Building Decoding Fluency in 8- to 9-Year Old Low Progress Readers

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ABSTRACT

The aim of this study was to extend the emerging evidence that 8- to 9-year old struggling readers are characterised more by a deficit in decoding fluency than a low level of phonemic awareness. A group of five children who were deemed to have an adequate level of phonemic awareness but were still at least one year behind in reading progress were selected. The children participated in specially designed fluency building activities with a trained peer tutor for 21 minutes a day, five days a week. Measures of decoding fluency were taken almost daily and, in order to assess any generalisation effects of the intervention to overall reading progress, timed running records were also taken once or twice a week. The intervention was conducted in the school setting and lasted for between two and four weeks depending on each child’s individual progress. Results showed that participants’ level of decoding fluency improved from an average pre-test level of 35 correct responses per minute to 76 correct responses per minute at six-week follow-up. In addition, participants improved in prose reading fluency from an average pre-test level of 50 correct words per minute to 70 correct words per minute at six-week follow-up. Implications of these findings for educational practice are discussed.
CHAPTER ONE

INTRODUCTION

Reading is a complex but necessary skill upon which success in a literate society depends. Children must be able to read in order to access the majority of information required for their learning at school. One cannot figure out mathematic equations or evaluate historical facts if one cannot read them from the board or the textbook in the first place.

The Development of Reading Competence

Reading is “the ability to extract visual information from the page and comprehend the meaning of the text” (Rayner & Pollatsek, 1989, p. 23). The process of learning to read involves the acquisition of several component skills (Gelheiser & Clark, 1991). The first skill is that of an adequate receptive vocabulary. Learning to read proceeds much more rapidly if the learner already understands the meaning of the words on the page as they read them. The second component skill is the acquisition of a sufficient sight word vocabulary, that is, a vocabulary of words which are instantly recognised. This allows the child to read passages of text more quickly than if they had to decode each word in turn. The third component skill is that of decoding fluency. Decoding is the process of translating graphemes (letter symbols or groups of letter symbols) into the phonemes (sounds) which they represent. For example, the grapheme “sh” translates into the sound /sh/.

In order to learn to decode, a child first needs to acquire a certain level of phonemic awareness, that is, the ability to discriminate aurally between the component phonemes of spoken language. There are around 40 to 44 phonemes in the English language and a child must be able to discriminate between all of these in order to learn to decode (Adams, 1990).
Secondly, the child must be able to discriminate between each of the 52 letters (upper and lower case) in the English alphabet (Adams, 1990).

Finally, the ability to decode unknown words requires a knowledge of the relationships which exist between graphemes (letters and letter groups) and phonemes. This is often referred to as the alphabetic code (Gelheiser & Clark, 1991). It is estimated that there are more than 200 graphemes in the English language, although only around 110 of them occur with high frequency (Adams, 1990). A competent decoder is one who can apply the alphabetic code to decipher words on the page which are not instantly recognised.

Once a knowledge of grapheme-phoneme correspondences has been acquired, the next stage is building this to fluency (Gelheiser & Clark, 1991). The competent reader is one who can decode unknown syllables and words both accurately and quickly, as well as recognising a large number of high frequency words instantly.

Causes of Reading Delay

Children may experience delays in learning to read because of either experiential or physical deficits. Most children with intellectual disabilities will have significant delays in their language and development which makes it difficult for them to learn to read (Cohen, Riviere, Plaza, Thompson, Chauvin & Hambourg et al., 2000). It is widely believed that some reading delays are the result of a specific learning disability, or dyslexia, which affects the processing or interpretation of written words (Lyon, 1995). Some children may experience difficulties in learning to read because of a physical abnormality, such as an uncorrected vision or hearing impairment or a motor disorder like cerebral palsy. However, there are many children who make slow progress in learning to read despite the absence of mental retardation, specific learning disabilities or physical disabilities. Therefore, these
children must be struggling because they have not yet acquired all of the component skills of reading or have yet to master them sufficiently to develop competence in reading.

In New Zealand around 17 percent of 6-year old children are referred to the Reading Recovery programme each year because they are having difficulty in learning to read (Kerslake, 2000). Reading Recovery consists of daily 30-minute individualised lessons with a specially trained teacher. The programme is designed to accelerate the reading progress of children who have failed to make adequate progress within the first 12 months of formal schooling (Center, Wheldall, Freeman, Outhred & McNaught, 1995). The Reading Recovery approach is essentially a more intensive version of the whole language or top-down method of reading instruction used by the majority of New Zealand classroom teachers (Tunmer & Chapman, 2001). This approach emphasises the use of multiple, context-based cues to identify unfamiliar words in text (Greaney, 2002). Very little emphasis is given to word-level decoding strategies and, in fact, children are only taught to use letter-sound decoding techniques to confirm their language predictions (Tunmer & Chapman, 2001).

There is considerable debate surrounding the efficacy of Reading Recovery and many authors have criticised the approach because it lacks specific letter-sound instruction (e.g. Center et al., 1995; Elbaum, Vaughn, Hughes & Moody, 2000; Greaney, 2002; Tunmer & Chapman, 2001). It is estimated that 30 percent of students who participate in Reading Recovery do not benefit from the programme (Elbaum et al., 2000). It has been found that the majority of the students who do not benefit from Reading Recovery are students who score significantly lower on measures of phonetic awareness and phonological recoding skills on entry to the programme than their more successful counterparts (Center et al., 1995). It seems obvious then that the students who do not benefit from the Reading Recovery approach will require “more intensive and explicit instruction in phonological awareness and the use of
letter-sound relationships” (Tunmer & Chapman, 2001) if they are to learn to read in a timely fashion.

For some time now it has been recognised that level of letter knowledge on entry to school is predictive of difficulties in learning to read (Bond & Dykstra, 1967; Johnston, 1998; Scarborough, 1998). Children who are able to name all of the 52 letters of the English alphabet and do so with speed are likely to make better progress in learning to read (Biemiller, 1977-1978; Johnston, 1998). For example, Walsh, Price and Gillingham (1988) found a strong positive correlation ($r = 0.8$ to $0.89$) between letter-naming speed and subsequent reading development in a sample of kindergarten children. In New Zealand, literacy development is monitored by a series of assessments known as the Observation Survey (Clay, 1993). The first assessment occurs within the first six weeks of school attendance when children are tested on their level of alphabet recognition and basic sight word vocabulary with the Concepts About Print test. As part of this test, children are tested on their letter knowledge by the Letter Identification Test. This requires the child to identify each of 26 letters presented in both upper and lower case, as well as some alternative forms. Acceptable identification of the letter can be by letter name, letter sound or by producing a word with the appropriate letter at the beginning. This test provides information regarding the extent to which the child can discriminate between each of the 52 letters.

A considerable body of research suggests that phonemic awareness is a component skill crucial to the early stages of learning to read (e.g. Adams, 1990; Castles & Coltheart, 2004; National Reading Panel, 2000; Scarborough, 1998; Wagner & Torgesen, 1987). Since graphemes represent the sounds that make up spoken words, a child must first be aware of the phonemic components of the language in order to learn the letter to sound correspondences. Musicians can only read and interpret the symbols on a music score if they have learned the note on their instrument which each symbol represents. Likewise, children can only read and
interpret text if they have an awareness of the sounds encoded by the letters and letter groups on the page. Research suggests that level of phonemic awareness on entry to school also predicts later progress in reading. In her longitudinal study of 54 children from Grade 1 to Grade 4, Juel (1988) found that the children who had good phonemic awareness in Grade 1 went on to become proficient readers in Grade 4. Those with poor phonemic awareness in Grade 1 conversely, were making slow progress in reading by Grade 4. Phonemic awareness can be tested in a number of ways, including phoneme deletion, blending, reversal and counting (Castles & Coltheart, 2004). Phoneme deletion requires the subject to mentally delete a sound from a verbally presented word and say what is left. For example, when asked to delete the beginning sound of “bang” the subject would leave out the /b/ sound and say “ang”. With phoneme blending the word is orally presented to the subject in segments and they are required to blend them to produce the whole word. Phoneme reversal requires the subject to reverse the sounds in a verbally presented word. For example, the sounds in “big” said backwards would be /g/ /i/ /b/. Finally, phoneme counting, often referred to as whole word segmentation, requires the subject to count or tap each phoneme in a word. For example, the word “wash” has three sounds /w/ /a/ /sh/. Whole word segmentation has long been viewed as a reasonably accurate measure of a child’s ability to discriminate between the phonemes in a word, and is therefore the method of phonemic awareness assessment chosen for this study (Liberman, Shankweiler, Fischer, & Carter, 1974; Wagner & Torgesen, 1987). However, despite the importance of phonemic awareness for the development of competent reading and the array of measures available for testing it, there is no formal assessment of phonemic awareness included in the Observation Survey.

A more advanced predictor of rate of progress in learning to read is the child’s level of knowledge of grapheme-phoneme correspondences (National Reading Panel, 2000). Once a child has developed a sufficient level of phonemic awareness and letter recognition, the next
step involves putting these two skills together to master the links between letters and sounds, often referred to as phonics. An early review of eight primary school reading programmes found that the number of grapheme-phoneme correspondences explicitly taught ranged from 7 to 35 (Beck & McCaslin, 1978). The importance in learning to read of being able to decode letters into sounds is highlighted by the finding that reading programmes which involve systematic phonics instruction tend to produce higher rates of reading progress than those that do not (Bond & Dykstra, 1967; Chall, 1967; National Reading Panel, 2000). However, letter-sound knowledge, although necessary, is not sufficient to develop competent reading.

Research suggests that decoding fluency, that is the ability to decode both accurately and quickly, may be the key to continuing progress in learning to read. It has been suggested that the best way to assess decoding ability is a pseudoword decoding test (Iversen & Tunmer, 1993). Pseudowords are nonsense words that simulate the standard orthographic form of English. Since pseudowords will be completely unknown to the subject, the only way they can be read is through applying a knowledge of grapheme-phoneme correspondences to decode each word.

Williams (2002) examined phonemic awareness and decoding fluency in a sample of 8- to 9-year old delayed and normal progress readers. A total of 64 children aged between 8 years 6 months and 10 years (Year 4 and 5) were tested, half of whom constituted the Normal Progress reading group and the remainder the Low Progress readers. Group membership was determined by scores on the Neale Analysis of Reading Ability (Neale, 1999). On average, the children in the Low Progress group were 27 months behind the Normal Progress group on reading accuracy. The groups were relatively evenly matched for gender and ethnicity, while the Low Progress group was, on average, one month older than the Normal Progress group. Following administration of the Neale, each participant was given two additional tests. Phonemic awareness was measured using a phonemic segmentation test based on the
Queensland Inventory of Literacy phonemic segmentation subtest (Dodd, Holm, Oerlemans & McCormick, 1996). Decoding fluency was measured using a one-minute decoding fluency test developed by Williams in consultation with Dr John Church. Results showed that phonemic awareness, as measured by the phoneme segmentation test, did not differentiate the slow and normal progress readers in this age group. The finding that both groups had similar levels of phonemic awareness was contrary to that expected based on previous research. However, decoding fluency measures were found to strongly correlate with group membership in that none of the slow progress readers were able to decode at or above 60 graphemes per minute, while the majority (84%) of normal progress readers were able to decode at this rate. It seems reasonable to suggest then, that although older poor readers may have developed an adequate level of phonemic awareness and the ability to translate graphemes into phonemes, by age 8 or 9 they are still unable to decode quickly and accurately enough to become proficient at reading.

Why is Decoding Fluency Important?

According to LaBerge and Samuels’ information processing model, a major contributor to reading difficulty is lack of automaticity (fluency) in decoding (1974). The ability to decode fluently is important for a number of reasons.

First, children who struggle to decode will be slow and laborious in their reading and will be covering less reading material per given amount of time than their peers. These children may take two or three times as long to complete the same tasks as their more able peers and this can make completion of classroom and homework assignments difficult. Since they are also getting much less practice in reading they are unlikely to improve in their reading ability at a rate that would allow them to catch up to their peers. In other words, the poor readers will become poorer readers over time while the good readers will become
increasingly proficient – a phenomenon referred to by Stanovich (1986) as the “Matthew Effect”.

Secondly, slow readers find it difficult to comprehend what it is that they are reading. For the beginning or struggling reader the process of decoding graphemes into phonemes is an arduous task and takes up a large proportion of their attention. So much time and energy is invested in decoding that little capacity is left to actually comprehend the content of what is being read. The more practised and skilled reader, however, is able to decode new words both accurately and quickly so that reading is effectively an automatised, or fluent, process. By the time a poor decoder has finished reading a passage of text they have often forgotten what was at the beginning and so may need to read material repeatedly in order to understand it.

Furthermore, they may become over-reliant on alternative sources of information to make sense of text (Kuhn & Stahl, 2003). They may depend on contextual clues in order to guess at unrecognised words and this is likely to lead to errors in their comprehension.

Thirdly, children who find the process of decoding slow and difficult are more likely to become frustrated with reading and are less likely to read for enjoyment. Reading may become an aversive activity for these children with the result that they choose alternative activities such as sport or television to occupy their time. Since reading is almost never enjoyable for poor decoders there remains little motivation to engage in it.

**How can Fluency be Improved?**

A deficit in any skill can best be rectified by direct instruction and extensive practice in that skill. In a review of reading fluency research, Kuhn and Stahl (2003) found that virtually all of the studies they reviewed that implemented direct fluency instruction saw improvements in the overall reading progress of subjects. The authors argue that it is only through repeated exposure to letters and words that children become fluent in the deciphering
of them. Children who have not discovered letter-sound patterns incidentally through more general reading will require a systematic and structured teaching approach that focuses specifically on developing phonologically-based skills and strategies (Iversen & Tunmer, 1993; Jitendra, Edwards, Starosta, Sacks, Jacobson, & Choutka, 2004; Tunmer, Chapman, Greaney, & Prochnow, 2002).

The National Reading Panel (2000) identified two major fluency building techniques - independent silent reading and guided oral reading. It was suggested that independent silent reading, although important for developing reading proficiency, is not sufficient in building fluency when used in isolation. If a child is struggling with reading then it is unlikely that independent practice will be beneficial until the missing skill, reading fluency, has been taught directly (National Reading Panel, 2000). The panel also suggested that guided oral reading with a more skilled reading partner has the greatest effect on word recognition, fluency and comprehension. In particular, it appears that repeated reading of text with feedback from a more skilled peer can be effective in increasing reading fluency.

Repeated reading has received much empirical support, as illustrated by Chard, Vaughn and Tyler's (2002) review of research on effective interventions for building reading fluency in struggling readers. They found that, overall, repeated reading interventions are associated with increased reading rate, accuracy and comprehension (Chard et al, 2002). However, since repeated reading involves practice on the same passage of text, it must be asked whether the fluency gains obtained in this way will generalise to the fluent reading of unfamiliar texts. In other words, it is possible that the gains in reading fluency which occur during repeated reading are passage specific rather than instances of increased skill in decoding. It is possible, therefore, that building decoding fluency directly might generalise to more fluent reading of any text, regardless of whether it is novel or familiar.
Aims of the Present Study

The present study aimed to follow up Williams’ (2002) observation that 8- to 9-year old children who are making slow progress in learning to read are characterised by a deficiency in decoding fluency and not a lack of phonemic awareness. This study attempted to address the following questions.

1. Is it possible to build decoding fluency in these children?
2. If so, how long does it take to achieve fluency in decoding?
3. Does an increase in decoding fluency generalise to improvements in reading fluency?

Review of Previous Research

The aim of this review was to locate studies that examined the relationship between grapheme decoding fluency and rate of progress in learning to read.

Procedure

Literature searches were conducted of the ERIC, PsycINFO and ProQuest databases. The following keywords were used: decoding fluency, automaticity, alphabetic principle, letter recognition, grapheme-phoneme conversion rules, graphemic, spelling-sound, phonics, cipher reading OR deciphering, sounding out, fluency building, decod*, read*, knowledge of the alphabetic principle. In addition, the names of various authors known to have research interests in the area of decoding fluency were entered as search terms, for example, Samuels, Nicholson, Tunmer, Chapman.

Empirical studies which met the following criteria were included in the review:

- Subjects were around 8 to 9 years of age.
- Subjects were at least one year behind their peers in reading progress.
- Delay in reading progress could not be attributed to intellectual or physical impairments.
• Interventions targeted both the speed and accuracy of decoding.
• Progress in learning to read was ascertained by a measure of prose reading.
• Practice materials and procedure were adequately described.

Results

The literature search identified very little research on the relationship between specific training in grapheme-phoneme decoding fluency and overall reading progress. Two studies were located that initially appeared to be relevant (Fiedorowicz, 1986; Frederiksen, Warren & Rosebery, 1985). However, neither study adequately described the practice materials or the outcome measures. In addition, fluency levels prior to the intervention were not reported and post-intervention results were reported as latency measures and were therefore uninterpretable as number of correct responses per minute.

One study was found that met the inclusion criteria. This is summarised in Table 1 and is discussed in further detail below.

Table 1. Summary of experimental study of decoding fluency practice.

<table>
<thead>
<tr>
<th>Author(s)</th>
<th>Subjects and Selection Criteria</th>
<th>Type of Intervention</th>
<th>A. Decoding Fluency Measure</th>
<th>B. Reading Progress / Generalisation Measure</th>
<th>Results</th>
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<tr>
<td>Jones, Torgesen &amp; Sexton (1987)</td>
<td>N=10 (+10 matched controls and 10 normal controls) - Mean age = 10.9 years - FSIQ = &gt;85 - Reading rate &lt;40 single syllable words/min - Word accuracy &gt;70%</td>
<td>Computer based “Hint and Hunt 1” - Practice on 47 target words. - 15 mins/day, 5 days/week x 10 weeks. - School based.</td>
<td>- Speed and accuracy of reading target and generalisation words – single words and lists.</td>
<td>- Speed and accuracy of reading target and generalisation words embedded in paragraphs.</td>
<td>Pre-test: - Target Words: - Accuracy: 80% - Decoding Fluency: 18 crpm* Generalisation Words: - Accuracy: 73% - Decoding Fluency: 15 crpm* Paragraph Reading: - Accuracy: 93% - Reading Fluency: 51 cwpm** Post-test: - Target Words: - Accuracy: 96% - Decoding Fluency: 33 crpm* Generalisation Words: - Accuracy: 93% - Decoding Fluency: 31 crpm* Paragraph Reading: - Accuracy: 98% - Reading Fluency: 78 cwpm**</td>
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* crpm = correct responses per minute  ** cwpm = correct words per minute  Figures are rounded to the nearest whole number.
Jones, Torgesen & Sexton (1987) conducted a study with a sample of 20 students (13 males and 5 females) identified by their school's as having a learning disability. The average age of the students was 10 years 8 months. All had Full Scale IQs of above 85 as measured by the WISC-R, and were at least one year behind in reading as determined by the Peabody Individual Achievement Test. Half of these students comprised a learning-disability (LD) control group that was evenly matched on characteristics (age, gender, reading achievement, intelligence and race) to the experimental group. As a measure of social validation, a group of 10 children of average reading ability who were matched for age with the LD experimental and control groups, were also assessed at pre- and post-intervention.

The intervention was a computer programme “Hint and Hunt 1” which provided training in decoding vowels and vowel blends in single syllable words. The actual practice words are not reported in the study. The programme included two activities which progressed through ten levels. During the first activity, the “Hint” phase, the student was introduced to the vowels and vowel blends by the visual presentation of the graphemes accompanied by synthesised speech pronunciation of them. In this phase the emphasis was on learning the grapheme-phoneme correspondences with no reference to speed of decoding. When students were able to perform with 100 percent accuracy on 10 consecutive trials in the “Hint” phase they were moved on to the “Hunt” phase. The “Hunt” phase involved speeded practice in decoding 47 target words and pseudowords which contained the vowel sounds introduced in the “Hint” phase. As students moved up through the levels the words were presented at increasingly faster speeds. The four speeds are not described in detail and are simply referred to as “fast”, “faster”, “very fast” and “super fast” (Jones, Torgesen & Sexton, 1987). Students were deemed to be proficient at each speed when they could complete the task with 100 percent accuracy. The training sessions were 15 minutes long and occurred five days a week for 10 weeks. This is a total of 12.5 hours of practice. Students in the normal control group
received no intervention during training of the LD experimental group, while the LD control
group received parallel training on a computer-based spelling programme for the same length
of time as the experimental intervention.

Five measures were administered both prior and subsequent to the intervention to
assess decoding fluency and reading progress. The first two tests were computer based and
required subjects to pronounce individual words as quickly and accurately as possible as they
appeared on the screen. One test consisted of the 47 target words practised directly by the
"Hint and Hunt 1” programme and the other consisted of 47 generalisation, or non-practised
words. The next two tests also required subjects to pronounce visually presented target and
generalisation words but this time they were presented in a printed list format rather than on
the computer screen. The last test measured overall reading fluency in that it assessed both
the accuracy and speed with which subjects read a printed paragraph containing both target
and generalisation words embedded within.

Jones, Torgesen and Sexton (1987) found that the LD experimental group’s accuracy
increased from 80% to 96% for target words and from 73% to 93% for generalisation words
from pre- to post-test. The total number of responses per minute increased from 22 to 34 for
target words and from 21 to 33 for generalisation words. This corresponds to an increase in
decoding fluency of 15 correct responses per minute for target words (from 18 to 33 correct
responses per minute) and 16 correct responses per minute for generalisation words (from 15
to 31 correct responses per minute). This equates to a rate of progress of 1.2 correct responses
per minute gained for every hour of practice. The control group maintained their mean
accuracy at around 80% and increased in speed of response by less than 10% for both target
and generalisation words.

On the paragraph reading test the experimental subjects increased in reading speed
from 55 to 80 words per minute. Accuracy in reading the paragraph also improved from 93%
to 98%. This means that the subjects’ reading fluency increased from 51 to 78 correct words per minute. The matched control group made non-significant increases in reading speed and accuracy. This generalisation to prose reading should be considered with caution as the reading task that participants were assessed on incorporated the practised words into the paragraphs and was therefore not a true generalisation measure. (Although the experimental group made significant improvements when compared to the matched controls, it is noteworthy that they remained about 25% slower and less accurate than the average reader controls.)

The aim of the present study is to extend the limited existing research into the relationship between decoding fluency and rate of progress in learning to read. While previous research largely supports the importance of fluent whole word recognition in reading, there is emerging evidence to suggest that fluency in the ability to decode the constituent parts of words (graphemes) may lead to fluency in decoding whole words and therefore passages of text. The present study specifically addresses the question of whether improving grapheme-phoneme decoding fluency generalises to prose reading fluency in low progress readers of eight to 10 years of age who have acquired adequate levels of phonemic awareness.
CHAPTER TWO

METHOD

Participants

Six primary schools in the Christchurch area were approached one at a time and given the opportunity to meet with the writer and an academic colleague to discuss the proposed research. Four of the schools either did not wish to participate or did not respond in time to be included. School Y was the first school to agree to participate and the intervention was conducted there during August 2004 with follow-up assessments at the beginning of October. The intervention was then conducted in a second school (School Z) from the beginning of September 2004 to the middle of October (with a two week school holiday break in the middle). Follow-up assessments were conducted at School Z in early December.

At both schools, the class teachers were asked to supply a list of 8- to 9-year old children whom they believed to be significantly behind their peers in reading progress. These children then completed a series of screening tests. Two children were nominated from School Y and five from School Z (two from Class 1 and three from Class 2). At School Y, informed parental consent was obtained prior to screening while at School Z the children were screened first and consent was then sought only for those who met the selection criteria.

Participants were included in the study if they met the following selection criteria,

1. An adequate level of phonemic awareness (at least 30/60 on the Phonemic Segmentation Test).

2. An inadequate level of decoding fluency (less than 60 correct responses per minute on the Decoding Fluency Test).

3. At least a year behind in reading accuracy (as demonstrated by the Reading Accuracy score on the Neale Analysis of Reading Ability).
One child from School Y and one from School Z did not meet these selection criteria as they were both less than one year behind in reading accuracy. Informed written consent was obtained for all of the remaining five eligible participants before the intervention was commenced.

The demographic characteristics and pre-test scores for the five participants selected are summarised in Table 2 below. As can be seen from the table, all five participants were between the ages of eight and ten years. Three were male and two were female. Child 6 was from School Y, Child 7 was from class 1 at School Z, and the remainder were all from class 2 at School Z. The majority of participants scored above 40 on the Phonemic Segmentation pre-test. The exception to this is Child 10 whose score was just 30 (i.e. 50%). Although this score was on the cut-off, Child 10 was nevertheless included in the study as he met the other selection criteria.

Table 2. Demographic characteristics and pre-test scores for the five participants.

<table>
<thead>
<tr>
<th>Child</th>
<th>School/Class</th>
<th>Age: Years: Months</th>
<th>Gender M/F</th>
<th>Phonemic Segmentation Score: sounds/60</th>
<th>Decoding Fluency Score: correct responses/min</th>
<th>Neale Analysis of Reading Ability: (Age equivalent: Years:Months)</th>
</tr>
</thead>
<tbody>
<tr>
<td>6</td>
<td>Y</td>
<td>9:5</td>
<td>M</td>
<td>55</td>
<td>35</td>
<td>7:2 7:5 10:2</td>
</tr>
<tr>
<td>7</td>
<td>Z/1</td>
<td>8:10</td>
<td>F</td>
<td>44</td>
<td>28</td>
<td>6:4 6:5 7:5</td>
</tr>
<tr>
<td>8</td>
<td>Z/2</td>
<td>9:1</td>
<td>M</td>
<td>47</td>
<td>33</td>
<td>7:5 7:3 7:1</td>
</tr>
<tr>
<td>9</td>
<td>Z/2</td>
<td>8:8</td>
<td>F</td>
<td>43</td>
<td>48</td>
<td>7:0 6:11 7:10</td>
</tr>
<tr>
<td>10</td>
<td>Z/2</td>
<td>8:7</td>
<td>M</td>
<td>30</td>
<td>33</td>
<td>6:1 7:3 6:8</td>
</tr>
</tbody>
</table>

Class teachers were asked to nominate a peer tutor for each of the participants. The tutors were to be of average or above average reading ability and to have a sufficient level of maturity to undertake the tasks required of them. All children nominated by the class teachers were recruited as peer tutors and each participant was paired with the same tutor for the duration of the study.
Settings

Testing was conducted predominantly in the family room and adjoining resource room at School Y. Occasionally, when the room was in use, testing was conducted in the school computer suite. The family room was also used by the participants for their daily practice although when the weather was fine they sometimes practised outside. At School Z, testing was conducted in a corner of the staffroom, a resource room, the library or outside, depending on which area was not in use at the time and where there was the least amount of distraction. The children in Class 1 at School Z practised in the classroom, while those in Class 2 practised either in the foyer between Class 1 and 2 or outside.

Measurement Procedures

The Neale Analysis of Reading Ability (Neale, 1999) was administered to determine potential participants' level of achievement in reading. The Neale consists of six passages of text of progressive difficulty. The passages are read aloud by the participant and timed by the administrator. At the end of each passage the subjects are asked a small number of questions about the content to check their comprehension. The Neale provides percentile ranks and age equivalents for reading accuracy, comprehension and rate. This assessment tool was chosen largely because it has Australian norms which are more closely comparable to New Zealand subjects than equivalent tests based on American norms.

To assess phonemic awareness, the children were administered Williams’ Phonemic Segmentation Test (2002) as part of the screening procedure. This test is an adaptation of the phonemic segmentation test in the Queensland Inventory of Literacy, a standardised Australian test which assesses phonological awareness in school aged children (Dodd, Holm, Oerlemans & McCormick, 1996). The assessment involves the oral presentation of 16 words (seven of which are pseudowords). The subject is required to repeat the word back to the
assessor dividing it into its component phonemes. The total number of segments for all 16 words is 60. Subjects are scored in terms of how many words are correctly segmented and the total number of segments identified out of 60. In this instance, the child was given the option of placing fingers on the table for each sound segment or using a pencil to ‘drum’ the sounds. The tester demonstrated this by segmenting the word “it” using the child's chosen method. The child was then given a series of five practice items. The tester provided feedback and, if necessary, further modelling and practice of the desired response. When the child indicated he or she was ready to go on, the tester administered the 16 test items. (This test is reproduced in Appendix I).

Decoding fluency was measured using the Decoding Fluency Test devised by Williams (2002). This requires the subject to read a series of single syllable words containing 45 of the most commonly occurring graphemes in the English language. The words are presented in lines of five and the set of 45 words appears twice on the sheet, each time in a different order. The test is timed and subjects are scored in terms of how many of the initial sounds they can read and pronounce correctly in one minute. Three of the words (“boy”, “hay” and “ox”) are scored for their final sound. The child was instructed to read the words as quickly as they could until told to stop. If they came to a word they could not read they were to say “don’t know” or “pass” and carry on to the next word. They were also reminded to read the words from left to right and top to bottom on the page. Before commencing the test, the child was given a separate page with ten practice words on it. The tester provided corrections for unknown words and, when children were observed to read slowly, the tester modelled reading the words quickly. The Decoding Fluency Test was used both as a screening test and to monitor progress in decoding fluency throughout the intervention. It was administered to participants either three or four times each week during the intervention. In order to control for potential practice effects, participants were required to begin the test on a
different line each time it was administered. (The Decoding Fluency Test is reproduced in Appendix II).

During screening at School Y, the Decoding Fluency Test was administered first, followed by the Phonemic Segmentation Test and then the Neale. It became apparent that, having been encouraged to read as quickly as possible during the Decoding Fluency Test, subjects tended to race through the Neale passages when they were read subsequently. In hindsight it was decided that this could potentially affect the number of errors made in reading the passage and the level of comprehension. Therefore, at School Z the Neale was administered first, followed by the Phonemic Segmentation Test and then the Decoding Fluency Test.

In order to measure any generalisation from increases in decoding fluency to prose reading fluency, a timed running record was collected twice a week. Running records were taken largely according to the procedure set down by the Ministry of Education (2000). However, in this study the participant was asked to read for exactly two minutes. After this time the tester calculated the total number of words read, subtracted the number of errors and then divided the number of correctly read words by two to produce a measure of the number of words read correctly per minute. Reading material for these generalisation tests was selected by first asking the class teachers to provide their estimate of the participants' current reading levels. Several school journals and books were then selected at this level and one level below. Any material already read by the participants was discarded. The first running record was conducted at the level suggested by the class teacher. If the participant was able to read at this level with at least 90% accuracy then this level was used for the remainder of the intervention. However, if the participant was found to be reading with less than 90% accuracy the material was deemed to be too difficult and the running record was redone with material at a level below. Child 6, 8 and 9 remained on the level originally suggested by their
class teachers. Child 7 was moved back three reading levels and Child 10 one level until stories which they could read with 90% accuracy or better were found. In order to obtain a reading fluency measure at pre-test and follow-up, the Neale passages which were passed by the children were used. The total number of words read correctly was ascertained by subtracting the number of errors from the total number of words read. This figure was then divided by the total number of seconds taken to read the passages and multiplied by 60 to calculate the number of words read correctly per minute. During testing sessions the timed running record was almost always taken prior to administering the Decoding Fluency Test.

The decision to terminate the intervention was made on an individual basis for each child. Originally it was planned that the intervention would cease when participants reached a criterion level of decoding fluency of 70 correct graphemes per minute on the Decoding Fluency Test. However, three of the participants reached this milestone within the first week of intervention and a fourth within the first two weeks. The decision was therefore made to continue the intervention until the participants reached a plateau with respect to correct responses per minute.

Approximately six weeks after the intervention was terminated, the tester returned to the schools to conduct a follow-up assessment. This assessment consisted of the Decoding Fluency Test to ascertain whether or not fluency gains maintained over this time, and the Neale Analysis of Reading Ability to assess participants’ level of reading progress.

**Practice Materials**

The words used for the practice materials were compiled by the writer in collaboration with Dr John Church. Fifty commonly occurring graphemes were selected for practice – the 45 selected by Williams (2002) plus “ae”, “ie”, “ue”, “ck”, and “y” as a vowel. A list of common words that contained these 50 graphemes was compiled. Selection was generally
limited to single syllable CVC words with no more than three phonemes. The only exception
to the three-phoneme rule was the word “video” which was included as a common word with
an initial /v/ sound. Words with irregular spellings (e.g. “said”) and homonyms (e.g. the noun
“saw” and the verb “saw”) were excluded. Although not CVC words, “fly” and “my” were
added to represent the vowel “y”, and “joy” and “Roy” were included to represent the
diphthong “oy”. The words were sourced, in the first instance, from Holdaway’s (1972) List
of Basic Sight Words and Carnine and Silbert’s (1973) List of 400 Common Words. At least
two words for each particular grapheme were selected from these sources. When suitable
words could not be found in the case of some less commonly occurring graphemes, such as
“v” and “qu”, searching was extended to the The Scrabble Brand Word Guide (Orleans &
Jacobson, 1953). A practice list of 60 words was created by selecting at least two CVC words
with each of the 24 target vowel graphemes, while at the same time ensuring that there were
at least two CVC words commencing with each of the 25 target consonants and consonant
digraphs. In order to achieve this balance, some duplication proved to be unavoidable. For
example, the short /i/ appeared in five words and the short /e/ and “ee” digraph appeared in
four words. The 60 words were then split into two matched lists (List A and List B). Each of
the two final lists contained each grapheme no less than once and no more than three times in
the initial or medial position. Each list was then divided into two matched subsets of 15
words. These lists were labelled A1, A2, B1, and B2, and constituted the practice lists. (The
practice lists are reproduced in Appendix III).

Three practice activities were designed and created by the writer and Dr John Church
using the lists of words. The activities were presented in small, A4 sized boxes as personal
“Fluency Building Kits”.

The first activity involved the use of flashcards. Flashcards have been used for many
years in schools to help children learn to read words quickly and thereby improve their
reading comprehension (Nicholson, 1998). In this instance, white flashcards the same size as
typical playing cards were constructed. Each card contained one of the words written
horizontally on the card in plain black ink, as shown in Appendix IV.

The second activity involved the use of reading racetracks. Rinaldi and McLaughlin
(1996) developed reading racetracks based on Precision Teaching principles. These have
been shown to be effective in increasing the fluency of reading words in children between the
ages of 8 and 10 years (Anthony, Rinaldi, Hern & McLaughlin, 1997; Rinaldi & McLaughlin,
1996; Rinaldi, Sells, & McLaughlin, 1997). In this instance, four racetracks were constructed,
one for each of the four lists of words (A1, A2, B1, and B2). A sample reading racetrack is
shown in Appendix V.

The final activity was a game based on the traditional card game “Snap!” The cards
were yellow and standard playing-card size. Each contained the words printed twice in black
ink and on the back of each card a picture of an alligator was printed in order to add interest.
A sample snap card is shown in Appendix VI.

In addition to the practice materials, personal diaries were created for each participant.
These were used by peer tutors to ‘sign-off’ after each practice session to verify that the
participant had practised that day. This enabled the amount of practice actually done by the
participants to be monitored from day to day. The diaries also contained a graph page on
which the participants’ individual progress on both decoding fluency and running record
measures was recorded. These were intended to help increase participant motivation by
enabling them to track their own progress and by providing an opportunity for them to receive
praise and encouragement from teachers and/or parents when the graphs were shown to them
by the participants. Regular performance feedback has been shown to improve academic
achievement in a number of areas, including oral reading fluency in 7- to 9-year old
struggling readers (Eckert, Ardoin, Daly, & Martens, 2002).

**Pre-Intervention Teaching Procedures**

Participants and peer tutors were trained in the use of the practice materials during one session in each school. Training in School Y took approximately one hour, while at School Z (with more participants and tutors) the training took around two hours.

First, the participants were individually introduced to the flashcards one at a time. If the participant was unable to read the word and/or did not know its meaning, they were taught this directly. The meanings of the majority of the words were already known to most of the participants. The major exception was “cuff” which was unknown by most of the children, and some were uncertain of how to define “porch”. While each participant worked through the flashcards, the remaining participants and the peer tutors were instructed to practise operating the electronic timers.

Second, both participants and peer tutors were introduced to the racetracks as a group. Following instruction in how the activity was to be conducted, the tester and academic colleague demonstrated by modelling the role of the participant and peer tutor. It was both explained and demonstrated that the participant was to read the words on the racetrack in a clockwise direction as quickly as they could. The peer tutor was to tell the participant when to start and was to time how long it took the participant to reach the finish line using the electronic timer. At the end of each race the peer tutors were instructed to provide feedback about any errors they detected in the participant’s word reading. The tester and academic colleague demonstrated doing this in a polite and encouraging manner. The participants then paired up with their peer tutors and practised the activity as the tester and academic colleague circulated the room to provide feedback and ensure practice was being conducted correctly.
Third, the “Snap!” activity was introduced, taught and modelled in the same way as for the racetracks activity. While demonstrating the game the tester and academic colleague appealed to the group at each turn to stimulate their thinking about whether or not two cards constituted a “Snap!” and, if so, they were required to identify the matching sound. This provided plenty of opportunities for corrective feedback and once it was deemed that the majority of the group understood the activity they moved on to practice in their pairs. At the end of the training session the peer tutors were seen separately to ensure they all understood their roles. In particular, they were asked to intentionally let the participants win some of the “Snap!” games in order to aid their learning. It was reiterated that they were chosen to be peer tutors because they were good readers and their job during the intervention was to help the participants get better at reading also.

Practice Procedures

Participants were requested to practise for seven minutes on each activity (a total of 21 minutes per day), five days a week. Prior to the intervention, various options regarding the scheduling of practice were discussed with both School Y and Z. Options included designated times during class, before and/or after school, and during lunchtime. All class teachers elected to schedule the practice during their regular classroom reading lessons.

The flashcards activity required participants to read the cards one by one either silently or aloud. Although the children were given the option of doing this activity by themselves, all of them opted to work with their peer tutor and therefore received immediate corrections and feedback on their performance.

The racetracks activity required the participant to start at the designated cell on the racetrack and move in a clockwise direction reading each word aloud until they reached the end. The peer tutor was responsible for timing the participant with an electronic timer and
providing corrections at the end of each circuit. The participant was encouraged to both read the words correctly and to reduce the amount of time it took for them to complete a circuit of the racetrack.

The final activity involved the participant and peer tutor engaging in a game of “Snap!” The cards were divided equally between the two players and then each took turns at placing one card down at a time. As each player placed a card they were required to read the word on the card aloud. When two cards containing a matching sound in any position in each of the two words were placed consecutively either player could yell “Snap!” If the player could then identify the matching sound in the two words they won that pile of cards. The overall winner was the player who ended up holding all of the cards. The peer tutor’s role in this activity was to ensure that the participant recognised the common sounds and not necessarily the letters. For example, although “nice” and “cute” both contain the same letter “c”, it makes a /s/ sound in the first word and a /k/ sound in the second so these two words would not constitute a “Snap!”.

All participants began the intervention on the A1 flashcards and racetrack, and A1 and A2 “Snap!” cards. Each time they were tested on the Decoding Fluency Test, participants were also tested on their fluency with the flashcards. All 15 flashcards were placed in three rows of five in random order in front of the participant. They were then required to read all of the words as quickly as they could. If this was achieved in 15 seconds or less (i.e. a rate of 60 words per minute) then the participant was presumed to be fluent on their current set of cards and they were promoted to the next set (i.e. A2 flashcards and racetrack, and A2 and B1 “Snap!” cards combined). This process continued until participants achieved fluency on each set, at which point they were given all of the sets and allowed to alternate among them when practising.
The decision to terminate the intervention was made on an individual basis. Williams (2002) found that none of the slow progress readers in her study were able to decode at or above 60 correct graphemes per minute, while most (84%) of the normal progress readers were able to decode at this rate. This fluency level therefore served as the criterion for the present study and participants were deemed to have reached fluency at this rate. However, it was decided that if a participant was continuing to make progress past this level then the intervention would continue until their performance plateaued. Similarly, if a participant plateaued at a level under 60 correct graphemes per minute the intervention would be terminated.

Unplanned Reversal

Due to unforeseen circumstances, the teacher of Class 2 at School Z was unable to allocate practice time during the second and third week of the intervention. This means that Child 8, 9 and 10 did not practise during this time. Some testing was still conducted during this period although not as extensively due to the potential negative effects on participants’ self-esteem and motivation from seeing their lack of progress. Child 9 reported that she took her kit home with her and practised with family members during this time. Although the child’s mother has signed the practice diary to verify this, the quality of the practice is uncontrolled since none of Child 9’s family members were specifically trained in the activities as the peer tutors were. This lapse in the intervention constituted an unplanned reversal in the research design.

Follow-Up

Follow-up testing was conducted with each child as close as possible to six weeks after cessation of the intervention, depending on the practicality of arranging testing times.
with the schools. Follow-up testing at School Y was conducted six weeks and one day subsequent to Child 6 completing the intervention. It was a little more difficult to arrange a testing time with School Z as the school year was coming to an end and the participants were involved in end-of-year activities, such as a drama production. Follow-up testing with School Z therefore was conducted slightly later at seven weeks and five days after the intervention was stopped.

In both schools, the follow-up testing was conducted in the same setting as testing during the intervention. Therefore, at School Y this was in the family room and at School Z this was the staffroom. Participants were administered the Neale Analysis of Reading Ability followed by the Decoding Fluency Test. Tests were administered by the researcher and an academic colleague.
CHAPTER THREE

RESULTS

Individual Results

Figures 1-5 show the fluency scores of the five participants on the Decoding Fluency Test and the running records of prose reading. The pre-test and follow-up prose reading fluency scores were derived from the pre- and post-test passages read by the children on the Neale using the procedure described in Chapter 2. The intervention prose reading fluency scores were derived from timed running records of classroom reading material with difficulty level controlled.

Child 6.

As can be seen from Figure 1, Child 6 started with a pre-test score of 35 correct responses per minute on the Decoding Fluency Test and a running record fluency level of 64 correct words per minute. Child 6 was very competitive throughout the intervention and was always eager to beat his previous decoding fluency score. The personal diary became a source of pride for Child 6 and was greatly reinforcing for him probably because he was able to display his progress to his teacher and classmates and this generated much approval. Child 6’s prose reading was somewhat pressured in that he appeared to struggle to produce the words orally. He also often added or omitted end sounds in words, particularly the /s/ sound.

As can be seen from Figure 1, Child 6 initially made rapid gains in decoding fluency, increasing to 82 correct responses per minute within the first week of intervention. This gain was maintained for a number of days and then followed by another steep rise at the end of the second week of intervention. Child 6’s performance then plateaued at 85 to 100 correct responses per minute. This level of decoding fluency was maintained at the six-week follow-up. Child 6’s prose reading fluency remained relatively stable during the intervention.
However, at the six-week follow-up Child 6 had improved to 78 correct words per minute on the Neale passages - an increase of 14 correct words per minute on his pre-test score.

Anecdotal evidence from Child 6’s class teacher supports this improvement. She commented that she has noticed positive changes in Child 6’s reading, particularly in the higher number of self-corrections he is now making.

Figure 1. *Number of correct responses per minute on the Decoding Fluency Test and number of correct words per minute on connected prose for Child 6.*

**Child 7.**

As can be seen from Figure 2, Child 7 started with a pre-test score of 28 correct responses per minute on the Decoding Fluency Test and read 34 words correctly per minute on the Neale. Child 7 was a very conscientious student and appeared eager to please the tester. She commented that it makes her sad when she is unable to read well and wished to improve. English is a second language to Child 7 who was born in Pakistan and still speaks her first language at home. Her class teacher commented that Child 7 also struggles with reading in her native language so it is unlikely that her difficulties with reading are due to
English being her second language. At the beginning of the intervention Child 7 appeared to make very little use of decoding strategies in her prose reading. She was observed to guess at unknown words, using the first letter of the word and information from the illustrations to help her. As can be seen from Figure 2, Child 7 made steady progress in her decoding fluency during the first two weeks of intervention and increased to a level of 79 correct responses per minute. After the two week school holiday period, during which no practice occurred, her decoding fluency had dropped to 60 correct responses per minute. She then built this again to 73 to 79 correct responses per minute over the next two weeks. At the six-week follow-up, she had maintained this level of decoding fluency. Child 7’s prose reading fluency improved markedly during the first phase of intervention to a level of 78 correct words per minute but this was not maintained over the school break. Following the holidays this rate was 49 correct words per minute and at intervention termination it had climbed back up to 63 correct words per minute. This was not maintained at follow-up where Child 7’s

![Graph](image)

*Figure 2. Number of correct responses per minute on the Decoding Fluency Test and number of correct words per minute on connected prose for Child 7.*
reading fluency on the Neale had dropped slightly to 50 correct words per minute. This was an overall improvement of 16 correct words per minute from her pre-test results. Child 7’s teacher commented that Child 7 was making slightly more self-corrections in her reading.

Child 8.

As can be seen from Figure 3, Child 8 obtained a Decoding Fluency score of 32 correct responses per minute and a Neale fluency level of 33 correct words per minute on the pre-test. Child 8’s prose reading was very disjointed and hesitant at the beginning of the intervention. He often guessed at unfamiliar words and then re-read parts of passages when they did not make sense to him. Child 8 made rapid progress in decoding fluency during the first two days of the intervention and this was maintained during the unplanned reversal in Weeks 2 and 3. Child 8 finished the intervention with a decoding fluency score of 77 correct responses per minute and at follow-up this was maintained at 79 correct responses per minute. Child 8’s reading fluency improved markedly during the first week of intervention and this

![Graph showing reading fluency over time for Child 8.](image)

*Figure 3. Number of correct responses per minute on the Decoding Fluency Test and number of correct words per minute on connected prose for Child 8.*
was maintained over the unplanned reversal. However, no further improvement occurred during the final week of the intervention and six weeks later had fallen to 57 correct words per minute. This represents an overall improvement of 24 correct words per minute from his pre-test level. Child 8 was observed to make a higher number of self-corrections in his prose reading at follow-up and made greater use of decoding strategies to sound out unfamiliar words.

**Child 9.**

As can be seen from Figure 4, Child 9 began the intervention with a score of 48 correct responses per minute on the Decoding Fluency Test and a reading fluency level of 77 correct words per minute on the Neale. Child 9 was a very enthusiastic student who claimed to enjoy reading despite her difficulties with it. At the time of the intervention Child 9 was also receiving weekly one hour remedial reading sessions with a special needs teacher. Child 9 made steady progress in decoding fluency during the first week of intervention. During the

![Graph](image)

*Figure 4. Number of correct responses per minute on the Decoding Fluency Test and number of correct words per minute on connected prose for Child 9.*
unplanned reversal her decoding fluency plateaued between 55 and 65 correct responses per minute. Although Child 9 took her practice kit home with her and claimed to have practised with family members, this claimed practice appears to have had no effect on decoding fluency. When the intervention resumed in Week 4, Child 9 was asked to cease her practice at home and concentrate on practising with her trained peer tutor at school. During this week, her decoding fluency rose steeply to 74 correct responses per minute, and she finished the intervention at 78 correct responses per minute. These gains were maintained at follow-up.

Child 9 maintained a level of prose reading fluency between 66 and 72 correct words per minute for most of the intervention. At follow-up, Child 9’s reading fluency had jumped to 120 correct words per minute, representing an overall gain of 43 correct words per minute.

Child 10.

As can be seen from Figure 5, Child 10 began the intervention with a score of 33 correct responses per minute on the Decoding Fluency Test and a reading fluency level of 42

![Graph](image)

*Figure 5. Number of correct responses per minute on the Decoding Fluency Test and number of correct words per minute on connected prose for Child 10.*
correct words per minute on the Neale. Child 10 was a nervous student and constantly looked
at the examiner while reading to check if he was reading correctly. He initially read very
quietly and disjointedly. He appeared to use almost no decoding strategies and tended to
guess at unfamiliar words based only on the information gained from the preceding text. This
resulted in a very high error rate and a low level of comprehension. Child 10 made some
gains to 50 correct responses per minute and this was maintained during the unplanned
reversal. He made no further gains during Week 4 (the second week of intervention) and his
decoding fluency score at follow-up was 52 correct responses per minute. Overall, decoding
fluency increased by 19 correct responses per minute from pre-test to follow-up, but no
improvement occurred in prose reading fluency.

**Group Results**

Table 3 shows the pre-test and follow-up data for each of the five participants on the
Neale Analysis of Reading Ability.

*Table 3. Pre-test and follow-up age equivalent scores on the Neale Analysis of Reading
Ability.*

<table>
<thead>
<tr>
<th>Neale Analysis of Reading Ability (Age equivalent: Years:Months)</th>
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<tbody>
<tr>
<td></td>
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<tr>
<td></td>
</tr>
<tr>
<td>Child 6</td>
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<tr>
<td>Child 7</td>
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<tr>
<td>Child 8</td>
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<tr>
<td>Child 9</td>
</tr>
<tr>
<td>Child 10</td>
</tr>
<tr>
<td><strong>Mean</strong></td>
</tr>
</tbody>
</table>

As can be seen from the table, participants made the most gains in reading rate,
improving by the equivalent of 1 year and 1 month from a mean pre-test age equivalent score
of 8 years and 1 month, to a mean of 9 years and 2 months age equivalent at follow-up. Child
6, 7 and 9 mirrored this mean with gains ranging from 9 months to 1 year and 5 months age
equivalent. Child 8 made improvements much greater than the mean and gained the
equivalent of 1 year and 10 months from pre-test to follow-up. Child 10 made no gains in
reading rate during the intervention and remained at an age equivalent level of 7 years and 10
months at both pre-test and follow-up. On the comprehension measure, participants improved
by the equivalent of 11 months, from a mean of 7 years and 1 month age equivalent at pre-
test, to a mean of 8 years age equivalent at follow-up. Child 6, 7 and 8 paralleled this mean
with improvements ranging from 10 to 12 months age equivalent. Child 9 made
improvements much higher than the mean and gained the equivalent of 1 year and 10 months
from pre-test to follow-up. Child 10 made much less than average progress, gaining the
equivalent of 4 months from pre-test to follow-up. Although participants made the least
improvement on the accuracy measure, the improvement from a mean age equivalent of 6
years and 10 months at pre-test, to a mean age equivalent of 7 years and 3 months at follow-
up, is nonetheless noteworthy. This is an improvement of the equivalent of 5 months from
pre-test to follow-up. Child 6, 7, 8 and 9 all paralleled this mean performance with age
equivalent improvements ranging from 3 months to 6 months, while Child 10 made twice the
average improvement at 10 months.

Table 4 shows the pre-test and follow-up data for each of the five participants on the
Decoding Fluency Test and the derived reading fluency taken from the Neale. On the
Decoding Fluency measure participants improved from a mean of 35 correct responses per
minute at pre-test to 76 correct responses at follow-up. This is a mean improvement of 41
correct responses per minute. Child 7 and 8 made similar gains in decoding fluency, moving
from 28 and 32 correct responses per minute at pre-test, to 72 and 79 correct responses per
minute at follow-up respectively. Child 6 made much higher gains, improving by 66 correct
responses per minute from 35 correct responses per minute at pre-test to 101 correct responses
Table 4. Pre-test and follow-up scores on the Decoding Fluency and prose reading fluency measures.

<table>
<thead>
<tr>
<th></th>
<th>Pre-test</th>
<th></th>
<th>Follow-up</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Decoding Fluency (correct responses per minute)</td>
<td>Prose Reading Fluency (correct words per minute)</td>
<td>Decoding Fluency (correct responses per minute)</td>
<td>Prose Reading Fluency (correct words per minute)</td>
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<tr>
<td>Child 6</td>
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<tr>
<td>Child 10</td>
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<tr>
<td>Mean</td>
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per minute at follow-up. Child 9 made less progress than the mean, improving from 48 correct responses per minute at pre-test to 75 correct responses per minute at follow-up. Child 10 made the least improvement from 33 correct responses per minute at pre-test to 52 correct responses per minute at follow-up, an improvement of just 19 correct responses per minute. On the prose reading fluency measure, participants improved from a mean of 50 correct words per minute at pre-test, to a mean of 70 correct words per minute at follow-up.

Child 6, 7 and 8 all made similar progress, improving by 14, 16 and 24 correct words per minute respectively. Child 9 made much higher gains, improving by 46 correct words per minute, from 77 correct words per minute at pre-test, to 123 correct words per minute at follow-up. Child 10 made no progress on the prose reading fluency measure with a score of 42 correct words per minute at pre-test and 41 correct words per minute at follow-up.
CHAPTER FOUR

DISCUSSION

The aim of this study was to follow up Williams’ (2002) observation that 8- to 9-year old children who are making slow progress in learning to read are more likely to be characterised by a deficiency in decoding fluency than a lack of phonemic awareness. The research attempted to address the following three questions:

1. Is it possible to build decoding fluency in these children?
2. If so, how long does it take to achieve fluency in decoding?
3. Does an increase in decoding fluency generalise to improvements in reading fluency?

In order to accomplish the aims of the study, it was necessary to develop reliable measures to assess phonemic awareness, decoding fluency and prose reading ability. In addition, the availability of resources and appropriate practice and testing conditions was vital.

Previous studies that have aimed to build decoding fluency in struggling readers have not included a measure of phonemic awareness (Fiedorowicz, 1986; Frederiksen, Warren & Rosebery, 1985; Jones, Torgesen & Sexton, 1987). Given the importance of an adequate level of phonemic awareness for the acquisition of grapheme-phoneme correspondences, this omission is unfortunate. If a child’s deficit is in phonemic awareness then an intervention which targets phonemic awareness is the intervention which is required. Therefore, an assessment of phonemic awareness is important to differentiate those poor readers who are poor decoders and those who have yet to achieve an adequate level of phonemic awareness.

In this study, phonemic awareness was measured using the Phonemic Segmentation Test (Williams, 2002). This measure was chosen because the ability to segment whole words into phonemes has been shown to be a reliable indicator of phonemic awareness (Liberman,
Shankweiler, Fischer, & Carter, 1974; Wagner & Torgesen, 1987). It is reasonable to assume that this test is adequately reliable since it is based closely on the Queensland University Inventory of Literacy Phoneme Segmentation Subtest which was found to have a test-retest reliability coefficient of 0.85 (Dodd et al., 1996). At times, the children in the present study found it difficult to understand the instructions and occasionally segmented the words according to the number of syllables or letters. In these instances the tester demonstrated the practice examples again and then carried on with the test. Another complication occurred when the number of fingers placed on the table or the number of pencil taps did not correspond to the number of segments verbalised by the child. For example, Child 7 placed four fingers on the table for “big” but actually said the three phonemes /b/ /i/ /g/. In these instances the tester recorded the number of segments uttered by the child.

It appears that very few research studies, if any, have assessed decoding fluency in the manner employed in the present study. Most have assessed this component skill using tests involving whole words or pseudowords. Some used tests that included words that had been practised by participants during the intervention (Fiedorowicz, 1986; Jones, Torgesen, & Sexton, 1987). It is therefore possible that some of the decoding fluency gains in these studies may have been due to direct practice of test items rather than mastery of the specific grapheme-phoneme relations targeted for practice.

In the present study, decoding fluency was measured using Williams’ (2002) Decoding Fluency Test. This test assessed participants’ ability to quickly recognise and pronounce 45 of the most commonly occurring graphemes in the English language. On almost every occasion, the Decoding Fluency Tests were co-marked by the writer’s academic colleague. Inter-rater agreement was almost always 100% and any disagreement was generally the result of the child’s response being misheard. Since the same test was used repeatedly throughout the intervention, participants were requested to begin on a different line
each time they were assessed. Practice effects are therefore likely to be minimal. It was noted during the intervention with Child 6 that after the first week of intervention he was beginning to make habitual errors on the test. For example, on the first test he read “aim” as “alarm” and, since this was not corrected by the examiner, he continued to read the word this way in subsequent tests without attempting to decode the word. The decision was therefore made to correct errors of this nature with the child at the end of each test. This procedure was implemented from the beginning of the intervention with all subsequent participants.

The Neale Analysis of Reading Ability (1999) was used to measure participants’ overall reading ability at both pre-test and follow-up. This measurement tool has Australian norms and these norms are likely to more closely resemble the New Zealand population than tests with American norms. Since the Neale is not routinely used by New Zealand classroom teachers, it was also more likely that the participants would not have seen the test passages before. The Neale produces a score for accuracy, comprehension and reading rate. In order to obtain a pre-test and follow-up measure of reading fluency the Neale passages were used. While the reading rate score gives some indication of how fluently a child is reading, it is not technically a measure of reading fluency, that is, accuracy and speed, as it includes words read incorrectly. The number of errors was therefore subtracted from the total number of words read and fluency assessed by calculating the number of correct words per minute across those passages which were passed.

Progress in reading fluency was monitored throughout the intervention by using timed running records of oral reading of controlled difficulty texts. Class teachers’ estimates of their students’ reading levels varied and two of the children (Child 7 and 10) had to be moved back a number of levels until stories were found which they could read with at least 90% accuracy. This caused some complications in that the children had already read many of the books available at the earlier levels and so it was difficult to find novel materials. Also, at the
lower reading levels the books tended to be shorter in length which meant the participants were changing stories more frequently than the other children on higher levels. However, despite these difficulties, the results of the running records are generally consistent for each child and are therefore likely to be accurate reflections of improvements in their prose reading fluency.

At School Y the children were able to use the family room to practise most of the time. If this was in use, they were able to use the computer room or classroom foyer. The family room was also mostly used for testing, but occasionally testing was conducted in a resource room. At School Z, the researcher was allocated a space in the staffroom to conduct testing. While this was generally well suited to the purpose of assessment, occasionally staff members would use the area and this caused some distraction for the children. At times the testing was conducted in the school library or a teaching resource room but often these were also in use. Child 7 was the only child from Class Z1 at School Z and so was able to practise at the back of the classroom. This option was not practical for the teacher of Class Z2 since Child 8, 9 and 10 were all in his class and he believed their practising would be too disruptive to the remainder of his students. These participants mostly practised in the foyer between Class Z1 and Z2.

For a number of reasons, the teacher of Class Z2 had some difficulty in continuing the intervention during the second and third week. In order to resume the intervention in the fourth week it was arranged that a teacher aide would remove the participants from the classroom and supervise their daily practice in the foyer between Class Z1 and Z2. This worked well because the classroom teacher was able to continue his usual classroom lessons and the participants benefited from extra supervision and assistance from the teacher aide. The lapse in intervention also constituted an unplanned reversal in the research design. Child 8, 9 and 10’s improvements in decoding fluency plateaued during this time. When the
intervention resumed, Child 8 and 9 both began once again to improve with respect to their decoding fluency. This reversal demonstrates that improvement was most likely a function of practice since gains were only made in decoding fluency while the intervention was in place.

All of the participants reported that they enjoyed the practice activities and they all seemed to respond competitively to progressing through the sets of practice cards. However, towards the end of each intervention it was noted that the participant’s enthusiasm for the intervention began to wane when they realised that they had progressed through all of the levels. Perhaps an additional activity or even another set of practice cards would have been helpful in maintaining motivation until the end of the intervention.

The use of peer tutors in the present study was very successful. All students recommended by the class teachers were retained as peer tutors for the duration of the study.

Overall, the results of the present study show that each child increased in their level of decoding fluency during the intervention and all but one of them experienced gains in their level of prose reading fluency. The variability in each child’s response to the intervention may be accounted for by individual differences.

Child 6 made higher than average gains in decoding fluency and slightly less than average gains in reading fluency. This discrepancy may be explained in part by Child 6’s highly competitive demeanour on the Decoding Fluency Tests. He placed considerably more emphasis on improving his decoding fluency than improving on the prose reading tasks.

Child 7’s improvements in both decoding fluency and reading fluency closely paralleled the group means. As previously mentioned, English is a second language to Child 7 and she was reported to struggle with reading in her native language. Since Child 7 struggles with reading no matter which language she is using, it is likely that her difficulty is with a component skill of reading that is common to both languages. Given the success of the present intervention with Child 7 it is likely that the missing skill was decoding fluency.
Child 8’s improvement in both decoding fluency and reading fluency also closely paralleled the group means. During Week 4, Child 8’s enthusiasm for the intervention began to wane and he needed a lot of prompting and praise to continue giving his best performance. He was also involved in a school play at that time and this was a big distraction for him. This may account in part for the temporary drop in both decoding and prose reading fluency during this time.

Child 9 made slightly less than average improvement in decoding fluency and much higher than the group mean improvement in reading fluency. Child 9 was a very diligent student who worked hard to improve at reading. She was also encouraged considerably by her parents who displayed a willingness to implement the practice activities at home. It is likely that these factors improved Child 9’s ability to benefit from the intervention.

Child 10 made the most modest gains in decoding fluency and did not improve at all in reading fluency. At pre-test, Child 10 was able to correctly identify just 30 out of 60 sounds in the Phonemic Segmentation Test. This suggests that his level of phonemic awareness may have been too low for him to benefit from training in decoding fluency, a higher level reading skill. All other participants obtained a score of over 40 out of 60 sounds at pre-test and experienced gains in both decoding and prose reading fluency.

A replication study conducted by Nixon (2005) found similar results to the present study. The replication study was undertaken concurrently with the present study and used the same method and practice activities. The five participants were of the same age and were attending the same schools. The results showed that all five participants increased in decoding fluency from pre-test to follow-up, with a mean improvement of 38 correct responses per minute (Nixon, 2005). In addition, all participants improved in their prose reading fluency with a mean increase of 43 correct words per minute (Nixon, 2005). A brief description of the participants in the replication study follows.
Child 1 read in a slow, disjointed manner and was easily distracted from the reading task by the pictures accompanying the story. Child 1 commented that he disliked reading and regularly made negative comments about his performance on the practice activities. His peer tutor also commented that Child 1 required frequent prompting to remain engaged during practice. Child 1 began the intervention with a pre-test decoding fluency score of 20 correct responses per minute and a reading fluency score of 38 correct words per minute. Child 1’s progress through the practice activities was slow but he made steady improvements during the intervention. By follow-up Child 1’s decoding fluency had improved to 61 correct responses per minute and his reading fluency was 68 correct words per minute.

Child 2 was a quiet, nervous student whose prose reading was hesitant and undertaken with little regard to punctuation. However, he was highly self-motivated and worked consistently on the practice activities and was enthusiastic to progress through the sets of cards. Child 2 began the intervention with a decoding fluency score of 49 correct responses per minute and a reading fluency score of 46 correct words per minute. At follow-up, Child 2 obtained a decoding fluency score of 83 correct responses per minute and a reading fluency score of 102 correct words per minute.

Child 3 was a confident, easy-going student who read slowly but accurately. She was very easily distracted by the pictures accompanying the stories and often lost her place in the text as a result. Her peer tutor reported that it was difficult to keep Child 3 focused on the practice activities during practice sessions. Child 3 began the intervention with a decoding fluency score of 38 correct responses per minute and a reading fluency score of 37 correct words per minute. Child 3 made steady gains during the intervention and at follow-up she obtained a decoding fluency score of 77 correct responses per minute and a reading fluency score of 55 correct words per minute.
Child 4 was a resistant student and expressed an intense dislike for reading and other related tasks and therefore required a high level of prompting and praise from her peer tutor. She read disjointedly and was not observed to self-correct any of her errors. Child 4 obtained a pre-test decoding fluency score of 36 correct responses per minute and a reading fluency score of 39 correct words per minute. At follow-up Child 4’s decoding fluency had improved to 56 correct responses per minute and her reading fluency to 61 correct words per minute.

Child 5 was an enthusiastic and dedicated child who was eager to please the examiner and constantly improve on his prior performances. Child 5 began the intervention with a decoding fluency score of 42 correct responses per minute and a reading fluency score of 38 correct words per minute. He made rapid gains, particularly in the first week of the intervention. At follow-up his decoding fluency had improved to 97 correct responses per minute and his reading fluency to 70 correct words per minute.

The present study aimed to address three central research questions, the first of which was whether or not it is possible to build decoding fluency in 8- to 9-year old children who have an adequate level of phonemic awareness. The experimental study reviewed earlier (Jones, Torgesen & Sexton, 1987) provided some indication that the direct training of decoding fluency may be successful. As a result of direct intervention the participants in this study experienced a mean improvement in decoding fluency of 15 correct responses per minute, from a mean of 18 correct responses per minute at pre-test to a mean of 33 correct responses per minute at post-intervention. Nixon (2005) found much higher levels of decoding fluency improvement with a mean increase of 38 correct responses per minute, from a mean of 44 correct responses per minute at pre-test to a mean of 90 correct responses per minute at follow-up. The participants in the present study also increased in decoding fluency, on average by 41 correct responses per minute from a mean of 35 correct responses per minute at pre-test to a mean of 76 correct responses per minute at follow-up. Both Nixon
(2005) and the present study included a pre-test measure of phonemic awareness which helped to ensure that the participants were ready for an intervention that targeted decoding fluency. Since Jones, Torgesen and Sexton (1987) did not include such a measure, it is possible that some of their participants may not have had an adequate level of phonemic awareness and this may have hindered their ability to benefit from an intervention targeting grapheme decoding fluency, a higher level component skill. Indeed, the low level of improvement in decoding fluency is comparable to that made by Child 10 in the present study who began the intervention with a borderline level of phonemic awareness. The two participants who made the greatest gains in decoding fluency had the two highest scores on the Phonemic Segmentation Test at the beginning of the intervention. Child 6 and Child 8 identified 47/60 sounds and 55/60 sounds respectively. It is plausible to suggest then that decoding fluency can be directly trained and the time taken to reach criterion will be directly related to the level of phonemic awareness.

The second research question asked how long it would take to achieve criterion levels of fluency in decoding. This raises the question of what such a fluency criterion might be. The present study initially defined decoding fluency as the ability to correctly read at least 60 graphemes per minute. This level was taken from Williams (2002) who found that all of the children in her study who were significantly behind in reading progress could not decode at this level while most of the normal reading progress children could. The previous study reviewed (Jones, Torgesen & Sexton, 1987) reported an average decoding fluency of 33 correct responses per minute after 12 and a half hours of intervention. The present study found that the four participants who improved to over 60 correct responses per minute did so after an average of one hour and 45 minutes of practice. The slowest participants (Child 7 and 9) took two hours and six minutes of practice while the fastest participant took one hour and three minutes to achieve 60 correct responses per minute. It took the same four
participants an average of one hour and 56 minutes of practice to reach 70 correct words per minute. The fastest participant (Child 6) took one hour and 24 minutes of practice to achieve this level and the remaining three (Child 7, 8 and 9) each took two hours and six minutes of practice. Child 6 took a total of one hour and 45 minutes of practice to exceed 80 correct responses per minute and Child 8 also accomplished this level of decoding fluency after a total of two hours and 27 minutes of practice. Child 10 was the only participant not to improve to over 60 correct responses per minute. Nixon (2005) found similar results to the present study with all five participants improving to over 60 correct responses per minute. This was achieved after an average of two hours and 16 minutes of practice. The slowest participant (Child 1) took four hours and 12 minutes to achieve this level, while the fastest participant (Child 5) took just 42 minutes of practice. All five participants also improved to over 70 correct responses per minute after a mean of two hours and 58 minutes of practice. The slowest participant (Child 1) took five hours and 57 minutes of practice to achieve this level, while the fastest participant (Child 5) took one hour and three minutes. Although each child will vary in the length of time it takes them to be trained to fluency in decoding, no child in the present study took longer than two hours of practice to surpass 60 correct responses per minute. In the replication study (Nixon, 2005) no child took longer than four hours of practice to reach 60 correct responses per minute, and most participants took around one hour and 45 minutes of practice.

The final research question addressed whether or not an increase in decoding fluency will generalise to improvements in prose reading fluency. Jones, Torgesen and Sexton (1987) found an average improvement from 51 correct words per minute to 78 correct words per minute on their measure of reading fluency from pre- to post-test. This result should be interpreted with some caution as the generalisation measure involved a combination of practiced and non-practiced words embedded in paragraphs. It is possible therefore that a
proportion of the fluency gains in this study may have been due to memorisation of the practiced whole words as opposed to a generalised improvement in prose reading fluency. The present study found an average reading fluency increase of 20 correct words per minute from a mean of 50 correct words per minute at pre-test to 70 correct words per minute at follow-up. Nixon (2005) observed similar gains with an average reading fluency increase of 31 correct words per minute from a mean of 40 correct words per minute at pre-test to 71 correct words per minute at follow-up. In most cases generalisation to prose reading fluency was not apparent until the follow-up assessments, suggesting there may be a period of delay between the acquisition of decoding fluency and growth in reading fluency. If this is the case then it may explain why some studies which have aimed to build decoding fluency (e.g. Fiederowicz, 1986; Frederiksen, Warren & Rosebery, 1985) do not report any generalisation effects as they did not conduct follow-up assessments where these may have been apparent.

Fuchs and Fuchs (1993) report that by the fourth year of schooling children should be improving in their oral reading rate by between 0.85 and 1.1 words per minute a week. The four participants in the present study who improved in prose reading far surpassed this rate of improvement making an average gain of around 12 correct words per minute a week. The participants in the replication study improved on average by around 11 correct words per minute a week (Nixon, 2005). It is widely accepted that children of this age should be reading at a fluency level of around 120 correct words per minute (Binder, Haughton & Bateman, 2002; Hasbrouck & Tindal, 1992). At the follow-up assessment for both the present study and the replication study, only one child (Child 9) had improved to this age appropriate level. However, if the accelerated rate of progress experienced by the participants during and for at least six weeks after the intervention could be maintained, it is conceivable that they could catch up to their normally progressing peers given time. Based on the results of the present study and replication study, it is likely that at least another two hours of practice with new
fluency building activities in conjunction with further prose reading practice on graded texts would be needed to achieve these gains.

Overall, the results of the present study, along with Nixon's (2005) replication study, have added weight to the argument that decoding fluency is of critical importance in learning to read. It is becoming increasingly accepted by researchers in the education field that accuracy, although necessary, may not be sufficient for optimal progress in learning to read (Binder, Haughton & Bateman, 2002). The ability to read both accurately and quickly allows the child to devote more attention to higher level reading skills such as comprehension and interpretation. In order to be fluent in prose reading, the reader must be fluent in grapheme decoding so that they can quickly decipher unfamiliar words in text without disrupting the flow of the passage.

If the component skills of reading are not fully mastered in a timely fashion, the child will find the task of reading more and more difficult and will become increasingly disheartened. Poor readers read less material in a given amount of time than normally progressing peers and therefore receive much less practice (Stanovich, 1986). Avoidance strategies will likely be used by the child to escape the aversive effects of engaging in reading – a task on which they have experienced repeated failure. Regular assessment of the component skills of reading would help to prevent children from entering this downward spiral of reading failure. In particular, phonemic awareness and decoding fluency measurements could be added to the battery of assessments currently administered in New Zealand schools as part of the Observation Survey (Clay, 1993). The Phonemic Segmentation Test and the Decoding Fluency Test used in the present study may be ideal for this purpose as they are reliable and quick and easy to administer. This would enable early identification of the children who are lacking in the component skills of reading and allow them to receive remedial assistance in a timely fashion.
The practice activities implemented in the present study would be well suited to regular classroom use. All participants reported enjoying the activities and most were highly motivated by the competitive nature of progressing through sets of practice cards. The use of peer tutors meant the classroom teachers had very little to do to ensure the intervention ran smoothly. Teachers were able to continue with regular classroom lessons and were involved in the intervention only as much as they wished to be. The practice activities also have the potential to benefit peer tutors in that not only are they receiving additional practice in their own decoding fluency but they are also developing important leadership and organisational qualities. On a more practical level, the practice materials cost relatively little to produce and can be used and reused many times.

In summary, the present study has shown that grapheme decoding fluency can be built in 8- to 9-year old struggling readers through direct practice in fluency building activities. This can be achieved over a relatively short time period of two to four weeks. In addition, the present study also found that the gains in decoding fluency generalised to overall prose reading fluency. However, further reading practice will be required to bring reading fluency up to age-appropriate levels.
REFERENCES


APPENDIX I:

PHONEMIC SEGMENTATION TEST
(Adapted from the QUIL TEST)

Date: ___________ Tester: ___________ Participant: ________________

I'm going to say some words and you will have to listen carefully. You are going say the sounds in the words and I want you to use your fingers to help you. In the word it there are two sounds - /i/ and /t/.

The tester demonstrates two sounds by saying "it" and then putting down her small finger and saying "/i/" and ring finger and saying "/t/".

Now we are going to do some practice items. Some of the words are made up words and some are real words. Say the word first. Then say the sounds.

The tester gives feedback and if necessary further practice on the practice items.

form? (3)  baby? (4)  knife? (3)  stelp? (5)  sledge? (4)

Say the word first. Then say the sounds.

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<th>Sounds</th>
<th>Word Score</th>
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Raw Scores /60

Words added to QUIL in bold.

Table constructed by Deborah Williams and Karen Bradley.
APPENDIX II: Decoding Fluency Test

DECODING FLUENCY TEST – Administration Instructions

In a moment I am going to show you a page that has some words on it. Some are real words and some are made up. I want you to read the words as quickly as you can until I say stop. Before we begin let’s try some for practice. Read these 10 words as quickly as you can. If you come to a word that you don’t know, just say “don’t know” and go on to the next one. Ready? Go.

car  dot  she  lad  kit
bed  his  mop  but  my

If the child hesitates on any word, say the word. If the reading is slow, model reading fast and then ask the child to try again (up to 3 times in total). Now go on with the test.

Okay, let’s try some more. Remember, read the words as quickly as you can and keep going until I tell you to stop. Ready?
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APPENDIX IV: Sample Flashcards

van

yes

nice
APPENDIX VI: Sample "Snap!" Cards

(From):

teeth

(Back):

An illustration of an alligator.