Oral Reading Accuracy

Figures 1 through 4 show oral reading accuracy during WLT and on passage probes for each pair of participants. Participants were ordered based on the amount of training they had received, most to least, and their response to the training, also most to least. The mean percentage of words containing each target vowel combination that was read correctly per condition is reported in Table 2. All eight students showed an increasing trend during WLT for at least one vowel team (10 of 13 WLT phases containing at least two sessions). For four students there was only one data point during the training phase for one of their vowel teams due to reaching the fluency criterion after the first retention assessment, and in one case the study being stopped due to the end of the school year. In addition, the majority of WLT phases (7/9) resulted in mean accuracy levels on retention probes above those of the prior untrained retention probes. Five out of the seven students who were trained in at least two vowel teams also showed maintenance in their reading accuracy on word lists once training was removed. Because each word list assessment probe contained a mix of four trained nonsense and four untrained (generalization) real words, these data suggest that students demonstrated generalized increases in oral reading accuracy to untrained real words presented in lists during the retention assessments.

On passage probes, all participants showed some variability in their baseline performance. In general there was a higher level of variability for the target probes compared to the generalization probes. Zack, Pam and Olivia started off with the lowest accuracy levels, with the majority of their probes at baseline being zero. The remainder of students showed greater variability in their baseline performance, with the majority of baseline target probes being read with higher accuracy compared to the baseline generalization probes.

Table 3 shows the PND values for the percentage of target words read correctly on passages across baseline/maintenance probes It should be noted that of the six initial baseline passage probes, five students achieved 100% accuracy on one of the two target passage probes (Heather on *oi*, Jessica on *aw* and *oi*, Katherine on *oi*, Lisa on *oi*, and Pam on *oi*). Based on this, the PND values may actually under represent the effects of training on target passages.

Following *aw* training, small to large effects were seen for Heather and Katherine on both target and generalization passage probes, Zack and Pam on target passage probes, and Jessica, Lisa, Natalie and Olivia on generalization passage probes. However, all students also showed small to large effects in their accuracy on the untrained passage probes following *aw* training; Heather, Jessica, and Katherine on both *oi* and *au* passages, Natalie, Zack, Pam, and Olivia on *oi* passage probes, and Lisa on *au* passage probes. Following *oi* training, additional increases in PND values were seen for Lisa, Natalie, Zack and Olivia on either the *oi* target or generalization passage probes, but similar to *aw* training, there were simultaneous increases seen on *au* passage probes with training in the previous *oi* vowel team for all participants except Pam. Because each passage probe contained untrained (generalization) real words, these data suggest that students demonstrated generalized increases in oral reading accuracy to untrained *aw r*eal words presented in either target or generalization passages during the passage probe assessments. Only half of the students showed similar increases with training in *oi* words and increases prior to training were observed for all students on both *oi* and *au* vowel teams.

Generalized Oral Reading Fluency

Figures 5 through 8 show oral reading fluency during WLT and on passage probes for each pair of participants. Each student's mean WCPM on word lists and passages is reported in Table 4. All eight of the students showed an increasing trend during WL training for at least one vowel team (10 out of 13 training phases containing at least two sessions). As noted above, four students had only one data point during the training phase for one of their vowel teams. The majority of WLT phases (7 of 9) resulted in mean fluency levels on retention probes above those of the untrained retention probes. However, only three of the seven students who were trained in at least two vowel teams also showed maintenance in their reading fluency on word lists once training was removed. These data suggest that all students demonstrated generalized increases in oral reading fluency on untrained real words presented in lists, but these increases were not maintained during subsequent word list retention probes.

On passage probes, all participants were relatively stable in WCPM at baseline, far more so than for oral reading accuracy. Zack and Pam started off with the lowest fluency levels. For all students, WCPM were similar between ORF on target probes compared to generalization probes at baseline and during subsequent maintenance probes.

Table 5 shows the PND for WCPM on passages across conditions. Following *aw* training, small to large effects were seen for Heather, Jessica, Katherine, Lisa, Natalie, and Pam on both target and generalization passage probes and for Zack on *aw* target passage probes. Olivia did not show an initial increase following *aw* training. Similar to the accuracy data, increases in fluency on passage probes associated with untrained vowel teams occurred following *aw* training; Heather, Jessica and Katherine on both *oi* and *au* passages, Natalie, Zack, Pam and Olivia on *oi* passage probes, and Lisa on *au* passage probes. Following *oi* training, additional increases in PND values were seen only for Katherine, Natalie, and Olivia on either the target or generalization *oi* passage probes, but similar to before there were simultaneous increases seen on *au* passage probes. These data suggest that most students demonstrated increases in oral reading fluency on both target and generalization passages after training on *aw* words, but only three students showed similar increases after training with *oi* words. For all students increases were seen in both *oi* and *au* vowel teams prior to training.

Generalized Oral Reading Fluency Instructional Levels

Further analyses were conducted to examine whether students had changes in their ORF instructional level from the beginning of the study at baseline, to the final reading of the passages (Table 6). The results showed that Heather, Jessica, Katherine, Lisa and Natalie had increases in level to either instructional or mastery for all passages. Zack and Olivia saw increases to an instructional level on one of the three vowel teams, *au* and *oi* respectively. Pam saw no change and remained at a frustrational level.

Training Criteria

Additional exploration of the data was carried out to examine the percentage of vowel teams that would have reached the training criterion at various combinations of accuracy and fluency (Table 7). From this it was determined that a fluency criterion of 30% WCPM of high frequency words with 2 or less errors would have allowed 94% of the students to reach criterion and most of them would have done so in less than 5 training sessions, allowing for quicker advancement to the next vowel team. A criterion of 30% WCPM of high frequency words with 5 or less errors would have allowed 100% of students to reach criterion. These data suggest that the criterion adopted in the present study (e.g., 50% with 1 error or less) may have been overly stringent.

Discussion

Previous research has shown that a) training students to blend the sounds that make up nonsense words can generalize to accurate reading of real words (Daly et al., 2004) and b) training students to blend sounds with accuracy and fluency in isolation using real words can generalize to accurate and fluent reading of words on word lists and in passages (Martens et al., in press). The purpose of this study was to replicate and extend previous research in these areas by further assessing the effects of fluency training in phonics using nonsense words on students' generalized oral reading accuracy and fluency. Specifically, we trained students to fluently blend nonsense words containing target vowel combinations and assessed three levels of generalization: to untrained real words in lists, to untrained but assessed real words in passages, and to novel real words in passages.

It was first hypothesized that following training in using decoding skills on nonsense words, students would generalize their use of the trained decoding skill to read similar untrained real words in isolation (i.e., on word lists) with greater accuracy (Hypothesis 1) and fluency (Hypothesis 2). Hypothesis 1 (higher accuracy on word list containing untrained real words) was supported. All students showed generalized increases from trained nonsense words to untrained real words on lists as evidenced by either increasing trends during the WLT condition or higher accuracy levels during WLT compared to no-training probes. Additionally, of the seven students who were trained in at least two vowel teams, five were able to maintain their accuracy levels on subsequent word list probe readings after training in that specific vowel team had been removed (i.e., all but Lisa). Hypothesis 2 (higher fluency on word list containing untrained real words) was also supported. All students showed generalized increases from trained nonsense words to untrained real words on lists again based on either increasing trends during the WLT condition and/or higher levels comparing to the no-training probes. Only three of the seven students who received training in at least two vowel teams were able to maintain fluency levels on subsequent word list probes after training in that specific vowel team had been removed. Thus, although this hypothesis was supported, more students maintained their levels of oral reading accuracy than fluency on word lists.

The third hypothesis (increased accuracy on untrained target real words within passages) was partially supported. Results showed an immediate increase over the most recent baseline in the percentage of *aw* target words read correctly on either the target, generalization, or both passages for all eight students but for only four of the eight students on *oi* words. Moreover, all of the students saw increases above baseline on passages containing vowel teams that had not yet been trained. These increases in untrained passage probes significantly weaken the demonstration of experimental control given the multiple probe design used in the present study. These increases may represent spontaneous generalization from training in a prior vowel team or may have simply been the result of repeated readings of the same passages during the probe assessments. With repeated readings it is possible that students were better able to use context cues to decode unknown words.

The fourth hypothesis (increased fluency on all words within passages) was also partially supported. Similar to the accuracy data, the fluency data also showed immediate increases over the most recent baseline in WCPM on either the target, generalization, or both passages associated with training in the *aw* vowel team for seven of the eight students but for only three students for the *oi* vowel team. However, all students also had increases above baseline on passages containing vowel teams that had not yet been trained. Again, given the multiple probe design used in the present study, one cannot determine with confidence whether these increases were related to training, or were a result of repeated readings of the same passages.

The results of the present study suggest that training students to blend nonsense words in isolation with modeling and feedback followed by practice and reinforcement for generalizing the skill promotes generalized oral reading accuracy and fluency to untrained real words on lists. The present training package contained several components including direct instruction of sound blending with modeling and feedback, practice with a mix of nonsense and real words (both known and unknown), and a reinforcement contingency for generalized fluency of the skill to untrained real words on lists. This combination of components resulted in a strong treatment package which promoted generalized responding in several ways. First modeling and error correction were used in the acquisition phase to ensure there was errorless learning of the skill. During this students also practiced accurate performance of the skill through repeated readings of individual words immediately after instruction (i.e., students correctly repeated the target word three times before moving on to a new target word). This may have helped with generalization of the skill by promoting strong stimulus control. Students were then given the opportunity to use the skill in a more challenging context during the immediate word list assessment. This assessment also determined whether there was any immediate generalization of the skill. Finally the use of a beat your score contingency during the word list retention assessment provided an extra incentive for skill generalization.

Within the present study better gains were seen in accuracy than fluency on word list. One possible explanation for this is that fluency tends to develop after a skill can be performed accurately. Even after extensive WLT on some vowel teams, several students in the present study failed to read words on lists with 100% accuracy. These students were assessed for fluency while still in the acquisition phase, and therefore may not have benefitted fully from the fluency building component of training. One would expect fluency to increase once accurate performance becomes more automatic, so more focus can be placed on speed.

These results support the findings reported by Martens et al. (in press). Similar to this previous study, training was effective at increasing students' generalized oral reading accuracy and fluency of target words in word lists. This was illustrated by increasing trends in the accuracy and fluency with which they were able to read untrained words on lists. Taken together, these results suggest that the training package promoted stimulus control over accurate and fluent responding to word classes (both nonsense and real words) when presented in lists.

The present study provided mixed support for the use of this training package as a technique to improve student's ability to apply the blending skill in different contexts (i.e., to words appearing in target and generalization passages). Gains in the percentage of target words read correctly and WCPM did not occur solely in the vowel teams that had received training. Additionally, gains seen on passages prior to training were similar in size to those seen on the trained passage probes in some cases.

It is possible that training only nonsense words on lists may have hindered generalization of the decoding skill to passage reading. Students were never directly trained on words form the target passages although these words were assessed on lists. Students may have shown better generalization had they been trained directly on real words and then encountered these same words within the passages. The present study did not allow for practice of words that were directly trained on lists in the more challenging context of passages, which may have hindered generalization.

Limitations

There are several limitations that must be highlighted concerning this study. First, six of the eight students were only trained on one (Pam) or two (Katherine, Lisa, Natalie, Zack and Olivia) vowel teams. This occurred because for these students training on each vowel team took longer than expected and the end of the school term arrived, so training had to be stopped. Examining the data for various training criteria suggested that a fluency criterion of 30% WCPM of high frequency words with 2 or less errors or 30% of high frequency words with 5 or less errors may have been more appropriate, in that the majority of students would have obtained the fluency criterion and in a shorter amount of time. In relation to the issue of timing, since the study was conducted for an entire school term it is possible that students were exposed to training in the vowel teams in the classroom during the training period. This may have accounted for some spontaneous increases seen in untrained vowel teams. Additionally the two students who received the intervention in the spring term (Natalie and Olivia) may have had more exposure to vowel teams, based on the fact that it was later in the school year.

Another limitation is that some students were required to move on from training prior to reaching the fluency criterion. This was necessary when the experimenters ran out of unknown real words to use on word list assessments, unknown real words were needed to keep the 3 unknown to 1 known ratio. Similar to the limitation discussed above, it is possible that too stringent of a fluency criterion was also to blame. Future research should examine the effects of using different fluency criteria to determine which mixture of fluency and accuracy is most functional (i.e., produces benefits in terms of generalization).

A third limitation was that repeated testing effects were seen on passage probes, with WCPM increasing for *oi* and *au* passage probes following *aw* vowel team training. This makes it difficult to determine the size of increase due to training.

A fourth limitation was the limited opportunities students had to demonstrate the decoding skills in the passages. The passage probes only contained six to ten target words distributed throughout the entire passages. Since most students were only able to read a small portion of the passages during the one minute time frame they were only able to encounter very few target words.

A fifth limitation of my study was the choice to use specific vowel teams in training. Due to the limited frequency of words containing vowel teams within the English language, the amount of training that could be done for each vowel team and also the number of target words that could be placed within passages was affected. Specifically the small number of target words within the passages led to limited opportunities for the students to use the decoding skill within the passage context.

A sixth limitation surrounds the fact that students were not evaluated for their phonological awareness (PA) skills at baseline. This would have allowed me to determine whether students had the necessary perquisite PA skills for reading development (i.e., letter names, letter sounds, initial sounds, phoneme segmentation), that would have allowed them to benefit from training in a more advanced reading skill (i.e., the vowel team syllable type).

A final limitation was the issue of potential dialectical differences among the experimenters and the participants. This may have affected how the vowel teams were modeled and rated by the experimenters and learned by the students.

Implications and Directions for Future Research

Results of this study have implications for how one looks at interventions focused on improving oral reading fluency (ORF). First, these results provide further support for the use of phonics training (PT) as a tool for teaching decoding. This was evidenced by the increases in accuracy and fluency seen during WLT.

Another implication of this study is the suggestion that PT alone may not be an effective tool for improving reading accuracy and fluency within context, evidenced by a lack of consistent increases in accuracy and fluency on passage probes following training, and spontaneous increases on untrained vowel teams. Increases in ORF in the present study may have resulted from repeated readings of the same passages.

Future research should focus on addressing the limitations stated above. In selecting a fluency criterion, an attempt should be made to ensure that the criterion is not too stringent. For the present study a criterion of 30% WCPM of high frequency words with 2 or less errors or 30% of high frequency words with 5 or less errors would have improved the number of students that were trained to criterion. However, whether either of these criteria is functional in terms of generalization needs additional research.

To address the issue of repeated testing effects, future research should attempt to create multiple story probes matched for difficulty. This will allow different stories to be used during each subsequent baseline and maintenance probe. This will also eliminate the chance of increases due to repeated practice of the same passage and allow for a clearer picture of whether improvement was due to the intervention.

To address the issue of limited opportunities to respond, an attempt should be made in future research to develop passage probes that contain a higher number of target words, so as to give students a greater number of chances to practice the decoding skill within passages. Conducting training on a variety of syllable types (e.g., final “le”, “r” controlled, and vowel teams), as opposed to focusing on specific vowel teams in the vowel team syllable type would also allow for a greater pool of target words that can be used within training and assessment.

Future research should also consider other experimental designs that allow for spontaneous generalization without compromising experimental control. One possible design is an alternating treatment design, in which the decoding fluency intervention is alternated with a no-treatment control and/or another commonly used intervention (e.g., LPP/RR), each applied to a different vowel team. This will allow the experimenter to see spontaneous increases within the no treatment control condition, and will also allow for further comparison of the present intervention to another well known technique.

Another important direction for future research would be to include a procedure that directly promotes generalized ORF. The present intervention included several components aimed at teaching students how to decode individual words on word lists, however there was nothing in place to allow the students to practice use of the skill in passages. Additionally there was no intervention in place to directly improve ORF on passages. Drawing from research that showed generalized ORF after students reached a criterion of 100 WCPM during RR of a passages, one possible direction would be to incorporate a LPP/RR procedure with a set fluency criterion of 100 WCPM prior to moving on to a generalization probe.

Results from the present study were valuable in the sense that they provided further insight into the effects of one approach to PT as an intervention for improving ORF. Though results were not completely as hypothesized, they presented several possible directions for future research.

Table 1

Mean WCPM at Screening, Percentage of Sentences Containing a Target Word, and Number of Unique Target Words per Passage

Vowel Team and Passage	WCPM	Percentage of Sentences	Unique Target Words
AW (Target 1)	28.8	100	6
AW (Target 2)	31.5	100	10
AW (Generalization 1)	24.1	90	8
AW (Generalization 2)	32.0	91	7
OI (Target 1)	28.0	100	8
OI (Target 2)	38.6	100	6
OI (Generalization 1)	32.3	100	9
OI (Generalization 2)	27.0	100	9
AU (Target 1)	39.0	100	7
AU (Target 2)	38.5	100	9
AU (Generalization 1)	27.8	100	6
AU (Generalization 2)	30.3	100	6

Note. WCPM = Words Correct Per Minute

Table 2

Mean Percentage of Target Words Read Correctly on Word Lists and Passages across Conditions

Name	Vowel Team / Passage		Base 1	WLT	Base / Maint 2	WLT	Base / Maint 3	WLT	Base / Maint 4
Heather	AW	T	0.0		80.0		90.0		81.5
		G	0.0	**64.3**	16.5	88.0	56.5	100.0	87.5
	OI	T	50.0		70.0		80.0		91.5
		G	12.5	0.0	62.0	**69.0**	76.5	88.0	89.0
	AU	T	12.5		37.5		62.5		91.5
		G	25.0	25.0	37.5	25.0	75.0	**100.0**	50.0
Jessica	AW	T	62.5		100.0		100.0		100.0
		G	16.5	**77.3**	83.0	100.0	87.5	100.0	100.0
	OI	T	62.5		75.0		45.0		80.0
		G	50.0	25.0	55.5	**71.3**	71.0	100.0	92.5
	AU	T	33.0		41.5		66.0		77.5
		G	25.0	0.0	25.0	0.0	25.0	**100.0**	75.0
Katherine	AW	T	26.5		58.5		75.0		-
		G	12.5	**62.6**	41.5	63.0	58.5		-
	OI	T	60.0		36.5		90.0		-
		G	46.5	0.0	37.5	**57.0**	57.0		-

Table 2 con't

	AU	T	0.0		25.0		28.5		-
		G	33.0	50.0	32.0	50.0	20.0	-	-
Lisa	AW	T	33.0		40.0		60.0		-
		G	12.5	**68.6**	50.0	25.0	49.5		-
	OI	T	50.0		83.5		81.5		-
		G	52.0	0.0	65.5	**68.0**	89.0		-
	AU	T	0.0		25.0		30.0		-
		G	12.5	25.0	12.5	75.0	18.0	-	-
Natalie	AW	T	33.5		33.0		12.5		-
		G	33.5	**100.0**	90.0	100.0	90.0		-
	OI	T	16.5		62.5		60.5		-
		G	16.5	0.0	40.0	**32.6**	75.0		-
	AU	T	16.5		12.5		58.0		-
		G	29.0	0.0	0.0	0.0	29.0	-	-
Zack	AW	T	0.0		33.0		0.0		-
		G	0.0	**39.4**	0.0	0.0	33.0		-
	OI	T	0.0		50.0		49.5		-
		G	25.0	63.0	32.0	**38.0**	26.5		-

Table 2 con't

	AU	T	49.5		10.0		12.5		-
		G	0.0	0.0	0.0	0.0	0.0	-	-
Pam	AW	T	0.0		16.5		-		-
		G	0.0	**37.7**	0.0		-		-
	OI	T	50.0		0.0		-		-
		G	0.0	0.0	20.0	-	-		-
	AU	T	25.0		0.0		-		-
		G	0.0	25.0	0.0		-	-	-
Olivia	AW	T	16.5		0.0		12.5		-
		G	0.0	**81.5**	16.5	100.0	46.0		-
	OI	T	0.0		0.0		22.5		-
		G	0.0	50.0	10.0	**25.2**	0.0		-
	AU	T	0.0		0.0		25.0		-
		G	0.0	0.0	0.0	0.0	29.0	-	-

Note. WLT = word list training; T = target passage; G = generalization passage; Base = baseline; Maint = maintenance

Table 3

Percent Non-Overlapping Data (PND) between Subsequent Probes and the Initial Baseline for the Percentage of Target Words Read Correctly on Passages

Name	Vowel Team / Passage		Base / Maint 2	Base / Maint 3	Base / Maint 4	Mean PND
Heather	AW	T	**100.0**	100.0	100.0	100.0
		G	**50.0**	100.0	100.0	83.3
	OI	T	0.0	**0.0**	0.0	0.0
		G	100.0	**100.0**	100.0	100.0
	AU	T	50.0	100.0	**100.0**	83.3
		G	50.0	100.0	**50.0**	66.7
Jessica	AW	T	**0.0**	0.0	0.0	0.0
		G	**100.0**	100.0	100.0	100.0
	OI	T	0.0	**0.0**	0.0	0.0
		G	50.0	**50.0**	100.0	66.7
	AU	T	50.0	100.0	**100.0**	83.3
		G	0.0	0.0	**100.0**	33.3
Katherine	AW	T	**50.0**	100.0	-	75.0
		G	**100.0**	100.0	-	100.0
	OI	T	0.0	**0.0**	-	0.0
		G	50.0	**50.0**	-	50.0

Table 3 con’t

	AU	T	50.0	100.0	-	75.0
		G	0.0	0.0	-	0.0
Lisa	AW	T	**0.0**	50.0	-	25.0
		G	**100.0**	100.0	-	100.0
	OI	T	0.0	**0.0**	-	0.0
		G	0.0	**100.0**	-	50.0
	AU	T	50.0	100.0	-	75.0
		G	0.0	0.0	-	0.0
Natalie	AW	T	**0.0**	0.0	-	0.0
		G	**100.0**	100.0	-	100.0
	OI	T	100.0	**100.0**	-	100.0
		G	50.0	**100.0**	-	75.0
	AU	T	0.0	100.0	-	50.0
		G	0.0	0.0	-	0.0
Zack	AW	T	**100.0**	0.0	-	50.0
		G	**0.0**	50.0	-	25.0
	OI	T	50.0	**100.0**	-	75.0
		G	0.0	**0.0**	-	0.0

Table 3 con’t

	AU	T	0.0	50.0	-	25.0
		G	0.0	0.0	-	0.0
Pam	AW	T	**50.0**	-	-	50.0
		G	**0.0**	-	-	0.0
	OI	T	0.0	-	-	0.0
		G	50.0	-	-	50.0
	AU	T	0.0	-	-	0.0
		G	0.0	-	-	0.0
Olivia	AW	T	**0.0**	0.0	-	0.0
		G	**50.0**	100.0	-	75.0
	OI	T	0.0	**100.0**	-	50.0
		G	50.0	**0.0**	-	25.0
	AU	T	0.0	50.0	-	25.0
		G	0.0	100.0	-	50.0

Note. T = target passage; G = generalization passage; Base = baseline; Maint = maintenance

Table 4

Mean WCPM on Word Lists and Passages across Conditions

Name	Vowel Team / Passage		Base 1	WLT	Base / Maint 2	WLT	Base / Maint 3	WLT	Base / Maint 4
Heather	AW	T	35.0		53.5		55.0		61.0
		G	30.5	**15.6**	34.0	18.0	42.5	32.0	55.0
	OI	T	35.5		54.5		56.5		60.0
		G	27.5	0.0	62.0	**12.5**	54.5	30.0	71.5
	AU	T	29.5		50.0		56.0		65.0
		G	41.0	4.0	52.0	5.0	58.0	**21.0**	60.0
Jessica	AW	T	41.0		54.5		56.0		54.5
		G	30.0	**23.3**	43.5	40.0	54.5	40.0	58.0
	OI	T	42.5		48.0		52.5		56.5
		G	35.5	5.0	44.0	**23.3**	44.5	37.0	53.0
	AU	T	38.5		39.0		46.0		57.0
		G	31.0	0.0	41.5	0.0	45.5	**28.0**	53.0
Katherine	AW	T	39.0		56.5		59.0		-
		G	41.0	**22.0**	55.0	20.0	66.0		-
	OI	T	55.5		52.5		63.0		-
		G	52.0	0.0	63.0	**21.4**	69.0		-

Table 4 con't

	AU	T	57.5		62.0		73.0		-
		G	44.0	22.0	64.5	15.0	62.0	-	-
Lisa	AW	T	35.0		49.0		67.5		-
		G	32.0	**22.5**	49.5	11.0	72.5		-
	OI	T	41.0		64.0		81.0		-
		G	33.5	0.0	50.5	**29.9**	76.0		-
	AU	T	33.0		51.0		64.5		-
		G	31.0	6.0	50.0	40.0	62.5	-	-
Natalie	AW	T	28.0		37.0		41.0		-
		G	29.0	**60.0**	48.5	53.0	53.5		-
	OI	T	30.5		33.0		46.0		-
		G	31.5	0.0	51.0	**14.8**	45.5		-
	AU	T	36.5		42.0		42.5		-
		G	36.0	0.0	37.5	0.0	43.0	-	-
Zack	AW	T	18.5		26.0		29.0		-
		G	20.0	**10.4**	21.5	0.0	35.5		-
	OI	T	14.5		30.0		26.0		-
		G	16.0	12.0	31.5	**38.0**	41.0		-

Table 4 con't

	AU	T	30.0		45.5		44.5		-
		G	22.5	0.0	35.5	0.0	37.0	-	-
Pam	AW	T	15.5		21.5		-		-
		G	13.0	**13.5**	19.0		-		-
	OI	T	16.5		25.5		-		-
		G	10.0	0.0	29.5	-	-		-
	AU	T	20.5		34.5		-		-
		G	16.05	0.0	26.5		-	-	-
Olivia	AW	T	29.5		30.5		41.0		-
		G	30.0	**47.0**	29.0	69.0	37.0		-
	OI	T	30.5		37.5		42.0		-
		G	31.0	18.0	34.5	**13.3**	40.0		-
	AU	T	24.5		34.0		37.5		-
		G	39.5	0.0	32.5	0.0	39.0	-	-

Note. WLT = word list training; T = target passage; G = generalization passage; Base = baseline; Maint = maintenance

Table 5

Percent Non-Overlapping Data (PND) between Subsequent Probes and the Initial Baseline for Words Read Correctly Per Minute on Passages

Name	Vowel Team/ Passages		Base / Maint 2/	Base / Maint 3/ PND	Base / Maint 4/	Mean
Heather	AW	T	**100.0**	100.0	100.0	100.0
		G	**50.0**	50.0	100.0	66.7
	OI	T	50.0	**50.0**	100.0	66.7
		G	100.0	**100.0**	100.0	100.0
	AU	T	100.0	100.0	**100.0**	100.0
		G	50.0	50.0	**50.0**	50.0
Jessica	AW	T	**100.0**	100.0	100.0	100.0
		G	**50.0**	100.0	100.0	83.3
	OI	T	50.0	**50.0**	50.0	50.0
		G	50.0	**50.0**	100.0	66.7
	AU	T	0.0	50.0	**100.0**	50.0
		G	50.0	50.0	**50.0**	50.0
Katherine	AW	T	**100.0**	100.0	-	100.0
		G	**100.0**	100.0	-	100.0
	OI	T	0.0	**50.0**	-	25.0
		G	100.0	**100.0**	-	100.0

Table 5 con't

	AU	T	0.0	100.0	-	50.0
		G	100.0	100.0	-	100.0
Lisa	AW	T	**100.0**	100.0	-	100.0
		G	**100.0**	100.0	-	100.0
	OI	T	100.0	**100.0**	-	100.0
		G	100.0	**100.0**	-	100.0
	AU	T	100.0	100.0	-	100.0
		G	50.0	100.0	-	75.0
Natalie	AW	T	**50.0**	100.0	-	75.0
		G	**100.0**	100.0	-	100.0
	OI	T	50.0	**100.0**	-	75.0
		G	100.0	**100.0**	-	100.0
	AU	T	100.0	50.0	-	75.0
		G	0.0	50.0	-	25.0
Zack	AW	T	**50.0**	50.0	-	50.0
		G	**0.0**	50.0	-	25.0
	OI	T	100.0	**100.0**	-	100.0
		G	100.0	**100.0**	-	100.0

Table 5 con't

	AU	T	100.0	100.0	-	100.0
		G	100.0	50.0	-	75.0
Pam	AW	T	**100.0**	-	-	100.0
		G	**50.0**	-	-	50.0
	OI	T	100.0	-	-	100.0
		G	100.0	-	-	100.0
	AU	T	100.0	-	-	100.0
		G	100.0	-	-	100.0
Olivia	AW	T	**0.0**	100.0	-	50.0
		G	**0.0**	100.0	-	50.0
	OI	T	50.0	**50.0**	-	50.0
		G	0.0	**50.0**	-	25.0
	AU	T	100.0	100.0	-	100.0
		G	0.0	0.0	-	0.0

Note. T = target passage; G = generalization passage; Base = baseline; Maint = maintenance

Table 6

Change in Instructional Level on Passage Probes from the First to Last Reading

	AW		OI		AU	
Name	Pre	Post	Pre	Post	Pre	Post
Heather	32.8 (F)	58.0 (I)	31.5 (F)	65.8 (M)	35.3 (F)	62.5 (M)
Jessica	35.5 (F)	56.3 (I)	39.0 (F)	54.8 (I)	34.8 (F)	55.0 (I)
Katherine	40.0 (F)	62.5 (M)	53.8 (I)	66.0 (M)	50.8 (I)	67.5 (M)
Lisa	33.5 (F)	70.0 (M)	37.3 (F)	78.5 (M)	32.0 (F)	63.5 (M)
Natalie	28.5 (F)	47.3 (I)	31.0 (F)	45.8 (I)	36.3 (F)	42.8 (I)
Zack	19.3 (F)	32.0 (F)	15.2 (F)	33.5 (F)	26.3 (F)	40.8 (I)
Pam	14.3 (F)	20.3 (F)	13.3 (F)	27.5 (F)	18.5 (F)	30.5 (F)
Olivia	29.8 (F)	39.0 (F)	30.8 (F)	41.0 (I)	32.0 (F)	38.3 (F)

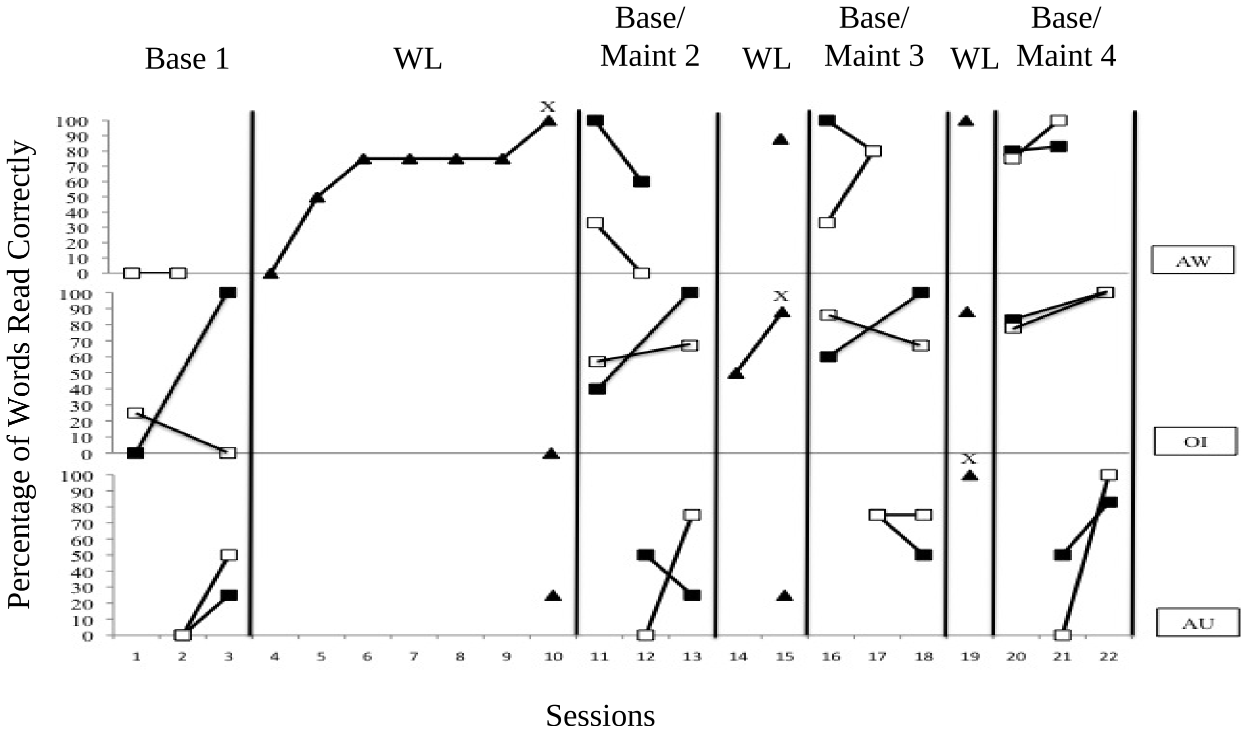
Note. F = frustrational; I = Instructional; M = mastery

Table 7

Percentage of vowel teams to reach criterion from the most to least stringent accuracy/fluency combinations.

% HFW WCPM	1< Errors	2< Errors	3< Errors	4< Errors	5< Errors	6< Errors	7< Errors	8< Errors
50%	65	76	88	88	88	88	88	88
40%	71	88	94	88	94	94	94	100
30%	76	94	94	94	100	100	100	100
20%	76	94	94	94	100	100	100	100
10%	76	94	94	94	100	100	100	100
0%	76	94	94	94	100	100	100	100

Note. HFW = high frequency words; WCPM= words correct per minute



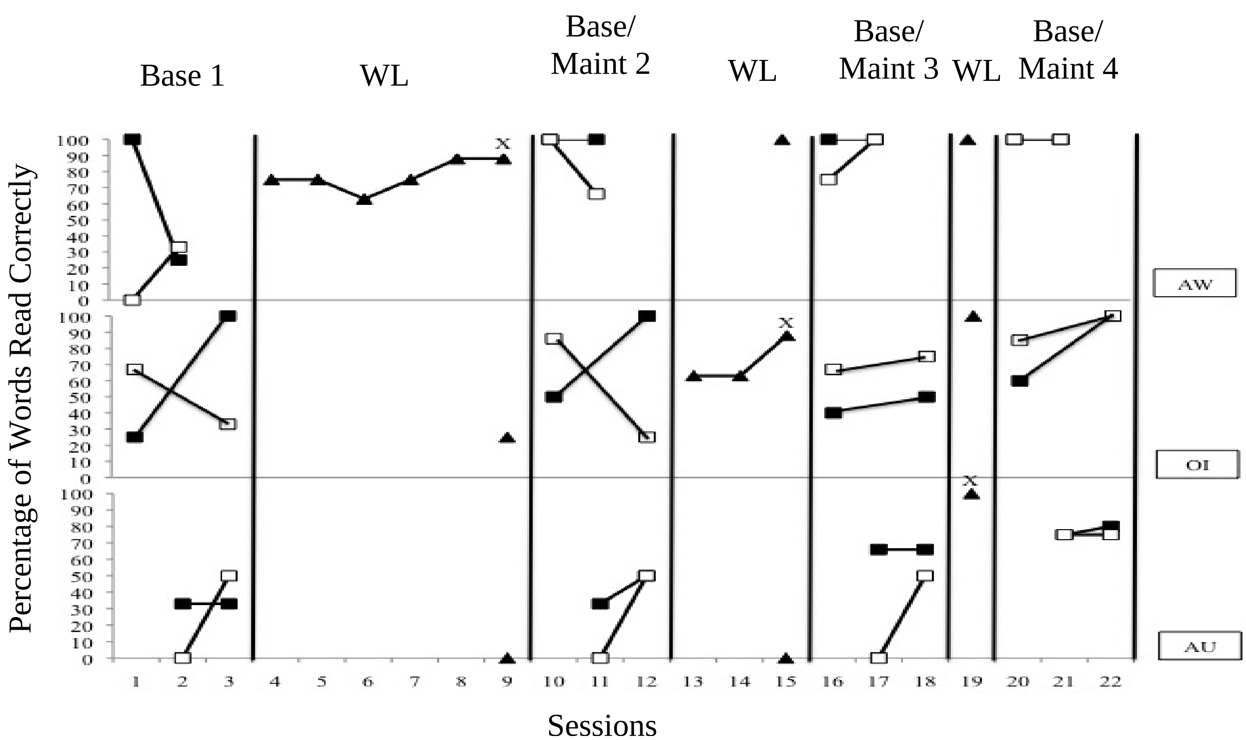


Figure 1. Percentage of target words read correctly on word lists and passages across conditions for Heather (top panel) and Jessica (bottom panel). Closed squares indicate Target passages, open squares indicate Generalization passages, and 'x' indicates when the WLT criterion was met.

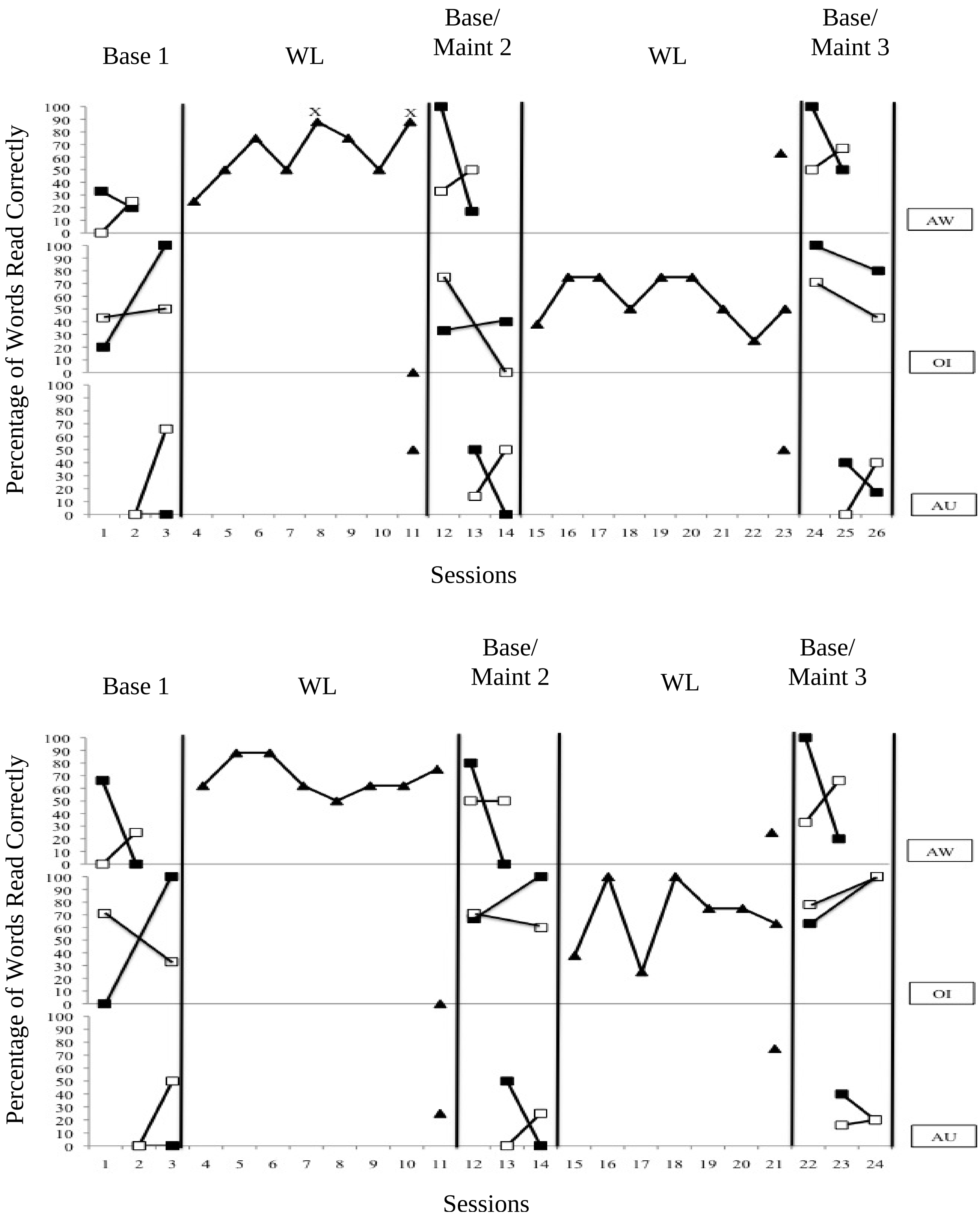


Figure 2. Percentage of target words read correctly on word lists and passages across conditions for Katherine (top panel) and Lisa (bottom panel). Closed squares indicate Target passages, open squares indicate Generalization passages, and 'x' indicates when the WLT criterion was met.

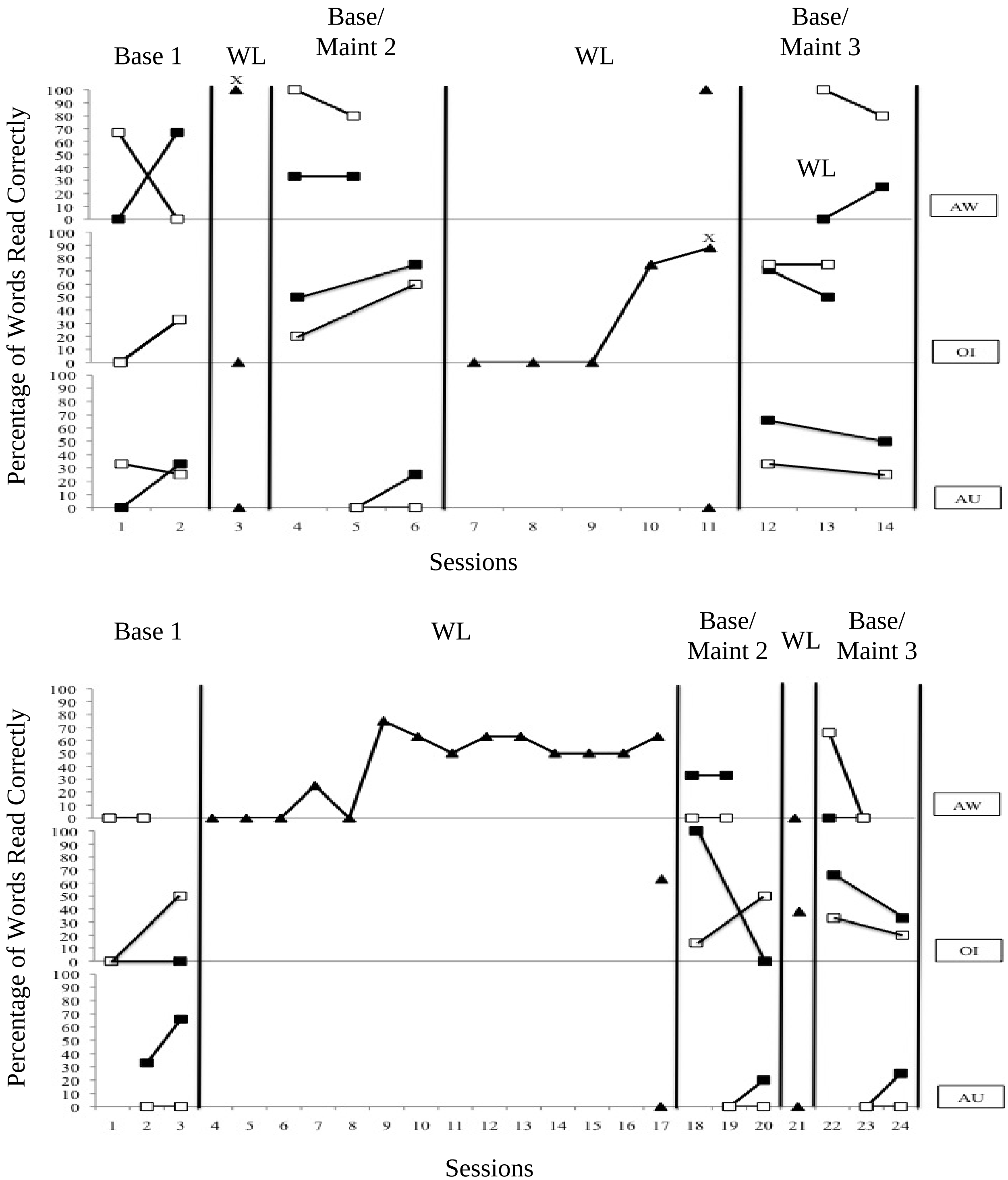


Figure 3. Percentage of target words read correctly on word lists and passages across conditions for Natalie (top panel) and Zack (bottom panel). Closed squares indicate Target passages, open squares indicate Generalization passages, and 'x' indicates when the WLT criterion was met.

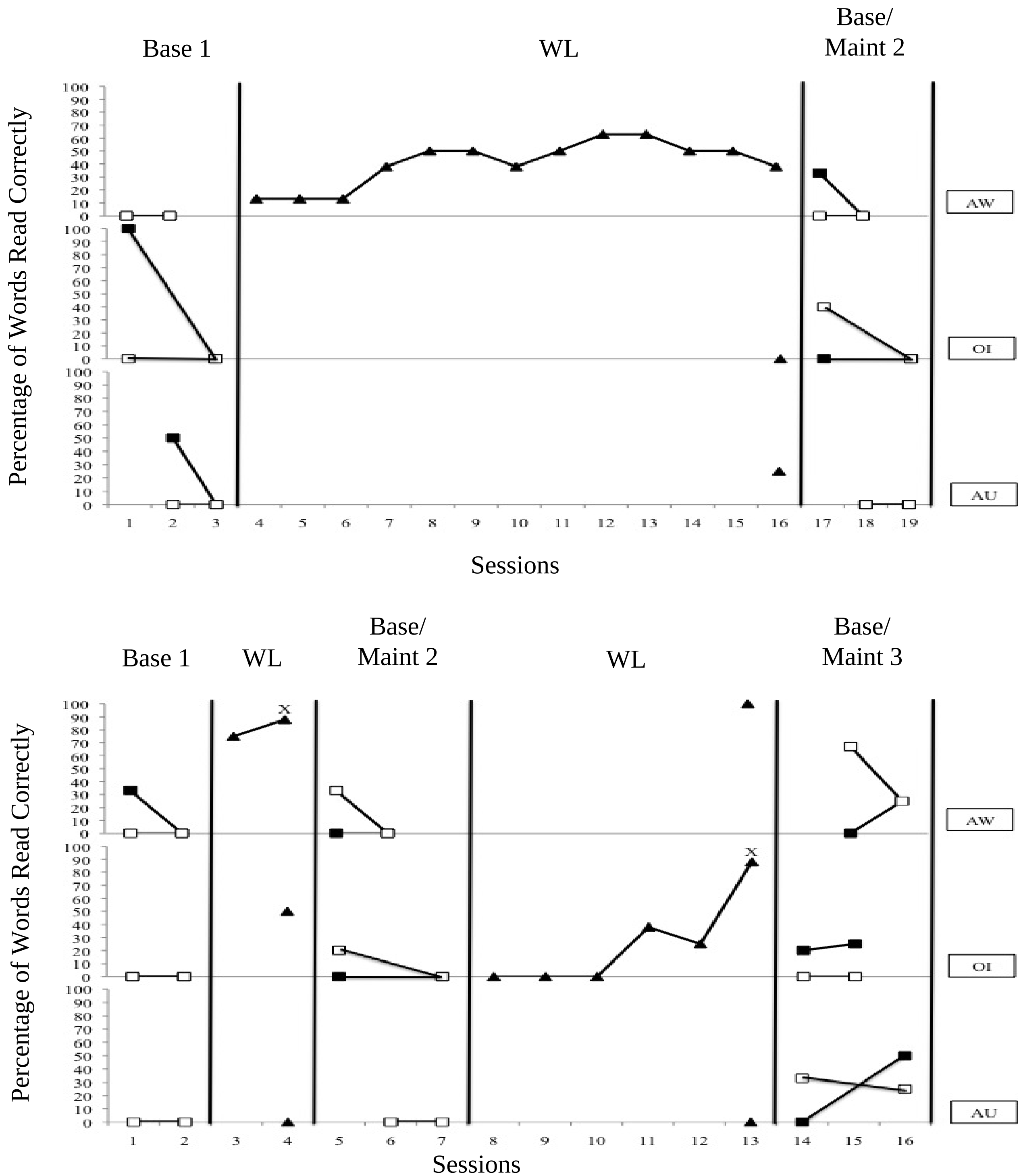


Figure 4. Percentage of target words read correctly on word lists and passages across conditions for Pam (top panel) and Olivia (bottom panel). Closed squares indicate Target passages, open squares indicate Generalization passages, and 'x' indicates when the WLT criterion was met.

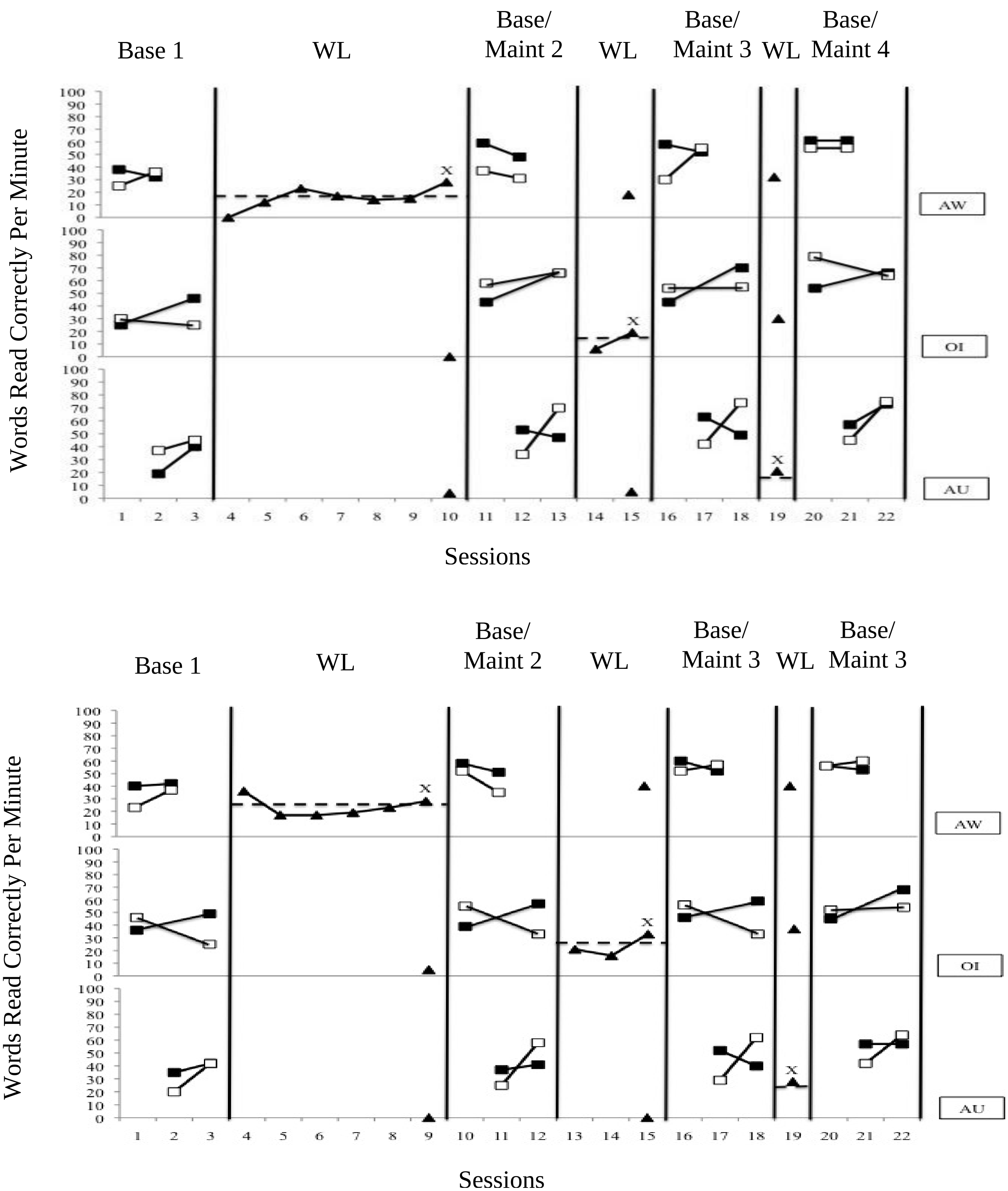
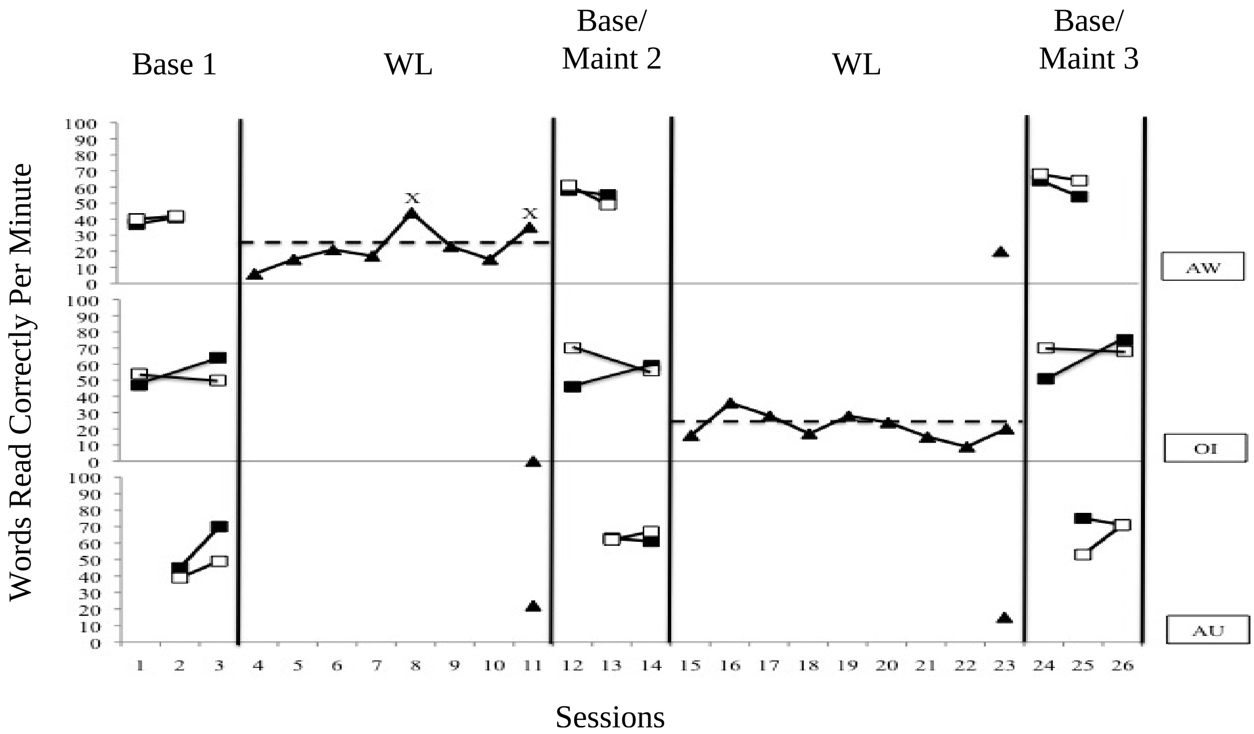


Figure 5. Words read correctly per minute on word lists and passages across conditions for Heather (top panel) and Jessica (bottom panel). Closed squares indicate Target passages, open squares indicate Generalization passages, and ‘x’ indicates when the WLT criterion was met.



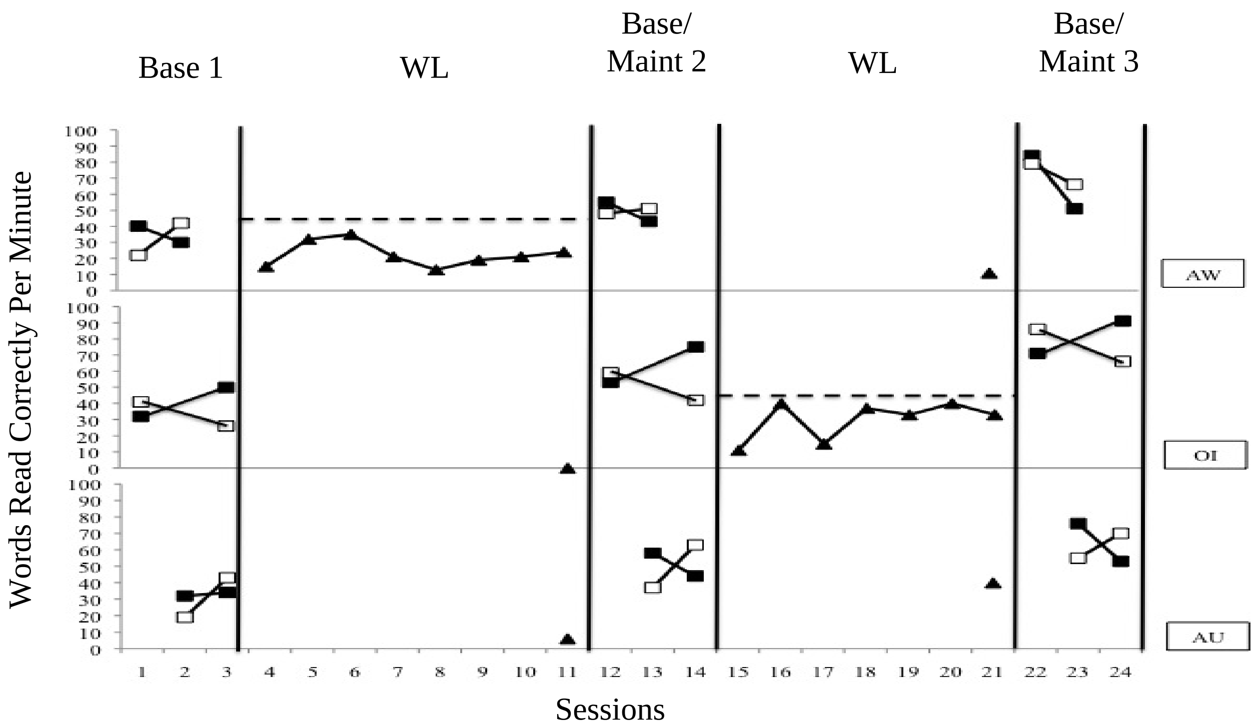
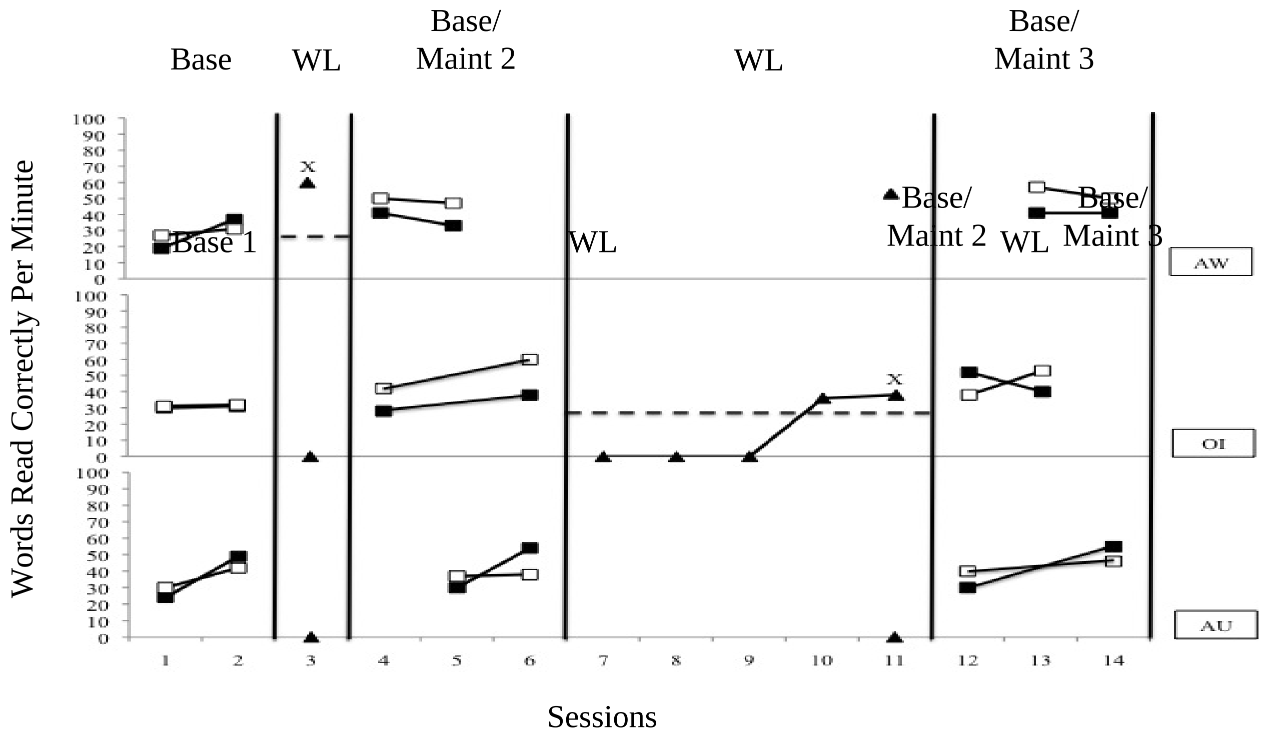


Figure 6. Words read correctly per minute on word lists and passages across conditions for Katherine (top panel) and Lisa (bottom panel). Closed squares indicate Target passages, open squares indicate Generalization passages, and ‘x’ indicates when the WLT criterion was met.



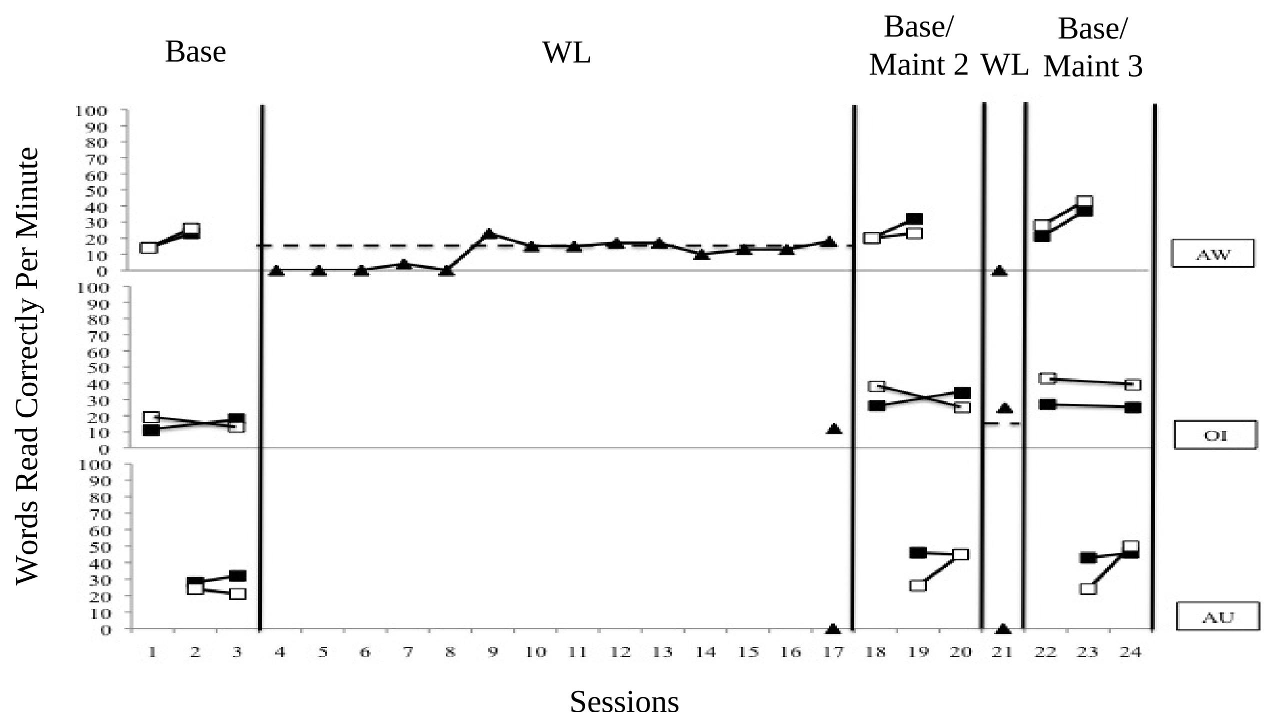


Figure 7. Words read correctly per minute on word lists and passages across conditions for Natalie (top panel) and Zack (bottom panel). Closed squares indicate Target passages, open squares indicate Generalization passages, and ‘x’ indicates when the WLT criterion was met.

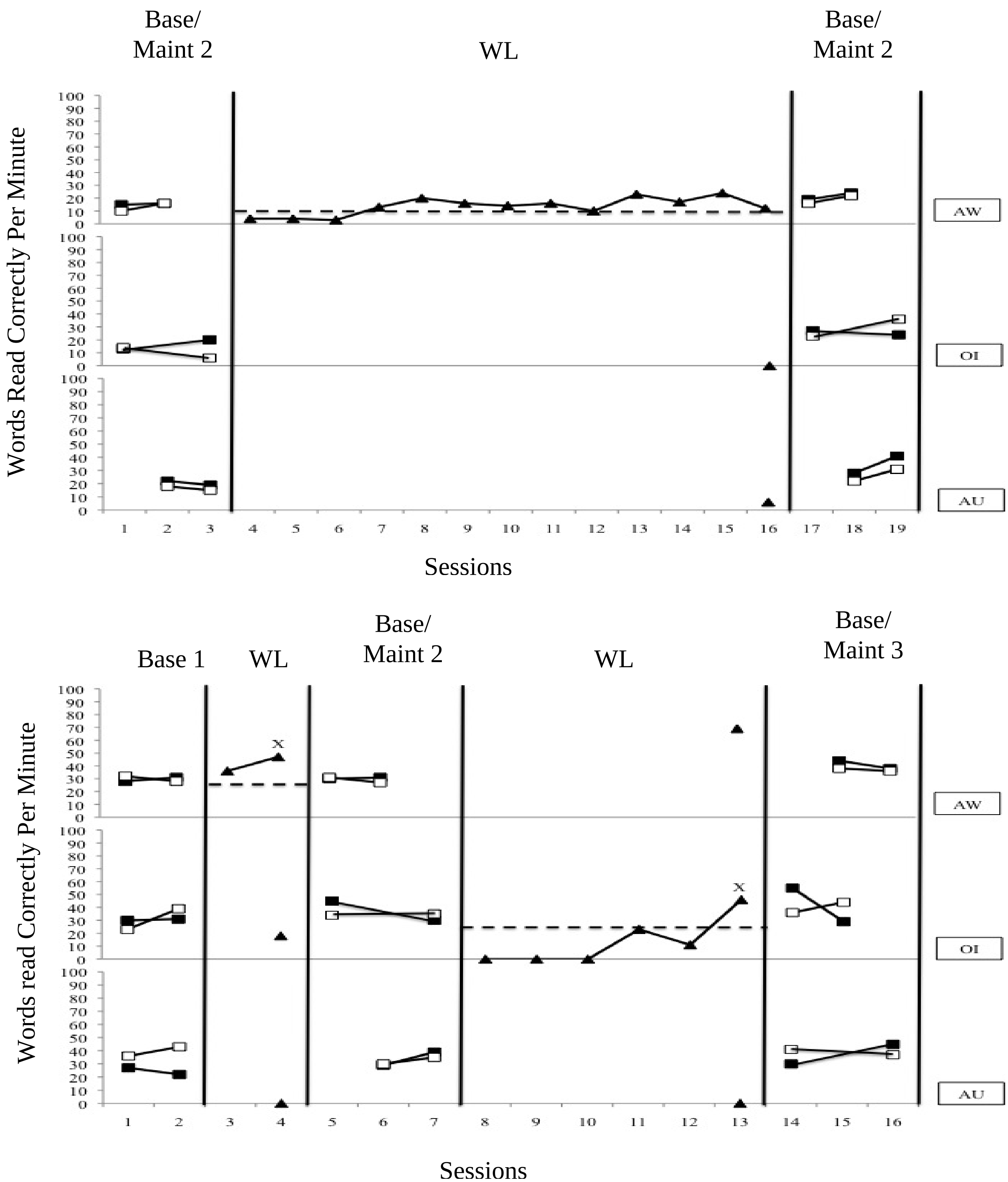


Figure 8. Words read correctly per minute on word lists and passages across conditions for Pam (top panel) and Olivia (bottom panel). Closed squares indicate Target passages, open squares indicate Generalization passages, and ‘x’ indicates when the WLT criterion was met.

Appendix A

Student: _________________ Date:________ Session:____________

Experimenter:___________________

Screening Protocol Vowel Teams

- ❑ Ensure letter combination on index cards are in the same order as the scoring protocol. Place stack of index cards containing vowel combinations “aw”, “au” and “oi” and corresponding words on table face down.

- ❑ Say, **“I am going to show you some letter pairs followed by some words and I will like you to read all the sounds that these letter pairs make and the words to me aloud. If you come to a letter pair or word that you don’t know, try your best, but I cannot help you.**

- ❑ When the student is ready show the first index card and say, **“Tell me the sound that these letters make”**. On the scoring protocol mark the “yes” or “no” box to indicate whether the student correctly pronounced the presented vowel combination. If the student produces the incorrect vowel sound or hesitates for more than 3 seconds, mark it as a “no”.

- ❑ Immediately following the presentation of the vowel combination, present the three subsequent index cards containing words containing the target vowel sounds one at a time. At each presentation ask the student **“What word is this?”** On the scoring protocol mark the “yes” or “no” box to indicate whether the student correctly read the word. If the student hesitates for more than 3 seconds, mark it as an error.

- ❑ Repeat steps until each screening vowel combination and target words have been attempted.

Number of steps completed correctly:____________

Percentage of steps completed correctly:__________

Student: _________________ Date:________ Session:___________

Experimenter:___________________

Reading Passages Protocol (Baseline)

- ❑ The experimenter collects experimenter and student copies of the target passage, and places the student copy of the passage in front of the student to read.
- ❑ Say, **"I'd like you to read this story to me aloud. Start at the top and keep reading until I ask you to stop.**
- ❑ Say, **"When I say 'Begin,' you may start reading."**
- ❑ When the student is ready, say **"Begin"** and start the stopwatch. Follow along while the student is reading and mark any errors that the student makes on the examiner's copy. If the student hesitates for more than 3 seconds, tell the student "**Go on to the next word.**"
- ❑ At the end of 1 minute, mark where the student is in the passage. Let the student finish reading the sentence before saying stop.
- ❑ Praise the student for reading.

Number of steps completed correctly:____________

Percentage of steps completed correctly:__________

Student: _________________ Date:________ Session:___________

Experimenter:___________________

A) Word List Training Protocol

- ❑ Experimenter collects index cards for 4 words for the word list training procedure (1 known / 3 unknown words).

- ❑ The experimenter presents the target vowel team on a flashcard and says **“This is (___ and ____), when put together they make the sound (___)”. What sound do these letters make when put together?”** Wait for response. If the student responds correctly move on to the next step. If the student responses incorrectly say **“That’s not quite right. When put together (___ and ___) make (___).”**

- ❑ The experimenter says, **“We’re going to learn how to say some new words and practice some old words you already know.”**

- ❑ The experimenter says, “**First, I’m going to show you the words broken up into pieces. Listen while I say the sound for each piece.”** The experimenter presents all three word segments, one card at a time on three index cards (onset, vowel combination, rime) while modeling each sound. The experimenter then says, “**Now you try it. Say the sound each piece makes while I place it on the table.**” Present all three word segments as before. If the student does not say any of the three correct sounds, say, **“No, that’s not quite right**” and re-present the cards with modeling. If the student says all three sounds correctly, say, **“That’s right – good job!”**

- ❑ Once all the segments are presented, the experimenter says, “**I would like you to put all these sounds together to make a word.”** The experimenter places all three cards on the table and models how to blend the first word while pointing at each word segment, e.g., **“/H/ /au/ /l/ makes haul. You try it.”** Experimenter waits 3 seconds for the student to respond.

- ❑ If the child blends the word incorrectly or does not respond within 3 seconds, the experimenter again models the correct blending **“No, (Insert sounds here) makes the word (Insert word here)”. You try it again.** If the student blends the word correctly say, “**That’ right, now repeat the word two more times**.” (DO NOT HAVE THE STUDENT SEGMENT THE LAST TWO REPETITIONS)

- ❑ Praise correct responses at each step.

- ❑ Repeat the steps above until all words have been blended.

Number of steps completed correctly:____________

Percentage of steps completed correctly:_________

Student: _________________ Date:________ Session:___________

Experimenter:__________________

B) Word List Same Day Assessment Protocol

- ❑ Experimenter collects 8 velcro-backed index cards for the word list assessment procedure (the same 4 words from training plus 1k/3u untrained words). Place the 8 word cards on the board so the student cannot see them.

- ❑ The experimenter says, **"Now I am going to show you a set of words that has some we practiced and some that are new. I would like you to try and read each word. When I say begin, start reading here at the top left and go across the row and then down to the next row (motion). I'd like you to do your best reading."**

- ❑ When the student is ready, say **"Begin",** turn over the word board, and start the stopwatch. If the student hesitates for more than 3 seconds, say, "**Go on to the next word**" and mark the word as an error. DO NOT PROVIDE CORRECT ANSWERS. Mark each word as either correct or incorrect.

- ❑ After all words have been attempted, stop the stopwatch and record the time in seconds.

- ❑ Praise the student for reading. Let them choose a prize from the prize box for complying with your instructions and attempting to read the words.

Number of steps completed correctly:____________

Percentage of steps completed correctly:_________

Student: _________________ Date:________ Session:___________

Experimenter:___________________

C) Word List Retention Assessment Protocol

- ❑ Experimenter collects the same 8 index cards from the word list assessment protocol and places them on the board so the student cannot see them (DIFFERENT ORDER).

- ❑ The experimenter will say **"I'm going to show you the same set of words we practiced last time. Just like before, I would like you to try and read each word. If you can read these words faster and with fewer wrong today than last time, you get to pick a prize from the prize box. When I say begin, start reading here at the top left and go across the row and then down to the next row (motion). I'd like you to do your best reading."**

- ❑ When the student is ready, say **"Begin",** turn over the word board, and start the stopwatch. If the student hesitates for more than 3 seconds, say, "**Go on the next word**" and mark the word as an error. DO NOT PROVIDE CORRECT ANSWERS. Mark each word as either correct or incorrect.

- ❑ After all words have been attempted, stop the stopwatch and record the time in seconds. Praise the student for reading.

- ❑ Score the student's WCPM. If they beat their previous reading score, let them choose a prize from the prize box. If they did not beat their previous reading score, say, **"Today you didn't beat your reading score from last time. Next time you'll have another chance to beat your score and pick a prize from the prize box."**

Number of steps completed correctly:____________

Percentage of steps completed correctly:__________

Student: ________________ Date:________ Session:___________

Experimenter:__________________

D) Word List Screening Prior to Passage Readings (This is used when the student reaches criterion on the Word List Retention Assessment before we move on to the first passages)

- ❑ **When the student reaches the fluency criterion on a vowel team during the word list retention assessment do a probe assessment of their fluency on the remaining two vowel teams.**
- ❑ Collects the 8 index cards (1 known to 3 unknown) from the word list
- ❑ The experimenter will say **"I'm going to show you a set of words. Just like before, I would like you to try and read each word. When I say begin, start reading here at the top left and go across the row and then down to the next row (motion). I'd like you to do your best reading."**
- ❑ When the student is ready, say **"Begin",** turn over the word board, and start the stopwatch. If the student hesitates for more than 3 seconds, say, "**Go on the next word**" and mark the word as an error. DO NOT PROVIDE CORRECT ANSWERS. Mark each word as either correct or incorrect.
- ❑ After all words have been attempted, stop the stopwatch and record the time in seconds. Praise the student for reading.
- ❑ Repeat with next vowel team in line until both remaining vowel teams have been screened.

Number of steps completed correctly:___________

Percentage of steps completed correctly:_________

Student: ________________ Date:_______ Session:__________

Experimenter:_________________

E) Reading Passages Assessment Protocol (Target & Generalization)

- ❑ The experimenter collects experimenter and student copies of 4 passages (T+G+T+G), and places the student copy of the first passage in front of the student to read.
- ❑ Say, **"Today I'm going to listen while you read to me aloud. You're only going to read a little of each of these 4 stories – kind of like 4 short races. For every 2 stories that you beat your score from the last time we read, you get to pick a prize from the prize box.**
- ❑ **Let's start with this one. Start at the top and keep reading until I tell you to stop. Be sure to do your best reading."**
- ❑ Say, **"When I say 'Begin,' you may start reading."**
- ❑ When the student is ready, say **"Begin"** and start the stopwatch. Follow along while the student is reading and mark any errors that the student makes on the examiner's copy. If the student hesitates for more than 3 seconds, say, "**Go on to the next word**" and mark the word as an error.
- ❑ At the end of 1 minute, mark where the student is in the passage.
- ❑ Praise the student for reading.
- ❑ Repeat the steps above with the 3 other passages saying, **"Now read this one. Start at the top and keep reading until I tell you to stop. Be sure to do your best reading."**
- ❑ Score the student's WCPM on each passage. For every two stories on which they beat their previous reading score, let them choose a prize from the prize box. If they did not beat their previous reading scores, say, **"Today you didn't beat your reading score from last time. Next time you'll have another chance to beat your score and pick prizes from the prize box."**

Number of steps completed correctly:__________

Percentage of steps completed correctly:__________

Student: ___________________ Date:__________ Session:______________

Experimenter:________________________

It was summer, and Cole and Meg liked to play outside on the lawn every day. 16
They also liked to play with Skipper, their new awesome puppy. Skipper had small paws 31
and a short tail. They had to play indoors with Skipper though because their mom said he 48
was too little to play outside on the lawn. 57

One day Grandma saw Skipper when she came over to babysit. Cole asked if 71
he could take Skipper outside and ride the seesaw. Grandma said it was okay if they saw 88
that the puppy did not run away. She said, "Don't let the puppy run off the lawn, or go 107
near the road." So Cole and Meg took Skipper outside one morning after dawn. 121

Total Words Read:____________

Words Incorrect per Minute:_____________

Words Correct Per Minute:____________

Student: ________________ Date:______________ Session: _______________

Experimenter: ________________

"It would be awesome if I could ride a bike," sighed Mary. "Every time I try, 16
it is just awful because I fall off and get hurt. I'll never be able to ride a bike without 36
flaws." 37

Mark looked with awe at Mary's sad face. "You are not an awful bike rider. It's 53
easier than solving a jigsaw puzzle. I'll help you practice in the dawn!" 66

"It hurts too much when I fall on the sidewalk," complained Mary with a yawn. 81

"You can learn to ride your bike on the lawn. It's a little harder to pedal, but the 99
grass is softer to land on, and you won't get hurt if you fall on your jaw," explained Mark. 118

"Can we go inside and draw instead?" asked Mary. 127

Total Words Read: ______________

Words Incorrect per Minute:____________

Words Correct Per Minute: ____________

Student: __________________ Date: ___________ Session: _____________

Experimenter: ________________

Joey liked to visit his Grandpa and Grandma who were lawyers. Today he played 14
with their old train set and their collection of classic fawn books. He helped Grandpa 29
finish a raw puzzle of a shark swimming in the ocean. He liked to play "Go Fish" 46
with Grandpa and to draw pictures of animals with Grandma. They drew a hawk flying 61
in the sky. 64

After lunch, Grandpa squawked and took a nap while Grandma worked on 76
some bills. The old house was so quiet Joey could hear the clock's tick-tock in 91
the den downstairs. 94

"I want to play football outside on the lawn with someone," Joey said. Grandpa's 108
legs were tired, and Grandma's back felt like straw. Since Joey had no one to play with, he sat 127
on the lawn. 130

Total Words Read: ___________

Words Incorrect per Minute:_____________

Words Correct Per Minute: _____________

Student: __________________ Date: ____________ Session: ___________

Experimenter: ______________

Tom and his family lived in a busy city so they didn’t have a backyard or a lawn. 18
There was always something Tom heard, even hawks. Sometimes Tom wanted to be an outlaw 33
and have a secret place of his own. He sometimes felt raw because he didn't have a place 51
that was just for him. 56

Tom made a drawn plan. One morning, just after a squawk, he climbed up high 71
inside the garage. He came to a little peak in the roof where his dad stored bikes, tools, 89
and some straw. Here was the secret place for Tom, the outlaw! 101

He looked out a little window to draw the city. He brought his favorite comic 116
books, and a bag of chips to his secret place. Tom didn’t feel an outlaw anymore. 132

Total Words Read: ___________

Words Incorrect per Minute:_____________

Words Correct Per Minute: _____________

Student: ________________ Date:________ Session:____________

Experimenter:____________________

Pat loved to help her grandma boil food and make cookies. Her grandma spoiled her 14
with the best cookies. 18

Pat mixed together the flour, eggs, and oil. Pat mixed it all together while Grandma 33
lined the cookie sheet with foil. Pat poured the chocolate chips into the moist batter. 48

Pat made the choice to get two spoons. She and Grandma scooped out the moist dough. 64
Then they dropped the dough onto the foil cookie sheets. Grandma put them under the 79
broiler in the oven. 83

Pat heard Grandma's voice telling her to set the timer. They scooped more of the 97
moist dough while they waited. They had lots of cookies to put on the foil. 112

Sometimes Pat took a break and looked under the broiler. She liked to peek at them 128
baking on the foil. 132

Total Words Read:__________

Words Incorrect per Minute:___________

Words Correct Per Minute:__________

Student: ________________ Date:________ Session:____________

Experimenter:____________________

Do animals really have voices to talk to each other? Let's listen to the voices 15
of the animals at the Bunker Hill Farm to hear what they might say to each other. 32

"Where did I put my coin?" asks the pig. 41

"I love to get lots of coins until my master takes me for a walk," says Ruff the dog. 60

"I get even more coins when I want to run." 70

Moo-Moo the cow says, "My last batch of milk was very oily. It'll make spoiled 85
cheese or cream." 88

"My milk is made into ice cream," says Spotty the cow’s voice. "I wish I could make 105
the choice to eat some. Then I wouldn’t get poisoned by eating grass." 118

"I hope all the kids make the choice to finish their milk." 130

Total Words Read: _____________

Words Incorrect per Minute:___________

Words Correct Per Minute: ___________

Student: __________________ Date:_________ Session:_____________

Experimenter:______________________

Come join the animal fair. All the animals will be there sitting in the soil. The 16
birds will be singing with sweet voices. The bees will be rejoicing and humming. The pigs 32
will be oinking. The horses will be joining each other to run. All the animals make the choice 50
to come because it is their favorite time of the year. 61

The horses will hoist people on their back for the races. The pigs make the choice to 78
eat the corn on the cob and cotton candy. The bees point at the best honey to see who will 98
win first prize. The birds have a singing contest to see who has the best voice. 114
Sam the cow points out a great idea. "Why don't we try not to spoil the fun?" 131

Total Words Read: __________

Words Incorrect per Minute:____________

Words Correct Per Minute: ____________

Student: ________________ Date:_________ Session:_____________

Experimenter:_____________________

“We've been walking through this soil forever.” 7

“Are you trying to avoid telling me we’re lost?" asked Andy. 18

"We're not lost, you spoil sport! We just left my house five minutes ago," Mark 33
pointed out. 35

"I’m going to make the choice to go back because I can't see your house from here. 52
Join me so we don’t get lost deep in the forest,” complained Andy. 65

"I've walked this soil path almost every day. My house is just past the starting point 81
of the path. Don't spoil the surprise, Andy," said Mark’s voice. 92

The path went deep into the woods and the boys saw a snake coiled up by a tree. 110
Andy was afraid, but he did not make any noise. Mark did know the way, and soon Andy 128
joined him at the foot of an enormous oak tree. 138

Total Words Read: __________

Words Incorrect per Minute:____________

Words Correct Per Minute: ____________

Student: __________________ Date:_________ Session:_____________

Experimenter:______________________

Last week Grandpa came to cook sausage at my house. When he left, he gave me 15
and each of my sisters two dollars cause we helped so much. "Buy something," said 30
Grandpa with a pause "and make sure you like what you buy." 42

My three sisters and I talked about what we could buy with our money, cause 57
we were so excited. 61

"I want something salty, I will buy sausage," said my sister. 72

"I want something to cook with, I will buy a cauldron," said my older sister. 87

"I want something to do, I will go to the auction," said my oldest sister. 102
Mom said those were all good autumn ideas. 110

Today after school, Mom told us some haunting news. "Grandpa is feeling 122
lonely today cause the weather is bad." 129

Total Words Read:___________

Words Incorrect per Minute:____________

Words Correct Per Minute:___________

Student: __________________ Date:_________ Session:______________

Experimenter:_______________________

I can say many numbers without even taking a pause. You can applaud me when 15
I say "one," and then I say "two." I can count very high, but it is not my fault that I 36
can't count every number. 40

Even though I was taught to write many numbers, I can never write every 54
number. It would not be my fault, just that I would run out of time and space before 72
I could finish. Numbers can daunt you they since keep going forever. 84

I see numbers just flaunt themselves anywhere I look. I was taught that numbers 98
help us every day. If I were an author I would put them together to write and write a 120
book. 121

Total Words Read:____________

Words Incorrect per Minute:_____________

Words Correct Per Minute:____________

Student: __________________ Date:_________ Session:______________

Experimenter:_______________________

It all began when my mom bought Sweet Tomato sauce. The bottle said there 14
was a secret flying saucer inside! 20

"I want the secret flying saucer," I said. 28

"The first one to open the sauce gets the prize," said my big brother. 42

I awoke early Monday morning, cause I wanted to open the Sweet Tomato 55
sauce before my sister. The secret flying saucer would be mine! I entered the kitchen 70
and caught my little sister there! She had a bowl of Sweet Tomato sauce. 84
I launched at the sauce and I stuck my hand inside. My little sister taunted me with 101
a smile. 103

"Give me the secret flying saucer," I said. 111

"I got it first," she said, walking over to the faucet. 122

Total Words Read:____________

Words Incorrect per Minute:_____________

Words Correct Per Minute:____________

Student: _________________ Date:_________ Session:_____________

Experimenter:_____________________

Kim was happy cause she lost her first tooth! 9

"Put your tooth under your pillow so the Tooth Fairy can come," said Mother 23
as she turned off the kitchen faucet. 30

"The Tooth Fairy will take your tooth and leave you some money," said Father 44
as he put away the left over sauce. 52

Kim thought all day, without a pause, about the Tooth Fairy. 63

"I would rather catch the Tooth Fairy than get money," she said hauling the 77
garbage out the door. "Once caught then she could be my little friend. We could 92
play games together and if she is not a fraud she can fly, so she could teach me to fly 112
too." Kim paused for a moment before saying under her breath, "that would be better 127
than money." 129

Total Words Read:___________

Words Incorrect per Minute:____________

Words Correct Per Minute:___________

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