REMEDIAL READING: AN INVESTIGATION OF THE NEUROLOGICAL IMPRESS METHOD, THE REPEATED READINGS METHOD, AND A COMBINED NEUROLOGICAL IMPRESS - REPEATED READINGS METHOD

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ABSTRACT

This study consisted of two phases. First, poorer and better readers were compared on reading ability, speed of processing and memory capacity. Second, three remedial reading procedures (the neurological impress, repeated readings, and a combination of the first two) were compared for effect on children's oral fluency and silent reading comprehension.

Forty students were equally divided into two groups for a comparison of poorer and better readers. Fourteen subjects were selected from the poorer reading group and assigned randomly to one of three experimental conditions or a control condition. Six subjects formed a marginally-delayed reading group, four subjects formed a moderately-delayed group while the remaining group of four were severely-delayed readers. Subjects in the remedial reading study were measured on a pretest-posttest basis, as well as on a repeated measures during treatment format. Subjects were given 40 remedial sessions of 15 minutes each over a 10-week period.

Statistically significant differences were found in reading ability, speed of letter processing and memory capacity. Differences in speed of processing did not

extend on a general basis. Subjects in the neurological impress, combined procedure and control condition demonstrated the greatest improvement across reading levels and skill areas. Treatment techniques had the greatest effect on mildly- and moderately-delayed readers. Treatment approaches also produced measureable improvement in oral reading speed and silent reading comprehension, but to a lesser extent in oral reading accuracy. Across subjects an inconsistent relationship was demonstrated between improved oral fluency and silent reading comprehension. On a group basis, poorer readers who improved in silent reading comprehension also measured more highly on memory capacity.

Differences in processing speed and memory capacity have suggested caution in viewing reading deficiencies on purely a phonetic or sight-word basis. The varied effect of treatment conditions across reading levels and skills has emphasized the need for detailed diagnostic procedures to ensure the best match between weakness and remedial procedure.

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DEDICATION

To my wife and children for their support.

Chapter 1: Introduction

Remedial Reading: An Investigation of the Neurological Impress Method, the Repeated Readings Method, and a Combined Neurological Impress - Repeated Readings Method

Skill in reading is integral to success in school. The ability to access information through reading is a requirement for success in practically all school subjects. Processing of information through a print medium significantly enhances a child's cognitive maturation (Hammill & Bartel, 1982). The ability to master the component skills of reading is a requisite in life for establishing a measure of economic and social independence. Reading disability is linked to a lower socio-economic status (Arnold, 1972). The significance of reading has prompted a multiplicity of remedial and support techniques for instances in which traditional approaches have not produced the desired results. Two of these approaches are the Neurological Impress method (NIM) and the Repeated Readings method (RRM).

Neurological Impress Method

The NIM is most closely associated with the work of R.G. Heckelman (1966, 1969). The NIM technique has been presented as a supplemental (Henk, 1983), multi-sensory

(Arena, 1980) approach to remediation with children whose fluency of reading is deficient as measured by the rate and accuracy of word recognition. Hollingsworth (1970) assessed the effect of NIM with normal developmental readers and failed to find evidence of superior gain in comparison with children who followed the traditional classroom method.

The NIM essentially involves the simultaneous oral reading of passages by an instructor and student. The goal of NIM is stressed (Heckelman, 1969) as the development of oral reading fluency and style, with the primary emphasis initially placed on developing a flow of reading rather than word accuracy. Success is predicated on the bases of exposing the child to a model of good reading and massive inputs of information. Correct patterns of oral reading are impressed upon a child's neurological organization and, at the same time, incorrect patterns of reading are slowly eradicated.

Among reading-disabled children, superior gains for the NIM have been claimed by Heckelman (1966, 1969), Gardner (1965), Langford, Slade and Barnett (1974), Hollingsworth (1978) and Mikkelsen (1981). However, within each study, measurement was not consistently applied across the same skill domains of oral reading

speed, oral reading accuracy and silent reading comprehension. Early studies favourable to the NIM have been criticized on their methodological design. In addition, studies by Arnold (1977) and Gibbs and Proctor (1977) failed to demonstrate a similar superior effect of the NIM compared to conventional approaches.

Studies (Cook, Nolan & Zanotti, 1980; Lorenz & Vockell, 1979) involving the NIM and learning disabled (LD) students with a specific auditory deficit have demonstrated a mixed result. Similarly, studies (Gibbs & Proctor, 1982; Henk, 1983; Strong & Traynelis-Yurek, 1983) involving specific modifications of the NIM have provided no uniform indication of effect.

In summary, research on the NIM has not yet established a consistency of results across treatment conditions. Early favourable studies have been criticized on methodological grounds. In NIM studies the same dependent variables, oral reading speed, oral reading accuracy and silent reading comprehension, have not been included consistently. A study involving the NIM with a reading-disabled group, measuring across skill domains, would appear to offer the possibility of resolving some uncertainty about the effectiveness of the procedure.

Repeated Readings Method

The development of a theory of repeated readings is more recent than research on the NIM. The theoretical basis of the RRM is most closely related to the writings of LaBerge and Samuels (1974, 1983) and Samuels (1979, 1981). Repeated readings, also referred to as multiple oral rereading (Moyer, 1982), is viewed as a supplemental reading programme similar to the NIM. However, the RRM is prescribed as supplemental for both normal readers and children with reading problems. By comparison to the NIM, the RRM more closely parallels traditional developmental approaches in its emphasis on repetition and controlled vocabulary. In theory, the limitation of possible responses decreases the demands of decoding and increases the possibility of comprehension (Samuels, 1979).

Terry (cited in Moyer 1982), Gonzales and Elijah (1975), Chomsky (1978) and Moyer (1982) employed the RRM to improve the oral fluency of reading-disabled children and adults. Dahl and Samuels (Cited in Samuels, 1979) demonstrated improvement in both oral fluency and comprehension using the RRM with reading-disabled children. Neill (1979) and Lopardo and Sadow (1982) have claimed improvement in oral fluency and comprehension using the RRM with reading-delayed high school and college

students. However, neither report has provided data by which to assess the value of the study. Carver and Hoffman (1981) have questioned the effect of the RRM using a modified computer-based approach. Results suggested that the RRM has an effect specific to age and does not easily generalize beyond a specific repeated readings task.

In review, the RRM is relatively new and requires validation through a weight of scientific evidence. Study reports which fail to report research data must be considered as subjective testimonials rather than hard evidence. Concerns regarding the age-dimension and generalizing effect from the RRM need to be addressed because of educational implications. In addition, research on the RRM, similar to research on the NIM, has failed to consistently analyze effect across the skill areas of oral reading speed, oral reading accuracy and silent reading comprehension. Particularly has little attempt been made to link improved oral fluency with improved silent reading comprehension in both the RRM and the NIM. An implied connection is not a sufficient basis on which to make educational decisions. A study involving the RRM with a reading-disabled group, measuring across skill domains, would also appear to

offer the opportunity to comment on the effectiveness of the procedure.

Combined NIM-RRM

Johns and Berglund (1982) have identified characteristics of readers for whom the RRM would be beneficial. These children are readers who have experienced very little success, read slowly word by word, lack conversational qualities in oral reading, lack motivation and have little confidence in their reading. These are precisely the characteristics of readers to which the NIM is directed (Heckelman, 1966, 1969).

Both the NIM and the RRM are viewed as supplemental or remedial approaches to reading rather than conventional instructional approaches. Both techniques, as originally defined by Heckelman (1966, 1969) and Samuels (1979), are oriented primarily toward the improvement of a child's fluency in terms of a quicker rate of reading and fewer errors of recognition.

Little attempt has been made to combine the NIM and RRM in a systematic study of oral fluency and silent reading comprehension. Heckelman has unintentionally overlapped the two procedures in his modified Presenting Method of NIM (Arena, 1980). However, no study has been reported through which to measure the effect. Lauritzen

(1982) has presented, without supporting data, a procedure of simultaneous, repeated group reading.

Application of the NIM provides the advantage of a model of good reading. Repeated readings provide the opportunity of improved fluency through controlled length of passages and a reduction in the number of potential responses (Moyer, 1982). The whole complex of oral fluency and reading comprehension would appear to be in a position to benefit from a rigorous study involving not only the NIM and RRM, but also a blending of characteristics from each procedure.

Purpose

The critical importance of reading to children's success in life justifies extensive research on different remedial, support procedures. Added justification is present where remedial, support techniques are simple and cost-efficient to administer, as in the case of the NIM and RRM.

In a broad perspective, the intention of this study is to resolve a number of issues related to the NIM and RRM and, at the same time, to provide a view of some characteristics of both proficient and deficient readers. More specifically, four questions provide the focus of this research investigation. First, would exposure to

the NIM or RRM, or a combined NIM-RRM, produce an improvement in the oral reading performance of deficient readers? Second, would improvement in oral reading fluency, through any of the NIM, RRM, or a combined NIM-RRM, translate into improved silent reading comprehension? Third, would one of the NIM, RRM, or a combined NIM-RRM produce relatively greater improvement in oral fluency and silent reading comprehension? Finally, poorer readers were administered a battery of tests as part of the final selection to the remedial reading programme. If the same tests were applied to the same number of good readers, under the same conditions, what null hypotheses of no performance difference would be tenable? Would the rejection of any null hypotheses of no performance difference provide a commentary on the NIM, RRM or reading process in general?

Chapter 2: Review of the Literature

Neurological Impress Method

Introduction

Heckelman (1969) has promoted the NIM as an alternative to traditional remedial techniques in which reading-delayed children are exposed to a further dose of phonics and structural analysis. Rather than stressing a rule-centered approach to phonics and structural analysis, often in the form of isolated workbook exercises, proponents of the NIM have stressed the perception of letter-sound associations and the rules of syntax through the natural reading of large quantities of printed material (Henk, 1983).

In Heckelman's (1966) traditional model of the NIM, the example of good oral reading occurs in the person of the instructor during simultaneous reading. As a student reads, confidence is gained from the accompanying reader. The voice of the instructor provides a simultaneous auditory confirmation of a type used with persons who are stutterers (Henk, 1981).

Parallel to the emphasis on the development of oral fluency has been a traditional deemphasis on comprehension in the NIM technique (Heckelman, 1966, 1969). While the child might volunteer information

from a passage, the instructor does not solicit information in order to avoid the pressure of accountability that a student might feel while practising his oral reading. The purpose of NIM is directed toward the child's understanding of the orthographic and syntactic patterns of language without the pressure or anxiety of being held accountable for comprehension of the passage (Henk, 1983). The deemphasis on reading comprehension would possibly explain the failure of some studies on the NIM to measure across reading skills.

Heckelman (1969) maintains that improved oral reading should be in evidence by the fourth hour of remediation. Often the sharpest rise in achievement occurs after the eighth hour of NIM. Even after the NIM training period is concluded, Heckelman (1969) maintains that a student's word recognition ability continues to improve gradually.

Gibbs and Proctor (1982) have offered a contemporary comment on the practicality of NIM. "That method (NIM), so useable and useful, is a part of virtually every remedial reading and learning disability teacher's repertory of workable approaches" (p.619). Cook and Earlley (1979) express a similar enthusiasm. "It (NIM) is, beyond a doubt, one of the easiest, yet most productive remedial techniques ever encountered" (p. 197).

Since Heckelman's original case study in 1952, the NIM has been assessed across varying degrees of disability, across varying skill areas, and has been modified to meet specific needs. Unfortunately, the accumulated findings have provided decidedly mixed results that do not, at this juncture, provide support to such sweeping generalizations about utility.

NIM and Regular Readers

Hollingsworth (1970) introduced a group variation on the NIM procedure using a radio and earphones arrangement. Instead of reading orally with an accompanying instructor, children read aloud individually in accompaniment with taped stories transmitted through earphones.

Sixteen children were selected from among regular readers at the Grade 4 level and equally divided between experimental and control groups. Children in the experimental group read 30 different stories over 30 daily sessions. Children read into a microphone in order that they could hear their own voices and the voice on the tape simultaneously. Children in the control group remained in class and followed the regular developmental programme.

Hollingsworth found no statistically significant

difference in mean reading growth across the skills of vocabulary, silent reading comprehension, reading speed and reading accuracy. Measurement was based on the Gates-McGinitie Reading Tests, First Edition (U.S. Edition). As a result of insignificant differences in reading growth, Hollingsworth speculated on two aspects of the study. First, the substitution of tape and earphones, in place of personal accompaniment, was possibly too significant a change from Heckelman's traditional NIM. Second, and more important, results suggested a confirmation of Heckelman's contention that the NIM is a supplemental procedure for cases of reading deficiency, and not for normal developmental readers.

NIM and Delayed Readers

Heckelman's case study in 1952 and his group study in Merced County, California in 1962 represent the earliest reported research on the NIM. Heckelman (1969) reported on the 1952 study involving an adolescent girl reading at a third grade level with very poor oral fluency. Through the simultaneous reinforcement of the student's reading, during hourly sessions carried out over 12 weeks, Heckelman identified a three-grades level improvement in the girl's oral reading.

The success of Heckelman's case study prompted a

subsequent group experiment in 1962. Heckelman's (1966, 1969) study involved an experimental group of 24 students drawn from grades 7 to 10 and including students reading at least three years or more below their actual grade placement. None of the children displayed evidence of brain damage or severe personality disorder and all children scored at 90 or higher on the Wechsler Intelligence Scale for Children (1949). Remedial sessions involved 15 minutes per day for a period of 6 weeks. Oral reading was assessed on the Gilmore Oral Reading Test (1952) while the California Achievement Test (1957) was employed as the silent reading test. While all children did not improve, mean reading gain was 2.2 years on oral reading and the mean gain in silent reading comprehension was 1.9 grade levels. Unfortunately, Heckelman failed to employ a control group in his design. Arnold (1972) has observed that, without a control group, it is not possible to determine the extent to which the reported improvement in performance was, in fact, merely a regression to the mean.

Charles Gardner, an associate of Heckelman in the original research team, has presented further support for the NIM procedure. Gardner (cited in Heckelman, 1966) reported a mean grade-level growth in oral reading

of 1.6 years in a group of 6 elementary-age students. The NIM was employed for 10 minutes per day over 6 weeks, resulting in a total of 5 hours intervention.

Gardner (1965) has detailed the results of a further study involving 49 students from Grades 5 through 8. Children selected for the study scored 85 or higher in IQ on the Stanford-Binet (Form L-M). Their reading level was 2 years below their chronological age based on the Gates Silent Reading Tests. No gross neurological or emotional problems were in evidence. Additionally, the subjects were matched for IQ, sex, chronological age and grade placement. The children were divided into an experimental group (N=20) which received NIM training, a control group (N=20) which received individual instruction in a traditional remedial programme, and a prime control group (N=9) which received no treatment and only completed the pre- and post-test measurements on the Gates Silent Reading Tests. Intervention for the experimental and first control group consisted of 10 minutes per day for 6 weeks. The experimental group demonstrated a grade-level improvement in silent reading performance of 3.2 months, whereas the control group reported a gain of 0.2 months and the prime control group reported a negative change of 0.2 months.

Langford, Slade and Barnett (1974) employed the NIM procedure in two case studies involving disabled readers. In addition, during a third case study involving a delayed reader, the authors utilized a Prime-O-Tec approach (Jordan, 1967) in which the student read in accompaniment with prerecorded readings employing a tape recorder-earphones procedure. Repeated measures during treatment were used to provide a profile of progress. In each case noticeable gains were recorded in both the rate and accuracy of reading.

Miller (cited in Arnold, 1977) also conducted a case study involving a reading-disabled 9-year old boy with a low average IQ. The NIM was employed daily for 8 weeks in 15-minute sessions. Miller reported a grade level improvement of over 0.5 years growth in oral reading accuracy and over one year's growth in reading comprehension.

Hollingsworth, in his original study, failed to identify superior achievement among regular elementary school readers using the NIM. In a subsequent study, Hollingsworth (1978) employed 20 students assessed in need of remedial help in reading. The number of training sessions was increased from 30 in the original

study to 62 in the second study. The pretest was based on the Gates-McGinitie Reading Tests (Level D, Form 1). Post-test measurement was carried out employing the parallel Gates-McGinitie Reading Tests (Level D, Form 2). Treatment using the NIM was administered for 15 minutes during each of the 62 daily sessions. Children in the control group were provided with equal reading time in their regular classroom. Using a similar tape recorder-earphones technique, Hollingsworth reported a mean score growth of one year in comprehension measures for the experimental group. Comparable mean score change in comprehension for the control group equalled 0.04 years.

Mikkelsen (1981) studied the effectiveness of the traditional NIM procedure compared to the effectiveness of NIM using the tape recorder-earphones technique. Forty-two students from Grades 1 to 8, who were enrolled in a summer remedial reading programme, were divided into four groups. The first group received taped passages using teacher-assigned materials at the pupil's frustration reading level. The second group similarly used taped passages, in this case employing student-selected material at the pupil's independent reading level. The third group read materials with the teacher

in a traditional NIM procedure and the fourth group was a control. Students were pre- and post-tested on alternate forms of the oral reading selection of the Gates-McKillop Diagnostic Test. Remedial sessions were 15 minutes per day, 4 times per week, for 3 weeks.

The most significant gains, an average grade level growth of 3 months, were made by students using the tape recorder and teacher-assigned materials at the student's frustration level. The other experimental groups made little improvement and the control group regressed in performance.

Mikkelsen's results must be viewed with caution. In the first place, Mikkelsen has, in effect, pitted the NIM against the NIM across experimental conditions. The fact that one group using the NIM should show superior achievement perhaps says less about the NIM and more about other constraints under which each group functioned. Further, it would be risky to adopt long-term educational strategies on the basis of 12 short remedial sessions over a brief 3 weeks period.

In summary, in a number of studies,claims of a positive effect from the NIM with reading-disabled children have been made. However, a number of criticisms

have been directed at several of the studies. First, Arnold has challenged the validity of Heckelman's group study on the basis of his failure to employ a control group. Lorenz and Vockell (1979) have challenged studies by Heckelman, Gardner, and Langford, Slade and Burnett. Lorenz and Vockell have questioned the validity of these studies on the basis of expectancy effects transmitted from researchers to subjects. The problems of expectancy of effects and novelty of treatment pertain to all educational research. How long should intervention be maintained in order to allow possible regression to occur and offset the novelty effects of a new treatment? The question bears consideration in light of relatively brief 6-week experimental studies by Heckelman and Gardner.

Hollingsworth (1978) appears to have provided the clearest evidence of effect. However, a risk lies in the introduction of an adaptation to the traditional procedure. To what extent is improvement in the dependent variable of comprehension the product of the NIM, or the product of a tape recorder and earphones? Mikkelsen has circumvented this problem by placing the adaptation in more than one group. However, a satisfactory design requires that a clear comment be made on the

NIM as an independent variable. In brief, the positive studies claiming a NIM effect with reading-delayed children are not solid. The picture is further confused by studies which have demonstrated no significant effect from the NIM.

Arnold (1977) conducted a research investigation to determine the relative effectiveness of the NIM and Language Experience Approach (LEA) with a group of reading disabled students in elementary and secondary school. Students were divided into three groups: a NIM group (N=10); a LEA group (N=13); and a control group (N=9). The children were prescreened for IQ on the Peabody Picture Vocabulary Test (1959) and the Raven's Progressive Matrices (1965). No student was included who scored at an IQ level of less than 80. Students were also prescreened for reading on the reading subtest of the Wide Range Achievement Test (1965). Intervention for the NIM and LEA groups consisted of 15-minute sessions to an average total time of 7 hours. Control subjects remained in the regular classroom programme and were not withdrawn for special treatment. The control group was included as a measure of regression to the mean after the initial screening. During the 3-month experimental period, the

NIM and LEA groups showed the greatest grade level gain of about one year in oral reading. Neither experimental group demonstrated any superiority of effect.

Gibbs and Proctor (1977) selected 39 students of average IQ who had scored at least one year below grade level in reading as tested on the Stanford Achievement Test (Intermediate Level II, Form A). Children were divided into 3 groups: a control group which continued to follow its daily reading programme; Treatment Group 1 which received the NIM using volunteer mothers; Treatment Group 2 which received assistance with regular classroom reading materials from the same volunteer mothers. Treatment sessions lasted for 15 minutes per day over 8 weeks. Post-test measures were taken on the Stanford Achievement Test (Intermediate Level II, Form B) using the Vocabulary, Reading Comprehension and Word Study Skills subtests. Statistical analysis of pre- and post-test results indicated greater differences within the group than between groups. On the basis of their respective results, both Arnold (1977) and Gibbs and Proctor (1977) questioned whether any one remedial reading intervention could be identified as more effective in an absolute sense for all skill deficiencies.

In an effort to gain a perspective on the effectiveness

of NIM with reading-delayed children, Lorenz and Vockell (1979) carried out a study involving 54 students from second through fifth grades whose IQ levels ranged from below to above average. Instructional level of reading ranged from 3 years to 6 months below grade level. Students in the experimental group received the NIM for 10 minutes, 3 times per week, to a total of 6.5 hours. Students in the control group were taught by traditional remedial reading techniques. Pretest and post-test measures were based on the Word Recognition subtest of the Wide Range Achievement Test and the Reading Comprehension subtest of the Peabody Individual Achievement Test. No significant differences were measured in word recognition and reading comprehension between control and experimental groups.

Despite their failure to find statistically significant advantages in favour of the NIM, Lorenz and Vockell have detailed a number of subjectively-assessed benefits of the NIM from instructors involved in the study. Students appeared more confident in their ability to read and were more motivated to pick up reading material of their own volition. Mechanical tracking and left to right progression appeared to improve as did oral expression in the form of better

phrasing and pauses for punctuation.

Judgement on the efficiency of the NIM with reading-disabled children must be suspended. Research studies have produced conflicting results across varying skill areas. Studies favourable to the NIM have been questioned on the bases of methodology and expectancy effects. Moreover, subjectively-assessed benefits of a motivational and mechanical nature have been put forward and require further study for substantiation.

The NIM and Auditory-deficient Children

The NIM has previously been identified as a multi-sensory approach to remedial reading. Arnold (1977) has categorized the NIM into two separate feedback systems. First, the auditory system is stimulated through unison oral reading. Second, the visual, kinesthetic and tactile systems are stimulated as a product of the child pointing to each word as it is read. "The theoretical rationale for NIM is to get the sensory systems working together to focus on correct reading patterns and these patterns will be impressed on the proper neurological system involved in reading" (Arnold, 1977, p.4). What happens when one of the feedback systems, specifically the auditory system, is defective? Superficially at least, the NIM would not appear to be

a viable remedial reading option.

As a component of their study of the effect of the NIM with disabled readers, Lorenz and Vockell included a specific subgroup with auditory disability. The purpose was to assess whether children with an auditory disability would experience any greater or lesser effect from the NIM. The auditory difficulties experienced by this sub-group were problems of auditory discrimination and/or auditory memory or the inability to maintain attention after too much auditory stimulation. The auditory-disabled subgroup revealed no statistically significant differences in performance compared to the reading-disabled group without auditory deficit. The reading-disabled group without auditory deficit failed to demonstrate superior performance compared to the control group.

Heckelman (1966) has recommended the NIM procedure for children with auditory disability. Heckelman, however, suggested a modified NIM approach that involves simultaneous reading along with an echoing procedure in which the student repeats selected phrases read by the instructor. If the procedures established by Heckelman represent the standards against which the NIM is to be assessed, Lorenz and Vockell's results must be

tempered by the fact that they applied the traditional NIM rather than the modified NIM for children with auditory disability.

Cook, Nolan and Zanotti (1980) have provided an alternative opportunity to assess the performance of the NIM under conditions of reading delay, compounded by auditory disability. Subjects in this study experienced a more specific auditory perception impairment. Twenty children were selected for a spring session and 24 for a summer remedial session. Prescreening was based on the Wepman Auditory Discrimination Test (1973) and the Goldman, Fristoe, Woodcock Test of Auditory Discrimination (1970). Subjects were 7 to 14 years of age, at least average in IQ and from 1 to 4 years delayed in reading development.

The subjects were paired in experimental and control groups on the basis of chronological age and IQ as determined by the Slosson Intelligence Test. Pre- and post-test measures were based on the Word Recognition, Oral Comprehension and Silent Comprehension subtests on alternate forms of the Standard Reading Inventory (McCracken, 1966). Children in the spring experimental group received two NIM sessions of 15 minutes duration each week. Children in summer experimental group

received 10 minutes per day of NIM. In both cases the total exposure to NIM was similar at just over seven hours treatment.

Spring and summer experimental groups showed superior gains in oral and silent comprehension. Only the summer experimental group showed superior gain in word recognition. On the basis of word recognition results, Cook et al. (1980) have recommended the use of daily sessions of NIM rather than the twice weekly approach.

Research on the effect of the NIM with auditory-disabled children has been limited in number of studies and conflicting in results. Lorenz and Vockell found no significant benefit. However, they followed the traditional NIM approach rather than Heckelman's suggested modification for the auditory-disabled. Cook et al. (1980) have demonstrated a significant effect in what amounts to two separate studies. However, Cook et al. (1980) similarly opted to use the traditional NIM rather than Heckelman's suggested adaptation. In fact, no citations exist in the literature for research on Heckelman's modified approach for the auditory-disabled.

Modifications of the NIM

Heckelman's adaptation for the auditory-disabled

has been referred to (Heckelman, 1966) as an Echoing Method of neurological impress and represents one of several modifications of the NIM designed to meet varying circumstances. Heckelman also has modified the traditional NIM to accommodate non-readers or severely delayed ones (Gibbs & Proctor, 1982). Heckelman has labelled this modification a Presenting Method of neurological impress (Arena, 1980). The Presenting Method procedures involve four stages: 1) initial repetitive readings of a passage by the instructor; 2) instruction in comprehension as the objective of the reading process; 3) repetition of phrases read by the instructor; 4) simultaneous reading of phrases. Heckelman has claimed (Arena, 1980) success for the Presenting Method equal to the success of the traditional NIM. However, he has presented no research data to support empirical observations.

Gibbs & Proctor (1982) did utilize the Presenting Method of neurological impress for initial reading instruction with two groups identified as potential non-readers. Subjects for the study were drawn from Grades 1 and 2 and were pre- and post-tested during a 6-week session using MacMillan's Series R vocabulary

lists. No significant difference was found at the Grade 1 level between experimental and control groups on accuracy of word recognition. However, at the Grade 2 level, a statistically significant difference was found in favour of the experimental group in word recognition.

Two comments are relevant to Heckelman's modification and the Gibbs and Proctor study. First, the direction of the NIM was altered substantially. The NIM was not designed as a technique of teaching reading, nor was it designed as a method purely directed at word recognition. Rather, it was designed as a method to improve oral fluency in connected discourse for students who were not succeeding in conventional approaches to teaching reading. Second, while Heckelman initiated this modification in delivery as a means of effecting left hemisphere development in young children (Arena, 1980), Gibbs and Proctor have restricted the original intent. Mere word recognition on a pre- and post-test basis is far removed from the true concept of reading as the extraction of meaning from connected discourse.

Strong and Traynelis-Yurek (1983) integrated the NIM with a behavioural reinforcement procedure. Fifty-two children classified as low achievers and enrolled

in Grades 2 through 6, were divided into experimental and control groups in a matched pair statistical design. Subjects were selected on the basis of a score between 70 and 90 on the Otis-Lennon Mental Abilities Test. During the 6-month programme, children in the experimental group received NIM training for 15 minutes per day, 4 days per week. On the fifth day of each week, children in the experimental programme were provided with token or free-time rewards depending on performance earlier in the week. Control subjects were drawn from different schools, remained in a regular classroom reading programme, received no specialized attention and no reinforcement for positive performance.

The confound should be clear. Would improved performance be a response to the NIM or a response to the contingent rewards? Results rendered the question academic. No significant difference was demonstrated in gains between experimental and control groups. Pre- and post-test results were based on the Slosson Oral Reading Test. Mean gain for both the experimental and control groups was 7.12 months. However, according to the Semantic Differential of Attitudinal Survey, children in the experimental group felt overwhelmingly that they

enjoyed reading more (100% of subjects) and read better (83.3% of subjects).

When assessing the non-significance of results, it is important to mention a second deviation in traditional NIM procedure instituted by Strong and Traynelis-Yurek. Instructors read at a normal reading pace on the supposition that the modified oral reading procedure would provide a better bridge to reading comprehension. Cornerstones of Heckelman's approach are variation in the speed of reading and a progressive increase in the speed of reading.

Proponents of the NIM have stressed the technique as a means of developing children's oral fluency. Assessment of comprehension has been deemphasized in order to minimize the anxiety level while the child works to improve his oral fluency. While the logic appears sound, at least in the initial stages of therapy, this approach appears to endorse a somewhat restricted view of the reading process.

The transfer from improved oral fluency to improved silent reading comprehension through NIM has been more implicit than scientifically verified. Tierney, Readance and Dishner (1980) have criticized the NIM on

the basis that it appears to stress the mechanical, psychomotor aspects of reading, rather than the reading-thinking processes that direct those skills. That criticism would appear to be borne out of a psycho-linguistic view of the reading process. Hollingsworth (1978), however, reported a statistically significant improvement in comprehension in his experimental group of disabled readers drawn from Grades 4 to 6. Cook et al. (1983) have also reported superior gains in oral and silent reading comprehension in both their spring and summer experimental groups.

Henk (1983) has outlined a method for adapting the NIM to help improve the comprehension ability of reading-disabled children. Henk has adapted the NIM to a Directed Reading Activity (DRA) which parallels the Presenting Method in the form of the pre-reading of a passage by the instructor. Both adaptations then follow with guided reading and skills development, except in reverse order. After the preview reading in the DRA, children would normally read the passage silently. Henk, instead, has adapted the procedure to have the child or children read orally with the instructor.

Henk's approach raises questions. Two assumptions

are made in this method. First, Henk assumes that the group methodology would be equally effective to the individualized treatment on the NIM. Second, there is an assumption that comprehension from the oral reading process is similar to comprehension stemming from silent reading. Proponents of the NIM have not tackled that issue. More seriously, Henk's description is a testimonial. No empirical or scientific observations have been presented to support the contention that this modified NIM technique works to improve reading comprehension.

Modifications of the NIM have been directed at non-readers, severely-delayed readers, and delayed readers with behavioural difficulties. In addition, a specific modification has been described that more directly addresses the issue of reading comprehension. A clear picture of effectiveness has not emerged on the basis of lack of research data and conflicting results. Proponents of modifications are possibly also in error in assuming that the efficiency of the traditional NIM has been satisfactorily documented.

NIM: Summary

The status of the NIM and modifications of the NIM, as remedial support techniques, would appear to be in question. Hollingsworth's (1970) study supported

Heckelman's contention that the NIM is not a developmental approach for normal readers. However, conflicting results have been reported in studies relating to reading-disabled children and reading-disabled children with auditory deficit. As well, results from modifications of the traditional NIM have been inconsistent.

Some studies favourable to the NIM have been criticized on methodological shortcomings. For example, the effect of the NIM cannot be separated from the novelty effect of tape recorder and earphones in Hollingsworth's (1978) study. In Strong and Traynelis-Yurek's study, the effect of the NIM on children's attitude and perception of their reading cannot be separated from the impact of a schedule of contingent rewards. Guthrie, Seifert and Kline (1978) have suggested that a minimum of 50 hours is necessary for remediation to carry over in the long-term. While this figure would present practical problems in educational research, it is fair to question whether studies of 3 to 6 weeks in duration (Gardner, Heckelman, Mikkelsen) have validity and durability of results.

Some writings (Arena, 1980; Heckelman, 1966; Henk, 1983) have confused testimonials and hard scientific data by which to assess the efficiency of the NIM and

its modifications. Oral fluency has been stressed and, as a result, measurement has been inconsistent across the more important domain of silent reading comprehension. At the same time, however, Lorenz and Vockell and Strong and Traynelis-Yurek demonstrated benefits in attitude, motivation and secondary mechanical aspects of reading that deserve further investigation.

Where statistical analysis of data has been provided in NIM research, results have been reported for the group. The focus of a remedial environment is progress on an individual basis. The averaging of group data obscures the pattern of individual progress (Guralnick, 1978; Hersen & Barlow, 1976). With the exception of the work by Langford, Slade and Barnett, no illustration has been provided in these studies of the pattern of individual progress under the NIM.

The focus of the NIM has been directed at a restricted view of the reading process. Reading is more than the development of facility in oral fluency. The relationship of the NIM to oral fluency in connected discourse and to passage comprehension has not been established. Gibbs and Proctor's (1982) and Cook and Earlley's (1979) endorsement of the utility of NIM as a remedial procedure might ultimately be verified. For

the interim, however, Lorenz and Vockell's (1979) call for further research would appear to be the more prudent course.

Repeated Readings Method

Introduction

Empirical and scientific measures directed at assessing the validity of a theory of repeated readings is more recent. The theoretical basis of the RRM is centered in the reading model of LaBerge and Samuels (1974, 1983) and is most clearly defined in their theory of automaticity in information processing during reading. LaBerge and Samuels' theoretical postulates on the reading process parallel the development of cognitive information processing and recent research on memory and attentional capacity. LaBerge and Samuels (1983) model of reading views the reading process as interactive in nature, involving an interplay between the functions of decoding and comprehension. Comprehension in this case involves the process of extracting meaning from the printed page.

Our attentional capacity and ability to store information in short-term memory is limited (LaBerge and Samuels, 1974, 1983). Attention is an hypothetical

construct. Samuels (1981), therefore, is able to provide only a sweeping definition of attentional capacity as "the energy or effort an individual can exert on a task" (p. 15). For students who are engaged in the feature discovery stage (Samuels, 1981) of letter recognition, or even the unitization stage (Samuels, 1981) of letter or word recognition, attentional capacity is directed toward decoding information (LaBerge & Samuels, 1983). Little or no attentional capacity remains for comprehension. Children who are slow readers have a great deal of difficulty reconstructing text in terms of long-term memory (Ashby-Davis, 1981).

Smith and Holmes (cited in Biemiller, 1977) have speculated that, unless a child reads quickly enough, he or she will not be able to comprehend because the memory system will not be able to organize and retain information input of such fragmented nature. Smith (cited in Biemiller) has speculated on a minimum silent reading rate of 150 words per minute to allow effective organization of material. Biemiller has dissented considerably from Smith's view; however, Biemiller would not place that figure below a minimum of 60 words per minute. Improved speed of identification and, therefore, the number of words read per minute corresponds

to improved comprehension ability (Biemiller). A positive correlation between improved oral fluency, improved silent reading and improved comprehension has also been cautiously supported by Allington (1983), Edwall and Shanker (1983) and Hagedorn and McLaughlin (1982).

It is not a sufficient condition for students to be able to decode accurately (Samuels, 1979). Accuracy is only a desireable intermediate goal in reading. What is required beyond accuracy is repetitive practice and automaticity in reading. At the automaticity stage, reading occurs without conscious effort. Repetitive practice, in theory, produces an automaticity of decoding involving minimal attentional capacity, thereby releasing unused capacity for the process of abstracting meaning (Melton, 1983). Switching back and forth from decoding to comprehension requires considerable attentional capacity. At the automaticity stage of processing, the child achieves the ultimate objective in the reading act, simultaneous decoding and comprehension (LaBerge & Samuels, 1983).

While proponents of repeated readings have attempted to establish a theoretical base in contemporary cognitive psychology, they have attempted also to

establish support at an everyday level. The practice of reading passages repetitively is viewed as analogous to the repetitive practice of skills to the point of automaticity by musicians and athletes (Samuels, 1979). The practice of learning to read through repetition of selected passages has been interpreted in historical context as similar to the practice of learning to read in earlier centuries by the process of repetitively reading Biblical passages (Chomsky, 1978). Additionally, children can take early steps in the reading process through a type of pseudoreading procedure. Children memorize favourite stories read to them over multiple occasions. The children may then make early phonemic-graphemic relationships rather than laboriously attempting to break the code of an unfamiliar passage.

Advocates of the NIM and the RRM subscribe to the simple, yet logical reasoning of Samuels (1983) that the best way to learn to read is by reading. Each procedure is directed at breaking the vicious circle of reading (Biemiller) in which students won't read because they can't read, and can't read because they won't. Concentrated reading in a non-threatening environment (Heckelman, 1969), with a no-fail condition (Chomsky, 1978), is a potential way to break the circularity of

poor reading.

The effect of the RRM has not been clearly established. The procedure, as defined by Samuels, is relatively new. Whereas research on the NIM is currently directed at resolving conflicting results, research on the RRM is directed toward establishing a tentative view of the effect of the procedure. The RRM has been recommended as a supplemental approach for normal developmental readers and reading-delayed individuals. Repetition and control of vocabulary could be of assistance to LD children with an auditory deficit. At this juncture, research assessing the impact of the RRM has been directed at normal developmental readers and the reading-disabled.

The RRM and Regular Readers

Gonzales and Elijah (1975) analysed the reading speed and errors of 26 third grade readers classed as normal developmental readers. The children were provided with the opportunity of multiple oral readings of passages at both their instructional and frustration levels. Students were assessed at between 2.75 and 4.25 in grade level of reading on the basis of their teachers' judgement. Passages were provided of at least 175 words in length. A statistically significant difference was found at both

reading levels in improved speed and reduced errors when the students reread the passages.

Terry (cited in Moyer, 1982) reported improvement in speed and accuracy in a study of college students repetitively reading mirror-image text. After one week's practice, comprehension of new mirror-image text was equal to comprehension from normal text.

The work of Gonzales and Elijah and Terry requires a perspective. Each study appeared to have a similar purpose of assessing the theory underlying the RRM. Specifically, assessment appeared directed at the principle of easier decoding and improved oral fluency through increasing familiarity with text. The authors' studies have not demonstrated that the procedure will, in fact, accelerate the development of normal readers.

The RRM and the Reading-Disabled

Several studies have been conducted in an attempt to assess the impact of the RRM on reading-disabled individuals. However, conflicting results, methodological problems and deficiencies in reporting studies have made it impossible to clearly determine the effect of the RRM from early research.

Chomsky (1978) initiated a repeated readings procedure with five reading-disabled children, 8-years of

age, reading at one to two years below grade level. The children employed a repeated readings, read-along format, using taped stories, until a passage was memorized. Children read silently in accompaniment with the taped stories. At the conclusion of the 3-month experimental period, the children, as a group, demonstrated improved vocabulary and oral reading speed. Chomsky's subjects acted as their own control. Rates of improvement after treatment were compared to below grade level achievement before treatment. No separate control groups were established. In addition, while improvement was measured across sight-word recognition and oral reading speed, comprehension was not assessed.

Neill (1979) reported improvement in reading fluency and comprehension in a study of junior high school students reading from 2 to 7 years below normal. However, limited data has been presented to support the contention that the RRM will improve oral fluency. No data was reported by Neill to support a relationship between the RRM and improved reading comprehension.

Lopardo and Sadow (1982) presented college students enrolled in a corrective reading course with criterion levels of speed, accuracy and comprehension. Overall criterion levels for speed of oral reading and silent

reading were 100 and 200 words per minute respectively. Criterion for word recognition was 95 percent accuracy. Criterion level for comprehension was 60 percent of questions correct. Students were introduced to reading materials at a level determined through prescreening on the Word Recognition subtest of the Wide Range Achievement Test (1965). Students repeated passages at a particular level until each standard of oral reading, silent reading and comprehension was passed successfully. Students then graduated to a higher level of oral and silent reading speed. Lopardo and Sadow, however, have neglected to provide any data by which the study can be objectively assessed.

Dahl and Samuels (cited in Samuels, 1979) identified significant gains in both oral fluency and comprehension in an experimental group of deficient elementary school readers in comparison to results for a control group. Moyer (1982) reported on the successful rehabilitation effect of repeated readings in the case of a 30-year old man who had suffered a severe loss of reading ability as a result of a cerebrovascular accident. During a 16-month post-operative training period, the subject was able to reacquire a rapid speed in identifying high-frequency words in isolation. After a further

12-week training period using the RRM, the subject demonstrated a 40 percent to 50 percent improvement in oral fluency with connected discourse. Moyer's reported findings did not, however, extend beyond oral fluency to the area of reading comprehension.

Modifications of the RRM with the Reading-Disabled

Repeated readings are characterized by a simplicity of approach and have been adapted for evaluation at the level of computer-assisted instruction. Carver and Hoffman's (1981) study of 12 reading-disabled students at the ninth and tenth grades suggested a rather mixed assessment of repeated readings in a computer mode. Carver and Hoffman indicated that the effect of repeated reading practice transfers to new material when a similar type of repeated reading task is performed. Results have provided limited support for the notion that the gains of repeated readings practice transfer to general reading ability. Additionally, Carver and Hoffman suggested that the value of repeated readings has an age dimension. Students below the Grade 5 level who were in the process of skill development appeared to benefit more from repetitive practice compared to students above Grade 5 who were reading for meaning, rather than developing decoding skills.

Carver and Hoffman's challenge to the generalizing effect of repeated readings across conditions is important. However, the methodology employed by the authors casts doubt on the validity of their results. During a passage of 100 words, students were presented with 20 instances in which they were required to select the appropriate word from an item choice. This item choice, every fifth word, purportedly measured the student's comprehension. The use of this technique to measure oral fluency makes the approach suspect. This procedure appears contrary to the stated purpose of producing a fluidity in reading through repetitive practice. Moreover, conflicting results on the pre- and post-test instruments employed, National Reading Standards and Gates-McGinitie Reading Tests, have caused the researchers to express concern about the standardized assessment measures in their design.

The RRM: Summary

The RRM has been employed as a supplemental approach for the development of normal readers and reading-delayed individuals. The principles of controlled vocabulary and repetition have been established as cornerstones of the RRM. Studies by Gonzales and Elijah and Terry have assessed the theory of repeated readings rather than the

developmental impact of the RRM with normal readers. Studies of the effect of the RRM on disabled readers have been characterized by inadequate and conflicting results. The ability of the RRM to generalize in effect across ages and situations has been challenged.

The underlying theory of the RRM has been based on the interrelationship between attentional capacity, automaticity in decoding, improved oral fluency and improved reading comprehension. The relationship between the RRM, improved oral fluency and improved silent reading comprehension has been implicit rather than widely assessed. Chomsky, Gonzales and Elijah, Moyer, and Terry neglected this aspect while the studies by Carver and Hoffman, Lopardo and Sadow, and Neill failed to provide clearly demonstrated evidence of effect.

Biemiller has indicated that speed of identification is important in overall reading rate and positively correlated with comprehension on simple passages. Jenkins and Heliots (1981) concluded that explicit vocabulary practice does not affect performance on overall passage comprehension, but that instruction which improves oral reading rate does affect passage comprehension. What exact relationship could exist

between improved oral fluency, through the RRM, and improved comprehension from silent reading? Virtually all reading and, therefore, the most common source of comprehension, is silent reading. Allington (1983) has described the relationship between oral fluency and silent reading comprehension as ambiguous and indirect. The answer for the RRM is still imprecise and any opinion seeks a weight of evidence.

Not all researchers have accepted the apparent simplicity of logic in Samuels' theory of repeated readings. Schreiber (1980) has questioned why such apparently impressive gains in speed and accuracy should occur across successive new reading samples. The precise reading skills acquired through the RRM have not been delineated (Otto, 1983). The process has not been defined through which the generalization of new skills occurs across passages that Samuels (1979) proposes of 50 to 200 words in length.

Schreiber has presented an alternate direction to the RRM though, at the same time, not rejecting the role of repeated readings in helping to develop an increasingly automatic sight vocabulary. Schreiber, however, proposes that the generalization of skills in the RRM comes

through an understanding of syntax and prosodic cues that are more evident in spoken language, but poorly evidenced in written language. As a child repetitively reads controlled selections, a familiarity develops with prosodic features of intonation, stress and duration. Smith (1979) has demonstrated that oral previews of a passage help to improve LD children's oral reading speed and accuracy. An obvious suggestion is that the children are helped to better recognize certain sight words. An alternative proposal would be that the passage makes more sense with the provision of a structure and prosodic cues that are not as clearly present in the written text. In summary, Schreiber's theoretical base for the possible success of the RRM rests more in a development of a sense of structure in written language and less in the development of a mechanical skill of word recognition.

The tone of early research on the RRM has been positive in relation to its impact on oral fluency and its implied effect on comprehension ability. However, studies have not been satisfactory in consistency of results, precision of reporting and scope of skills assessed. In addition, the theoretical base of the RRM has not been universally accepted. Lorenz and Vockell's call for more research on the NIM would appear

also to be a prudent course for researchers and practitioners interested in the RRM.

The Combined NIM-RRM

The NIM and RRM, as originally defined by Heckelman and Samuels, are primarily oriented toward the improvement of children's fluency in terms of a quicker rate of reading and fewer errors of recognition. Proponents of the NIM emphasize an approach to good oral fluency through the modelling of good reading and through the input of massive amounts of information in order to avoid boredom (Heckelman, 1966, 1969). Within the RRM the path to good oral fluency lies in the repetition of a selected number of passages read by the child. Boredom is avoided by charting the improvement of performance over repeated measures (Neill, 1980; Samuels, 1979).

Attempts at blending the two procedures have been scant. Heckelman's Presenting Method of neurological impress for non-readers or severely-delayed readers includes a repetitive component in the oral previews by the instructor and in the Echo Phase (Gibbs & Proctor, 1982) of phrase development. Any overlap between the NIM and RRM found in the Presenting Method was unintentional on Heckelman's part. Gibbs and Proctor's (1982)

assessment of Heckelman's modification to the traditional NIM produced mixed results in what amounted to a simple word identification exercise. Arena (1980) contended that the Presenting Method is "as effective or even more effective than the NIM with young children" (p. 494). However, neither Arena nor Heckelman have provided objective data by which to support such a contention.

Lauritzen (1982) has constructed a bridge between the NIM and RRM. At the same time a group dimension has been added to each technique. Initially the teacher models the reading of a passage, followed by the children echo reading selected lines, sentences or paragraphs. Finally, the teacher and students read the entire passage together. The group procedure is designed to offset potential boredom from repetitive one-to-one exposure. Motivation, especially in the RRM, comes in the form of a graph of individual progress. Plotting and checking are, however, time consuming for the teacher. Motivation in this combined technique is based on the careful selection of appealing reading material.

Lauritzen has synthesized the NIM, Presenting Method of NIM, and the RRM. The group methodology is

important in searching for cost-efficient methods of remedial delivery. Maintaining student interest during remediation is an issue of central importance. Unfortunately, again, no data was presented by which to assess the efficiency of the procedure.

The NIM and RRM have a similar primary objective of influencing the development of oral fluency. A combined NIM-RRM is characterized by an integration of modelling, repetition and controlled vocabulary. For the combined NIM-RRM, no conflicting studies require resolution. Nor has any weight of evidence been established on the effectiveness of the procedure. The combined NIM-RRM is at an elementary stage of scientific investigation. An initial study is required from which to establish a preliminary supposition of effect and direct future research.

Chapter 3: Experimental Design

This study was divided into two parts. First, children who represented poorer and better readers were measured in order to assess the null hypotheses of no performance difference across skill areas. Second, a group of poorer readers was selected for a remedial reading study. The purpose of the study was to measure the relative effectiveness of the NIM, RRM and a combined NIM-RRM across skill areas in reading and levels of reading ability.

Experiment 1

Method

Subjects

Forty children were drawn from Grades 3,4 and 5 of a public elementary school in a small town in the southern interior of British Columbia. Twenty subjects represented the poorest readers from the three grades while the remaining 20 subjects, matched by grade level, represented the best readers. Prescreening for selection to this group was based on prior school results on the Gates-McGinitie Reading Tests (1976), as well as the recommendation of teachers, learning assistant and principal. In four cases children were new to the

school and prescreening was based on records from the previous school, as well as the recommendation of the teaching staff in the current school.

The average age of the poorer reading group was 118.0 months (S.D.=12.4) and the composition included 12 male and 8 female students. The average age of the superior reading group was 114.8 months (S.D.=9.2) and the composition included 9 male and 11 female students. In all cases English was the first language of the student. In no cases did any student demonstrate a serious mental or emotional disability.

Instrumentation

Inferior and superior readers were measured across a number of skills and abilities related to reading and cognitive processing. These skills and abilities were: oral reading speed measured in the number of words read per minute (WPM); oral reading accuracy measured in the number of errors for every 100 words read; silent reading comprehension; letter identification speed; counting speed; attentional and memory capacity.

Oral reading speed and oral reading accuracy were assessed using selected passages from the Classroom Reading Inventory, Form A, (Silvaroli, 1976). Silent reading comprehension was measured using the

Gates-McGinitie Reading Tests, 1976, Form 2, Levels C and D. The Gates-McGinitie Reading Tests are widely-recognized instruments used to assess vocabulary and comprehension and possess high degrees of content validity and reliability.

For speed of letter identification, subjects were presented with the letters of the alphabet randomly typed on a plain white page of paper. In order to assess counting speed and attentional and memory capacity, the Counting Span Test (Case, Kurland & Daneman, 1979) was employed. No validity and reliability information have been provided for the Counting Span Test.

Procedure

All subjects were measured individually, during regular school hours, in a separate room which offered no distractions. Poorer readers were assessed during the week prior to the start of Experiment 2. Superior readers were assessed after the poorer readers had been measured and screened for inclusion in Experiment 2, the remedial reading study. For superior readers, the average length of test session was approximately 35 minutes. For poorer readers the average length of test session was approximately 45 minutes.

Children were requested to read orally 4 passages

from the Classroom Reading Inventory, Form A. Passages totalled 476 words and were assessed at a Grades 2 through 6 level of reading difficulty. Four children from the poorer reading group completed only two of the four oral passages. These samples totalled 198 words and were assessed at a Grades 2 and 3 level of reading difficulty. The administration of more than two oral passages to these children would have been frustrating to the subjects and counter-productive.

The level of difficulty for all test passages, during both experiments, was assessed using the Fry readability formula and a revised Fry readability formula (Kretschmer, 1976). Kretschmer's revision of the Fry formula measures passages on the average number of sentences and syllables in selected 100-word passages. However, Kretschmer reduces the value of a number of easily-recognized, polysyllabic words to the value of a monosyllabic word. The net effect is to provide slightly lower readability levels than the original Fry procedure. The focus of readability assessment is on word and sentence complexity. The formula does not tackle the issue of surface structure and deep structure in the meaning of a passage (Ollila, personal communication, March, 1984).

Multiple oral readings were provided for two reasons.

First, children were being assessed by an unfamiliar examiner in a subject area in which they had achieved little success. If a positive regression effect were to occur during reading, multiple readings could provide the best opportunity. Further, multiple oral readings were provided by virtue of the fact that children's oral reading strategies vary with materials employed and a variety of passages provides potentially more information about a child's reading abilities (Kibby, 1979).

The nature of a word recognition error is a valid question. Errors can be strictly interpreted as any deviation from the script presented. However, mistakes of recognition have also been classified as miscues (Goodman & Burke, 1980) with varying degrees of significance depending on semantic preservation. For purposes of standardization, any uncorrected deviation from script was classified as a word recognition error. Such errors included additions, omissions, repetitions, substitutions, mispronunciations, reversals and situations in which children failed to follow punctuation and ran sentences together. However, for the purpose of daily reading, the argument is acknowledged that miscues do have a degree of severity based on semantic continuity in the passage.

For the purpose of letter processing speed, the subjects were requested to read, as quickly as possible, the letters of the alphabet. The letters were typed randomly on five lines and the subjects were requested to read the letters as if they were reading the lines of a book. Subjects were timed by stopwatch and performance was recorded in the number of seconds to complete the task.

Speed of counting was assessed using the first part of the Counting Span Test. Children were presented with a series of eight cards, red in colour, measuring 28.0 cm x 21.5 cm. On each card were a varying number of white squares measuring 2.5 cm x 2.5 cm. The total number of squares was 50. Subjects were asked to count the total squares as quickly as possible and indicate their answer. Performance was measured by stopwatch and results were recorded in speed and accuracy of processing.

The second part of the Counting Span Test was used to assess attention and memory capacity. Children were shown a set of cards ranging in number from one to six in the set. Each card contained a varying number of red squares, measuring 2.5 cm x 2.5 cm. In addition, each card contained a varying number of distractor

squares of the same size, but yellow in colour. Subjects were given five practice trials in order to familiarize them with the procedure and in order to detect any gross problems of visual discrimination. Subjects counted the number of red coloured squares on each card and indicated their answer. The number of red squares varied from two to nine per card. Incorrect answers required a recounting on the card. Subjects were required to remember the number of squares on each card in correct series. The entire test consisted of 30 sets of cards.

Hypotheses

In summary, five domains were assessed that varied from more specific reading skills to a cognitive processing dimension. These domains were: oral reading speed; oral reading accuracy; letter processing speed; counting speed; attention and memory capacity. The purpose of assessment was to test the null hypotheses of no performance differences between poorer and better readers.

Experiment 2

Method

Subjects

For the purpose of a comparison of the NIM, RRM and the combined NIM-RRM, 14 of the 20 poorest readers from

Experiment 1 were selected. Selection was determined primarily on the basis of need through consultation with the principal and staff. The 14 poorer readers were divided into three groups of 6, 4, and 4 subjects respectively. Division into the three groups was based on the Gates-McGinitie Reading Tests (1976) used as a pretest, four oral reading passages, chronological age and consultation with the principal.

Group 1 was composed of 6 male subjects enrolled in Grade 5. The average age of the group was 119.5 months (S.D.=5.62). Average T-score on the pretest of vocabulary and comprehension was 45.2 (S.D.=3.76). The average speed of oral reading, based on four passages, was 57.5 WPM (S.D.=7.67). The average number of oral reading errors per 100 words read was 6.25 (S.D.=4.41).

The original intention was to randomly assign one subject to each experimental condition and the control condition. However, the six male subjects matched closely and all were included in the study in the event that any subject should be lost to the group during the experiment. All subjects in the group completed the programme.

This group represents a lower priority level in

the delivery of remedial services. The NIM and RRM are procedures that do not require specialized training. The intent in including this group was to measure the effectiveness of the NIM and RRM with children who required more of a booster-treatment than intensive remediation.

Group 2 consisted of 3 males and 1 female, enrolled in Grades 3 and 4, with an average age of 108.5 months (S.D.=6.18). Average pretest T-score on vocabulary and comprehension was 42 (S.D.=2.55). The average speed of oral reading, based on four passages was 36.0 WPM (S.D.=10.52). The average number of oral reading errors per 100 words read was 17.7 (S.D.=5.55).

Group 3 was composed of 2 males and 2 females, enrolled in Grades 4 and 5, with an average age of 133.3 months (S.D.=9.34). Average pretest T-score on vocabulary and comprehension was 33.75 (S.D.=6.10). The average speed of oral reading, based on two passages, was 22.35 WPM (S.D.=11.36). The average number of oral reading errors per 100 words read was 17.15 (S.D.=5.57).

Each remedial group presented a measureably different character ranging from children who were marginally delayed in reading development to children who were severely delayed. The intention was to measure the

efficiency of the NIM, RRM and combined NIM-RRM over a range of conditions.

The original experimental design called for control of the variable of sex within each group. Biemiller (1977) reported that it took boys longer to recognize letters, words and words in context. It was possible to control for sex in Group 1 without yielding control of other variables. That control was not available for candidates to Groups 2 and 3. However, on a purely empirical basis, as children in Groups 2 and 3 struggled to improve their efficiency in the reading process, differences in sex appeared inconsequential.

Within each group children were randomly selected by lot to the control condition or one of three experimental conditions. In group 1, containing six subjects, two subjects were randomly selected to the NIM and two subjects were randomly selected to the RRM. Both the treatment condition and the subject were selected by lot and paired. Under alternative random selection outcome, two children in Group 1 could have been selected to the control or combined NIM-RRM conditions.

Instrumentation

Subjects were pre- and post-tested on silent reading

comprehension ability using the Comprehension subtest on alternate forms of the Gates-McGinitie Reading Tests (Levels C and D), Canadian Edition, 1976. Alternate forms of the test are constructed to provide the same result in both Vocabulary and Comprehension subtests (personal correspondence, Nelson Canada Ltd., November, 1984).

Pre- and post-test measures of oral reading speed and oral reading accuracy were based on passages drawn from the Classroom Reading Inventory (Silvaroli, 1976). The passages employed as a pretest were the same passages used in Experiment 1 to measure differences in oral fluency between poorer and better readers. Subjects in Groups 1 and 2, representing marginally and moderately-delayed readers, were provided with four oral passages drawn from Form A of the Classroom Reading Inventory. The passages totalled 476 words and were assessed at Grades 2 to 6 in level of readability, based on a revised Fry formula. Subjects in Group 3, representing severely-disabled readers, were provided with two oral passages from Form A, totalling 198 words and assessed at Grades 2 to 3 reading level.

Post-tests of oral reading speed and oral reading accuracy were carried out on two separate occasions using

the Classroom Reading Inventory (Forms B and C). Students in Groups 1 and 2 were provided with four oral passages of 472 and 428 words respectively. Passages were assessed at Grades 2 to 5.5 and Grades 2 to 6 respectively. Children in Group 3 were provided in each post-test session with two oral reading passages of 197 and 200 words respectively. Passages were assessed at Grades 2 to 3 and Grades 2 to 4 respectively.

The Classroom Reading Inventory is one of a number of informal reading inventories used to quickly assess a child's capability in varying reading skills. No measures of validity and reliability are provided for the test. Therefore, each passage was carefully assessed on the revised Fry formula in order that pre- and post-test passages be as parallel as possible in difficulty.

During the treatment phase, subjects were assessed on repeated measures of oral reading speed, oral reading accuracy and silent-reading comprehension using the Basic Reading Inventory, Forms A, B, C (Johns, 1981a). Each passage was a standardized 100 words in length, supplemented by 10 comprehension questions. Subjects in Group 1 were assessed on passages at the Grades 4 and 5 level while subjects in Groups 2 and 3 were assessed on passages at the Grades 2 and 3 level. Passages

presented on the Basic Reading Inventory have been assessed for readability on the traditional Fry readability formula. No information has been provided on validity or reliability for the Basic Reading Inventory.

Two weeks after the end of treatment, an informal questionnaire was given to staff members who had instructional contact with any of the subjects receiving remedial reading treatment. Two questions were asked of the staff member regarding the child. First, the teacher was asked to indicate whether, in his or her opinion, the subject read "no better", "somewhat better", or "noticeably better". Second, if the teacher indicated that the student was reading better, the teacher was asked to provide tangible evidence on which this determination was based.

The staff members also were asked to pose two questions to the subjects. First, the subjects were asked if they felt themselves to be "no better", "somewhat better", or "noticeably better" as readers, compared to the beginning of the term. Second, the subjects were asked if they read more compared to the beginning of the term. No mention was made in the questionnaire of their involvement in a remedial reading programme. All comparisons were made on a time

basis to the beginning of the school term.

Procedure

General Procedure

This research study involved a total of 13 weeks during the Fall term. The first week was directed at pretesting and selecting the 14 subjects who would be involved in the experimental study as poorer readers. The intervention phase of treatment involved 10 weeks, while the final two weeks were directed at post-test measures and administration of the questionnaire.

All subjects received 40 remedial sessions on an individual basis at the same time each day. Absenteeism and the occasional disruption in the school schedule account for the average of four sessions each school week. Remedial sessions were 15 minutes in length. This length of session conforms to Heckelman's standard in the traditional NIM. Gardner employed 10-minute sessions while Lorenz and Vockell utilized 30-minute sessions. Heckelman, during his initial group research in 1962, employed 15-minute sessions and the majority of studies on the NIM have adhered to this schedule. No similar time recommendation for length of treatment sessions has been suggested for subjects experiencing

the RRM. Each subject, therefore, received 10 hours of individualized remedial instruction. Heckelman (1969) has recommended a total treatment time of 8 to 12 hours.

All sessions took place in a separate room that was brightly-lighted, quiet and afforded privacy. Students were scheduled during the day at a time when they normally had their reading class or a class with a reading component, such as social studies. All testing and treatment sessions were administered by this author. The sole exception occurred when the teaching staff administered a brief questionnaire to the students regarding their perception of their reading and the amount of reading they were doing at the conclusion of the programme.

One of the cornerstones of the RRM has been the provision for children to select their own reading material on which to practice (Samuels, 1979). The purpose is to avoid neutralizing any potential positive effects of repetitive practice as a result of exposing the student to passages that are uninteresting. While Heckelman makes no comment on the matter, the same logic would appear to apply to the NIM and combined NIM-RRM. Therefore, children in each experimental condition, and also in the control group, were encouraged to select

materials of their own choice.

A small library, covering a range of topics, was available in the remedial room. In addition, children were encouraged to draw on book resources in the school library and at home. Materials of questionable readability were assessed on the revised Fry readability formula. If the readability level appeared to be too difficult, subjects were encouraged to select an alternative reading.

During the research study, four independent conditions of treatment were imposed: the NIM; the RRM; a combined NIM-RRM; a control condition. The effectiveness of each condition was measured through the dependent variables of oral reading speed, oral reading accuracy and silent reading comprehension.

The nature and instruction of reading comprehension have been brought into sharp debate by the writings of Durkin (1978/1983). Barrett (cited in Guszak & Hoffman, 1980) has identified five desireable levels of comprehension: literal recognition and recall of details; reorganization of explicit information; inferences; evaluation; appreciation. The Gates-McGinitie Reading Tests and the Basic Reading Inventory were selected because they incorporate some of these elements in their

assessment of comprehension. Passages from the Gates-McGinitie Reading Tests assess both literal and inferential comprehension. Each passage from the Basic Reading Inventory is accompanied by 10 questions, including 5 questions on literal comprehension, 2 questions on inferential comprehension, 2 evaluative questions and 1 question on word meaning.

Through the course of treatment, other variables were constructed as uniformly as possible. Uniformity was achieved across the variables of instructor, location of treatment, length of session and number of sessions. Reading passages were drawn essentially from the same pool of materials. Each student was provided with at least one graph of his or her performance for motivational purposes. Finally, every subject within a reading group received exactly the same 100-word passage on repeated measures during treatment.

The purpose of the post-treatment questionnaire was to provide some assessment of the practical criterion (Murphy & Bryan, 1980) or clinical significance (Hersen & Barlow, 1976) of treatment. While statistical or graphic demonstration of effect is important, in a remedial environment particularly, the most important

practical criterion is the extent to which a child is able to function at an expected level after treatment (Murphy & Bryan).

The weakness of a questionnaire lies in the potentially subjective nature of the assessment. The solution lies in identifying criteria by which to measure the practical effect of treatment. Criteria employed to guide the teaching staff in their assessment included: subject more willing to read in class; subject achieving better marks in reading or in class work involving a reading component; subject more willing to pick up a book and read; subject now taking more books out of the library; subject now demonstrating an improved quality of reading, suggesting comprehension, as reflected in the presence of prosodic features of pitch, stress and juncture.

The NIM

Subjects randomly selected to the NIM followed the traditional procedure as described by Heckelman (1966). The principles adhered to from the traditional NIM were: proper seating position; massive amounts of reading; variation in oral reading speed; word-finger-eye-coordination; a general developmental increase in reading speed; improvement in word accuracy; and avoidance of

comprehension assessment.

The instructor and the subject orally read passages simultaneously, consistent with the procedure prescribed by Heckelman for the NIM. The instructor sat on the child's left side, slightly to the rear, and directed his voice into the child's left ear as each read in unison. The purpose of each daily session was to simultaneously read as much printed material as possible within the allotted time.

During the introductory stage of therapy, Heckelman prescribes that the instructor might read at a rate slightly ahead of the student. However, as the child gains confidence, he or she might read at a pace equal to, or even slightly ahead of, the instructor. During the initial stage of this study, the instructor attempted to follow Heckelman's recommended procedure. However, the result was a confusion and awkwardness of reading, much like an attempt to talk while hearing one's own voice by delayed auditory feedback. As a result, the objective quickly became precise simultaneous reading.

Similarly, during early therapy, the instructor's voice level dominated until the child gained confidence in his own oral fluency. Voice level posed no confusion.

As a result, after the initial stage of therapy, instructor and subject alternated in dominant voice during reading.

At the same time as oral reading practice was occurring, the instructor was directing the student's finger to track each word as it was read. Again, as the child gained confidence in his own fluency, he or she came to track each word independently. The precise coordination of word, finger, and eye was essential in order to achieve accurate word identification and also to convey the natural flow of the reading process. Heckelman interpreted finger-tracking as the vehicle through which the visual, kinesthetic and tactile components of reading are developed.

Acceleration of the pace of reading by the instructor was also important during therapy in order to extend the child's rate and volume of reading. Variation in the pace of reading was instituted in order to assist the child to develop his own pattern of oral reading rather than merely reflecting the instructor's style.

Proponents of the NIM initially have stressed the development of a flow of reading rather than word accuracy. While secondary in importance during oral reading practice, word accuracy was important during reading

and was given a position of equal importance during pre- and post-testing and on repeated measures.

Parallel to the emphasis on oral reading speed was a deemphasis on comprehension. While subjects volunteered information relevant to a passage, the instructor did not solicit information in order to avoid any pressure that might have affected the quality of oral fluency. In addition to volunteering information supplemental to the text, subjects were permitted at any time to ask for a clarification of pronunciation and meaning of words.

After each of the six repeated measures of oral reading speed, word accuracy and silent reading comprehension, the subject's performance was plotted on a graph. The primary purpose of the graph was as a motivational tool. The child received his own copy of the graph to show to his teachers and parents.

The RRM

Subjects randomly selected to the RRM were encouraged to select their own passages that ranged from 50 to 275 words in length. Samuels (1979) suggested passages of 50 to 200 words. Only the marginally-delayed readers of Group 1 selected the longer passages over 200 words.

The instructor orally previewed each passage for

the subject. D. Smith (1979) demonstrated that reading-disabled children improved their rate of reading and decreased their errors as a result of an initial preview and modelling of the passage. After the preview, the subject was then presented with three options: practice orally reading the passage; practice silently reading the passage; an attempt to achieve criterion levels of oral speed and accuracy. After each option was completed, the same options were again presented to the child.

Initial criterion levels on oral speed and accuracy were established for each subject on the basis of pre-treatment performance on the oral passages from the Classroom Reading Inventory. If a child did not successfully achieve criteria, he or she was presented once again with the three options of oral practice, silent practice or another attempt at criteria. If a subject did successfully achieve criteria, performance requirements on the subsequent passage were increased by 5 WPM in expected oral speed and decreased by one in the number of permissable errors per 100 words read.

The highest level of oral accuracy demanded of any student was no more than two errors for every 100 words

read. The general oral reading speed objective for Group 1 was to achieve greater than 100 WPM with minimal errors. The general objective for Group 2 was to achieve between 60 and 100 WPM with minimal errors, while for Group 3 the general objective was to achieve at least 60 WPM with minimal errors. Every attempt at criteria was plotted on a chart of daily performance. In addition, the six repeated measures of oral speed, oral accuracy and silent reading comprehension were recorded on a separate graph. Therefore, each child in the RRM had two motivational graphs based on daily performance and achievement on repeated measures.

The Combined NIM-RRM

Students randomly selected to the combined NIM-RRM were similarly encouraged to select their own passages ranging from 50 to 275 words in length. The instructor, similar to the RRM group, orally previewed the selected passage. The instructor and the subject then simultaneously read the passage repetitively. The subject was given the choice of selecting whose voice would dominate and whose finger would track the words.

After any reading of the passage, the student was entitled independently to attempt to achieve

criteria on oral speed and accuracy. Initial criterion levels were established also on the basis of pre-treatment performance on the oral passages from the Classroom Reading Inventory. If the subject was unsuccessful on either criterion, the instructor and child returned to simultaneous repetitive reading of the passage. Change in criterion levels of performance duplicated the procedure for subjects in the RRM. Success on a trial resulted in an increase of 5 WPM on the next criterion level. Similarly, allowable errors were decreased by one for every 100 words read to a base of two word errors per 100 words read.

General oral fluency objectives were the same as the desired levels in the RRM group. Group 1 aimed at greater than 100 WPM with minimal errors. Group 2 attempted to reach between 60 and 100 WPM with minimal errors while Group 3 attempted to reach at least 60 WPM with minimal errors. Similarly, all children in the combined NIM-RRM had a graph of daily performance on criteria attempts as well as a graph of performance on repeated measures.

Control Procedure

Subjects randomly selected to the control condition engaged in two activities. During some

sessions students identified word lists drawn from the revised Dolch Word List (Johns, 1981b). The revised Dolch list contains 226 words compared to the original Dolch list of 220 words. Johns' revised list was derived by deleting 31 words not currently considered to be in as common usage as Dolch considered. In their place, Johns has added 37 words that are more current in usage, used frequently in the earliest grades and found commonly across basal reading series published since 1970. Subjects were timed by stopwatch on each list and an individual chart of progress was maintained during the study.

The identification of sight word lists would have provided a valid control condition. However, when children are released for an experimental programme on remedial reading, the educational expectation, and justifiably so, is that the children will be reading and that all will improve. In order to fulfill an educational expectation, children in the control condition also spent time reading.

The subjects selected stories of interest to them and read without assistance, except for words that provided difficulty and obstructed the flow of the passage. At the beginning of the following session, a

list of sight words that caused difficulty the previous day was presented for review. At intervals the entire 15-minute session was directed at reviewing problem sight words that had accumulated over several days.

In summary, the control condition was a blend of sight-word identification and reading by the student. However, at no time was the flow of reading assisted by the instructor. For motivational purposes speed of identification of word lists was recorded and compared independently for each control subject. In addition, control subjects were also given a graph of progress on repeated measures of oral reading speed, accuracy and silent reading comprehension.

Hypotheses

Experiment 2 was directed at the assessment of four hypotheses. Expressed as null hypotheses, they are:

1) No performance differences would occur across reading skills in a comparison of subjects in the experimental conditions of the NIM, RRM and combined NIM-RRM.
2) No performance differences would occur across reading skills in a comparison of subjects in the experimental and control conditions.

3) No performance differences would occur across reading skills in a comparison of the three reading level groups.

4) No performance differences would occur in a comparison of achievement across the skill areas of oral reading speed, oral reading accuracy and silent reading comprehension.

Summary

Experiments 1 and 2 overlapped in subjects, instrumentation, procedures and, in a general sense, the investigation of the reading process. On a more specific level the focus of each experiment was different.

Experiment 1 was constructed to provide generalizations on a group basis about skill and ability differences between poorer and superior readers. Skills specific to reading were oral reading speed, oral reading accuracy and silent reading comprehension. Abilities related to the cognitive domain were processing speed and attentional and memory capacity. The purpose of Experiment 1 was to assess the null hypotheses of no difference in these skill and ability areas in a comparison of poorer and superior readers.

Experiment 2 was constructed to provide an evaluation

of the NIM, RRM and combined NIM-RRM as remedial procedures for delayed readers. The purpose of the experiment was to assess the impact of each procedure on the individual subject, across differences in level of reading disability, and across the reading skills of oral speed, oral accuracy and silent comprehension. Because of the differences in focus and design between experiments, the derived data were suited to different techniques of recording and analysis.

Chapter 4: Results

Data collection and analysis were directed at two different comparisons. First, null hypotheses of no performance difference were assessed in a comparison of poorer and better readers across reading skills and cognitive abilities. Assessment of the null hypotheses on a group basis, using inferential statistical analysis, represented a suitable procedure. Results indicated statistically significant differences in oral fluency, silent reading comprehension, letter processing speed and attention and memory capacity. Statistically significant differences did not extend on a general processing level to counting speed.

Second, null hypotheses of no performance difference were assessed in a comparison of three experimental remedial reading treatments and a control condition. Performance was measured across reading skills and reading ability levels. The experimental design in this instance reflected a remedial learning situation. As a consequence, the individual profile represented a more appropriate analysis and representation of data. Results indicated a significant difference in performance between the NIM, RRM and combined NIM-RRM.

Control subjects also performed at levels equal to the most effective experimental procedures, the NIM and combined NIM-RRM. In addition, treatment effects had greatest impact on the less seriously delayed subjects and greatest impact on oral reading speed and silent reading comprehension.

Experiment 1

Data Collection and Analysis

Data was collected for poorer and superior readers on both a group and individual basis. Data on vocabulary and silent reading comprehension was derived from a group assessment using the Gates-McGinitie Reading Tests. Information on oral reading speed and accuracy, processing speed, and attentional and memory capacity was obtained through individual testing of the 40 subjects.

Raw score performance on the Gates-McGinitie Reading Tests was converted into standard T-score units for each subject. Performance across multiple oral readings was measured in WPM for oral rate and reading errors per 100 words read for oral accuracy. The multiple oral reading scores on speed and accuracy were averaged for each subject.

Speed of letter processing was recorded in seconds on an individual basis. Errors of letter processing were recorded also on an informal basis as a potential indicator of more deep-seated reading problems. Speed of counting was measured in seconds and subjects' correct or incorrect answers were informally

tabulated. Performance on attention and memory capacity was recorded as the number of sets correct of a total possible 30 sets.

Group means and standard deviations were calculated in each skill and ability category for the poorer and superior reading groups. Because of the small size of the samples, 20 in each group, assumptions of normality and homogeneity of variance required for parametric analysis (Hinkle, Wiersma & Jurs, 1979) could not be met. Therefore non-parametric analysis of results was employed. The Mann-Whitney U-Test was applied to subjects' scores in order to determine statistically significant differences between the groups. The Mann-Whitney U-Test compares individual results and is sensitive to both the central tendency and distribution of scores. It is recommended (Hinkle et al. 1979) as a viable alternative when assumptions underlying the t-test cannot be adequately met.

Results

The mean oral reading speed for the 20 poorer readers was 50.9 WPM (S.D.=25.1). For the 20 superior readers, the mean oral reading speed was 115.6 WPM (S.D.=20.0). The difference between scores in the two reading groups

was significant at $p<.001$.

The mean oral reading errors for every 100 words read was 10.2 (S.D.=7.3) in the poorer reading group. For the superior reading group, mean oral reading errors for every 100 words read was 2.9 (S.D.=1.6), ($p<.001$).

The mean pretest T-score for vocabulary and comprehension combined was 43.8 (S.D.=6.5) for the poorer reading group. The superior reading group scored a mean of 64.7 (S.D.=4.9), ($p<.001$). For the poorer reading group, the mean pretest T-score purely on silent reading comprehension was 42.7 (S.D.=6.3). For the superior reading group, the mean pretest T-score on silent reading comprehension was 63.5 (S.D.=5.28), ($p<.001$).

The mean speed in seconds required to identify randomly typed letters of the alphabet was 18.6 (S.D.=4.7) for the poorer reading group. The mean speed in seconds required by the superior reading group was 14.7 (S.D.=2.7), ($p<.01$).

The mean speed in seconds required to count the squares on the Counting Span Test was 36.7 (S.D.=9.6) for the poorer reading group. For the superior reading group, the mean speed in seconds was 31.7 (S.D.=6.4). The difference in group scores was not statistically significant at $p>.10$. In each group, 9 out of the 20

students correctly counted the total number of squares.

When presented with 30 sets of cards on the Counting Span Test, the mean number of correct responses for the poorer reading group was 15.3 (S.D.=4.6). For the superior reading group, the mean number of correct responses was 19.0 (S.D.=2.7). The difference in group scores was statistically significant at $p<.05$.

Experiment 2

Data Collection and Analysis

Within the remedial reading study, comparisons were made across treatment conditions, skill areas and reading ability levels. Measures of performance were taken on a pretest-posttest basis and on a repeated measures during treatment format.

A pretest of oral reading speed and accuracy was completed during the week prior to the initiation of treatment. This pretest was also the occasion on which data was derived for a comparison of poorer and superior readers in Experiment 1. Posttests of oral speed and accuracy were administered one and two weeks after the end of treatment. All pre- and post-test measurements of oral reading speed and oral reading accuracy were taken on an individual basis. Oral reading speed was measured

in WPM. Oral reading accuracy was measured in reading errors for every 100 words read.

Differences in silent reading comprehension were assessed using the differential in Extended Scale Scores for comprehension from the Gates-McGinitie Reading Tests. Because subjects were of varying age and different grade level, a pre- and post-test comparison of T-scores from alternate forms of the Gates-McGinitie Reading Tests was not appropriate. Extended Scale Scores represent data on an interval scale and can be employed to compare performance change for subjects writing different levels of the test.

A problem with the pretest-posttest procedure lies in the situation that each assessment represents a snapshot of performance at a particular instant in time. In this procedure, a limited two snapshots are provided on which to make a judgement about performance improvement. In a remedial environment particularly, what we need is a series of snapshots that will provide a more detailed profile of progress. For that reason subjects were repeatedly measured during the experimental study.

Nine separate measures were recorded for both skill areas of oral reading speed and oral reading accuracy. The nine measures of oral fluency were obtained in the

following way. Each subject was assessed six times during treatment. The grade level of passages was determined by performance on the oral reading pretest passages. Oral fluency scores were kept also for each separate oral passage during the pretest and two posttests. Scores on pretest and posttest passages, at the same readability level as those used during treatment, were included in a subject's profile. Therefore, a student's profile of development in oral fluency included an initial measure from the pretest, six data points during treatment, and two observations, one and two weeks after the withdrawal of treatment.

In the case of silent reading comprehension six measures were taken during treatment. Subjects orally read a 100-word passage. This was followed by a silent reading of the passage and 10 comprehension questions. The procedure of oral reading-silent reading-comprehension assessment was selected through a desire to more closely approximate classroom expectations, rather than research expectations, in measuring a subject's performance. The profile of performance on repeated measures of silent reading comprehension was also related to pre- and post-test measures, but in a different manner from

observations of oral fluency. An explanation of the construction of a profile of performance is required initially.

The problem of repeated measures lies in determining what the fluctuations in performance really mean. Raw scores from repeated measures are of limited value unless they can be converted to demonstrate a pattern of development. All raw scores from repeated measures - and from pretest-post-test scores, in the case of oral fluency - were converted into a straight-line profile using a quarter intersect technique (Koenig, cited in White & Liberty, 1976).

The quarter intersect procedure divides the number of observations or data points into quarters. The median value of data points on each half of the observations is calculated. A point is then established on each half of the data points at which the median score intersects with the middle day of assessment. A straight line is drawn connecting the two points of intersection, providing a straight-line profile of progress.

White and Liberty have indicated that seven samples are adequate for most purposes. A profile based on 9 to 11 samples can be approached with confidence of few

errors. On that basis profiles of silent reading comprehension should be viewed as tentative. Whereas pre- and post-test measures of oral fluency were incorporated into profiles, repeated measures of silent reading comprehension need to be analyzed in conjunction with pre- and post-test Extended Scale Scores from the Gates-McGinitie Reading Tests.

Results

Results are presented in both graphic and tabular form. Results from repeated measures of oral reading speed, oral reading accuracy and silent reading comprehension are illustrated in graphic form and summarized in tabular form. Pre- and post-test results on silent reading comprehension are also presented in tabular form. Raw scores on pre- and post-tests of oral reading speed are shown in Appendix A. Raw scores on pre- and post-tests of oral reading accuracy are shown in Appendix B. Because the reliability of results on repeated measures during treatment is influenced by pre- and post-test scores on silent reading comprehension, the latter are presented first in Table 1.

Table 1

Silent Reading Comprehension: Pre- and Post-test Results in Extended Scale Scores (ESS)

	Subject	Grade	Pretest ESS Score	Posttest ESS Score	Net Change
Group 1	NIM1	5	476	503	+27
	NIM2	5	486	522	+36
	RR1	4	441	465	+24
	RR2	4	441	460	+19
	NIM-RR	4	433	395	-38
	Control	5	470	497	+27
Group 2	NIM	3	343	372	+29
	RR	3	357	365	+08
	NIM-RR	4	424	395	-29
	Control	4	483	386	-97
Group 3	NIM	5	365	415	+50
	RR	4	386	415	+29
	NIM-RR	4	424	---	---
	Control	5	358	373	+15

Extended Scale Scores permit a comparison of performance between subjects working at different levels. Because two subjects were randomly selected in Group 1 to the NIM and RRM treatment conditions, each subject has been distinguished by a number 1 or 2. An average yearly growth in Extended Scale Scores for silent reading

comprehension is 37 at the Grade 3 level, 27 at the Grade 4 level, and 25 at the Grade 5 level. One subject in Group 3, the combined NIM-RRM subject failed to complete the comprehension subtest. One subject in Group 3, the control subject, improved a minimum of 15 points since the pretest score was unranked because of its low value.

Results from repeated measures during treatment are shown in graphic form in Figures 1 to 9 on pages 97 to 105. Each graph demonstrates a profile of progress for experimental and control subjects in a group. In figures 1 to 3 the profiles of performance on oral reading speed for each subject in each reading level group are illustrated. In figures 4 to 6 a profile of performance on oral reading accuracy for each subject in each reading level group is illustrated. In figures 7 to 9 a profile of performance on silent reading comprehension for each subject in each reading level group is illustrated.

Performance on oral fluency is shown on the vertical axis in WPM for oral reading speed and in errors per 100 words read for oral reading accuracy. Because pre- and post-test measures of oral fluency were incorporated with repeated measures, the profile of performance spans

13 weeks on the horizontal time scale. Performance on silent reading comprehension is shown on the vertical axis as a percent of questions answered correctly. Because repeated measures of silent reading comprehension were analyzed only in conjunction with pre- and post-test results, the profile of performance spans weeks 3 to 11 of the study.

A general summary of graphic results would indicate varied performances across treatment conditions, reading ability levels and skill areas. A more specific summary of performance on repeated measures is shown also in tabular form (Table 2). Each treatment condition - the NIM, the RRM, combined NIM-RRM, or control - was evaluated across skills and reading ability levels. Table 2 summarizes the skill domains and reading ability levels in which each treatment condition produced an improvement in performance.

Table 2

Positive Results by Treatment Condition Across Reading Skills and Reading Ability Groups

	Oral Speed	Oral Accuracy	Silent Comprehension
Group 1	NIM2 NIM-RR RR2 Control	NIM1 NIM2 NIM-RR Control	NIM1 NIM2 RR1 RR2 NIM-RR Control
Group 2	NIM NIM-RR RR Control	NIM-RR RR Control	NIM Control
Group 3	NIM-RR Control	-------	NIM NIM-RR

Within the three reading ability groups, a total of four subjects were randomly selected to the NIM, four subjects to the RRM, three subjects to the combined NIM-RRM and three subjects to a control condition. Because two subjects in Group 1 were randomly selected to each of the NIM and RRM, subjects in Group 1 in each of the two treatment conditions are numbered 1 or 2.

Each subject was repeatedly measured across three

skills. Therefore, with four subjects in the NIM and RRM, 12 improvements were possible across reading skills or reading levels in each treatment condition. In each of the combined NIM-RRM and control conditions, with three subjects in each, 9 potential improvements could have occurred across reading skills and reading levels. Improvement occurred in 8 of 12, or 66.7 percent of possible cases for the NIM subjects. For the RRM subjects, improvement occurred in 5 of 12, or 41.7 percent of possible cases. For the combined NIM-RRM subjects, improvement occurred in 7 of 9, or 77.8 percent of possible cases. Improvement also occurred in 7 of 9, or 77.8 percent of possible cases for the control group.

These results were based on the use of repeated measures of silent reading comprehension during treatment. Pre- and post-test Extended Scale Scores were substituted for repeated measures scores in silent reading comprehension. The only net change accepted as an improvement from Extended Scale scores were those which clearly indicated an improvement in performance in excess of that which would normally have been expected over a three month period.

Through this alternate format the NIM subjects

produced the same 8 of 12, or 66.7 percent of possible improvements. For the RRM subjects, improvement increased to 6 of 12, or 50.0 percent of possible cases. For the combined NIM-RRM subjects, improvement decreased to 5 of 8, or 62.5 percent of possible cases. One subject in the combined NIM-RRM failed to complete the comprehension posttest. Improvement remained constant at 7 of 9, or 77.8 percent of possible cases for the control subjects.

Results were further analyzed for the impact of all treatment conditions on each reading ability group. Six subjects were placed in Group 1 and four each in Groups 2 and 3. Therefore, by measuring across the three skill areas for each group, 18 potential improvements in reading skills could have occurred for Group 1, the marginally-delayed readers. Twelve potential improvements could have occurred in each of Groups 2 and 3, the moderately and severely delayed. For subjects in Group 1, improvements occurred in 14 of 18, or 77.8 percent of possible cases across the skills of oral fluency and silent reading comprehension. Improvements occurred in 9 of 12, or 75.0 percent of possible cases for subjects in Group 2. For subjects in Group 3, improvements occurred in

4 of 12, or 33.3 percent of possible cases across skill domains.

Application of the pre- and post-test Extended Scale Scores differential produced the following results. For subjects in Group 1, improvements occurred in 13 of 18, or 72.2 percent of possible cases. For subjects in Group 2, improvements occurred in 8 of 12, or 66.7 percent of possible cases. Improvements occurred in 5 of 11, or 45.5 percent of possible cases for subjects in Group 3.

Results were also analyzed for the effect of treatment methods across skill areas. Ten of 14, or 71.4 percent of subjects demonstrated improvement in oral reading speed using repeated measures data. Seven of 14, or 50.0 percent of subjects reflected improvement in oral reading accuracy. Ten of 14, or 71.4 percent of subjects showed an improvement in silent reading comprehension, also using repeated measures data. When Extended Scale Scores were used for silent reading comprehension, 9 of 13, or 69.2 percent of subjects demonstrated an improvement.

In order to further draw together the results of both experiments, an analysis was carried out of the memory capacity scores and the silent reading comprehension

scores of the 14 poorest readers. Nine students scored higher on the posttest Extended Scale Scores and five students achieved a lower posttest score. The student in Group 3 who provided no result was placed in the negative category on the basis that he stopped writing the posttest shortly after it began. Mean score on the memory capacity test for poorer readers who improved their Extended Scale Scores was 16.7 correct (S.D.=3.7). Mean score for poorer readers who did not improve their Extended Scale Scores was 10.8 (S.D.=4.6). The Mann-Whitney U-Test was applied to the group scores and the difference was significant at $p < .05$.

While the results on performance measures provided a somewhat varied picture, teacher and student opinions from the questionnaire reflected a consistency of opinion. In 19 separate teacher assessments of the 14 poorer readers involved in the study, 15 of the 19 indicated an improvement in the subjects reading performance. All positive opinions were supported by observations ranging from a greater willingness to read in class to improved marks in reading. Four assessments indicated a noticeable improvement and 11 assessments identified somewhat of an improvement in performance.

In only one case did an assessment contradict another teacher's assessment. The subject of the contradictory assessment was the control subject in Group 3.

Every subject considered that he or she was a better reader compared to the beginning of the term. Twelve considered themselves to be much better readers and 2 felt that they were somewhat better. Compared to the beginning of the term, 10 of the 14 readers considered that they were now reading more.

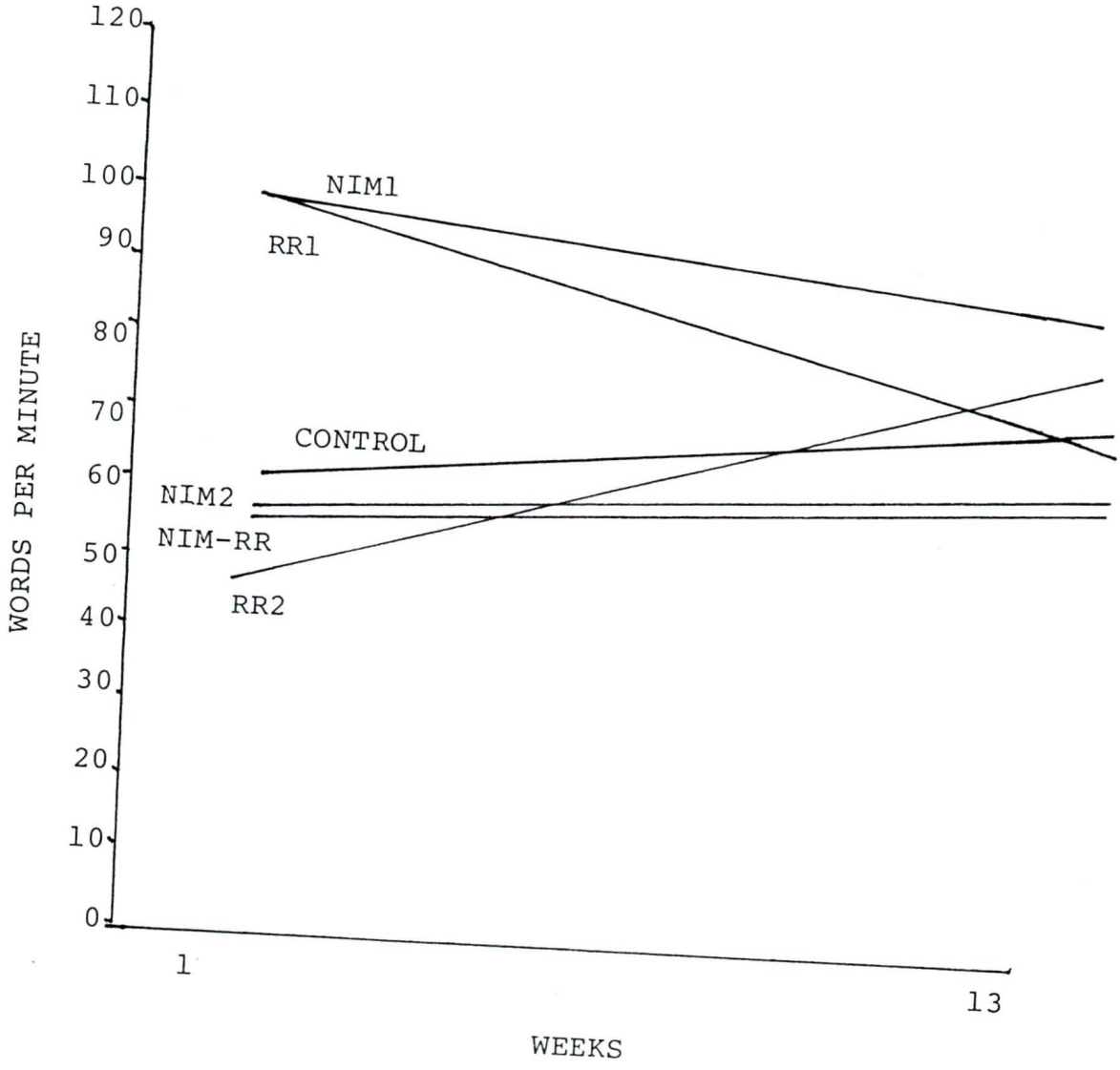

Figure 1: Group 1 - Performance on Repeated Measures of Oral Reading Speed

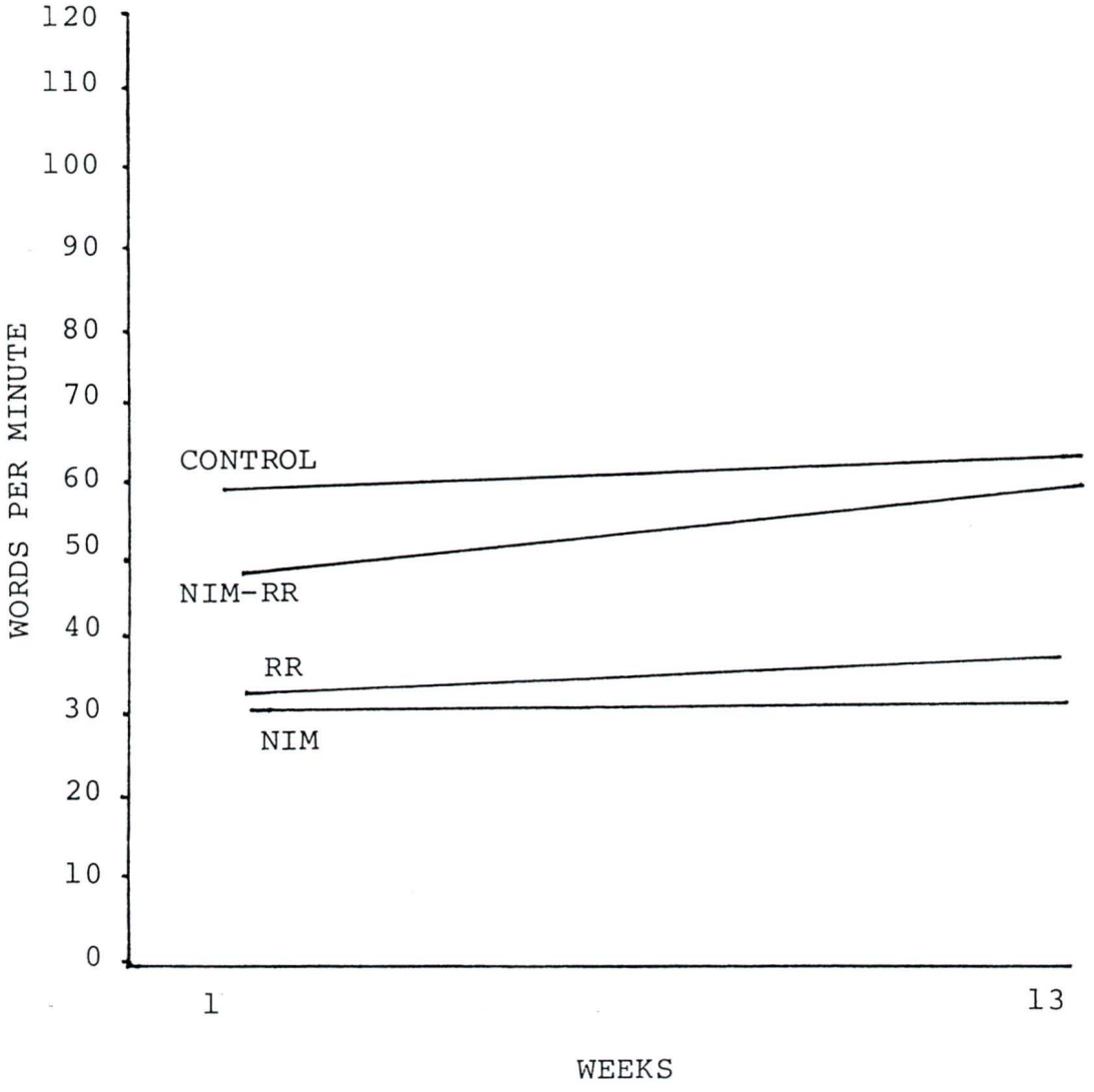

Figure 2: Group 2 - Performance on Repeated Measures of Oral Reading Speed

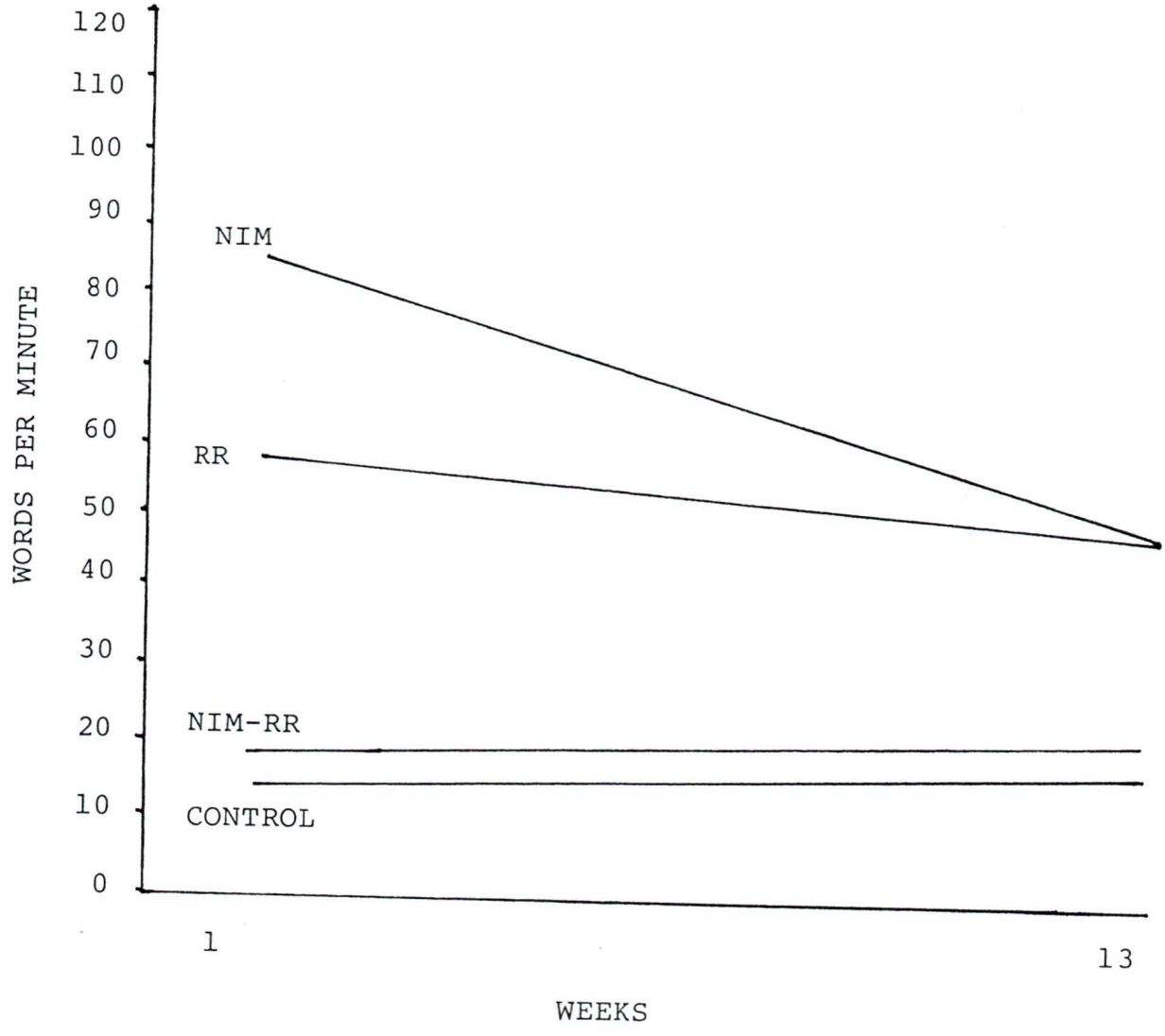

Figure 3: Group 3 - Performance on Repeated Measures of Oral Reading Speed

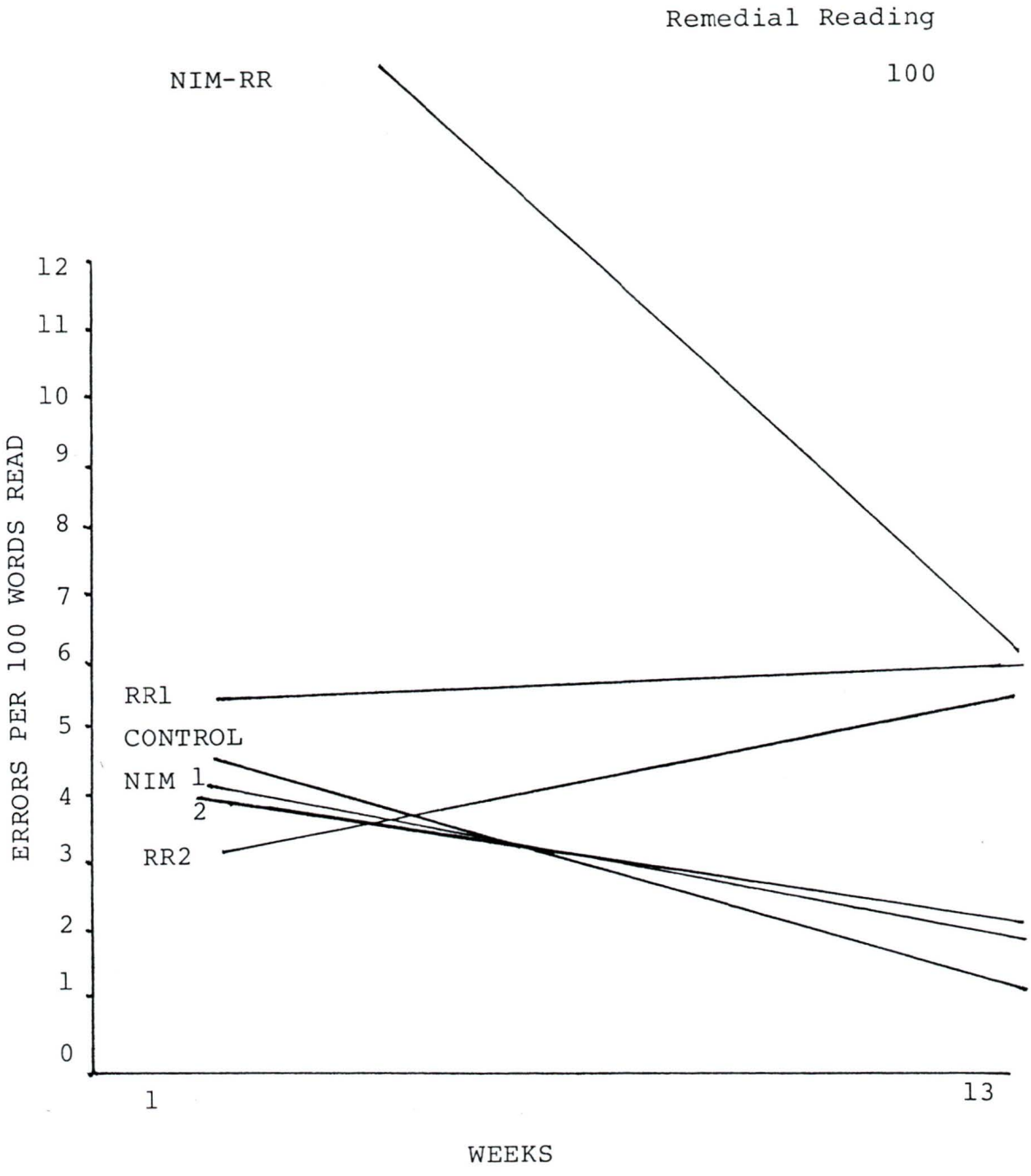

Figure 4: Group 1 - Performance on Repeated Measures of Oral Reading Accuracy

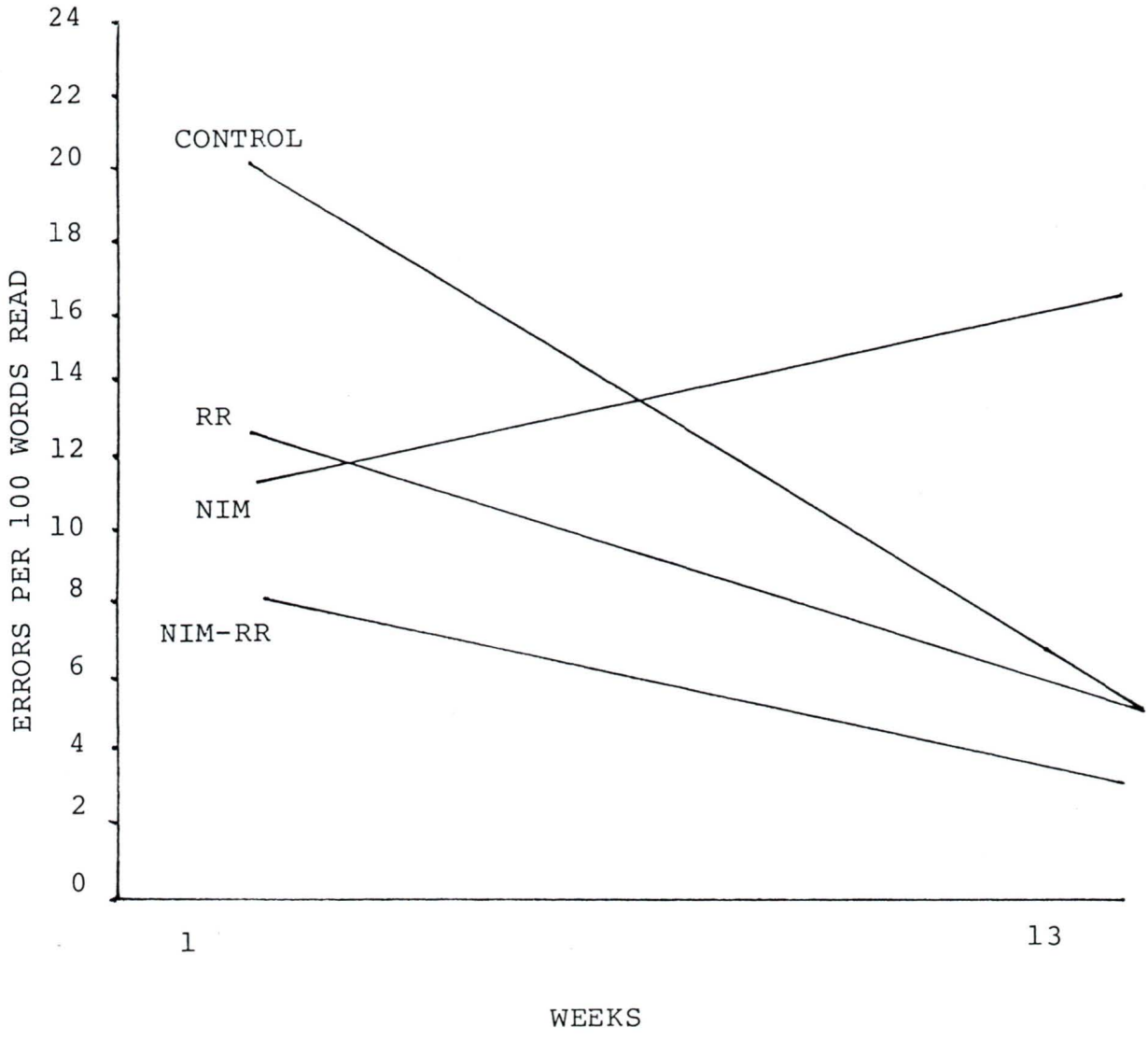

Figure 5: Group 2 - Performance on Repeated Measures of Oral Reading Accuracy

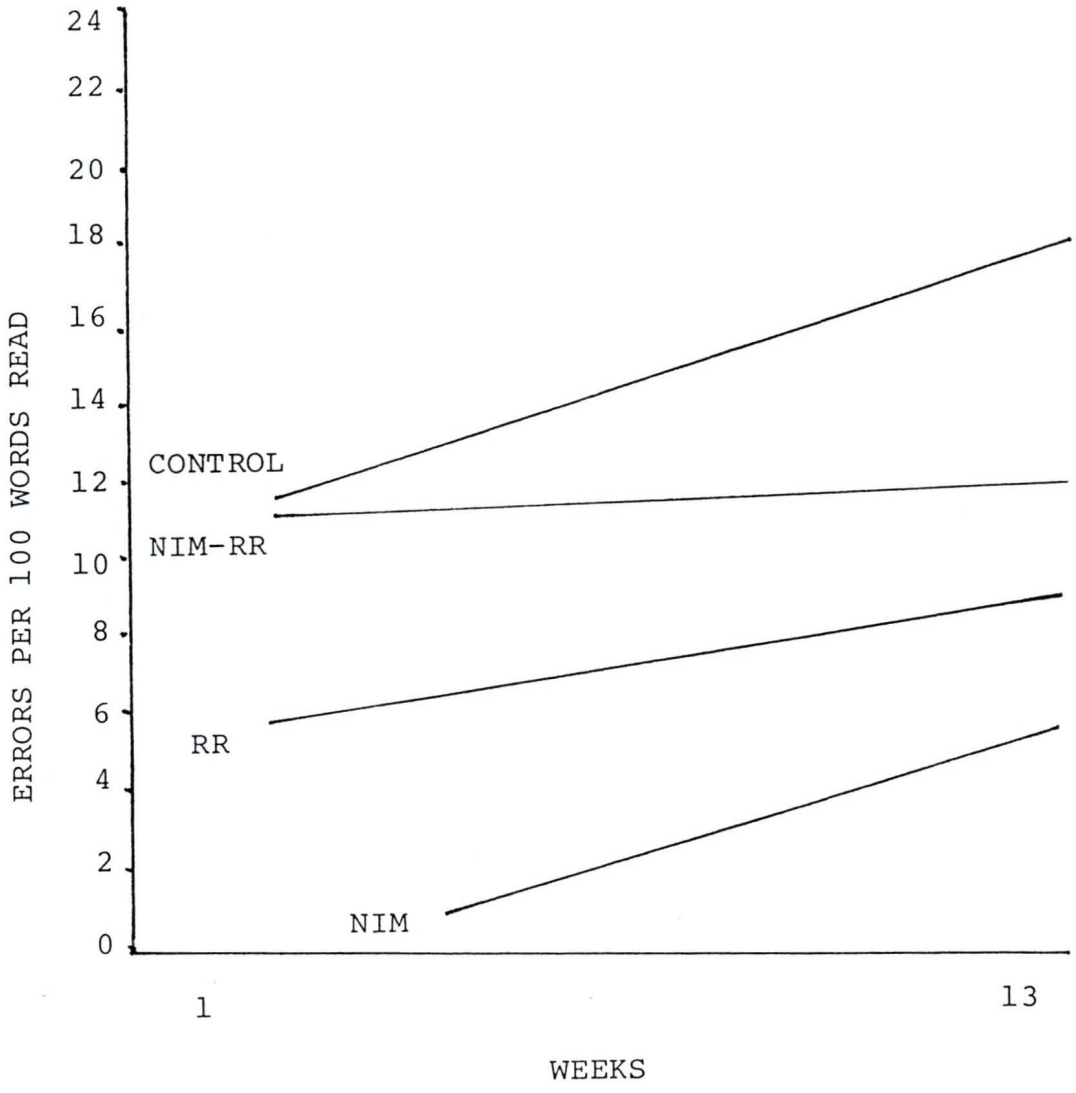

Figure 6: Group 3 - Performance on Repeated Measures of Oral Reading Accuracy

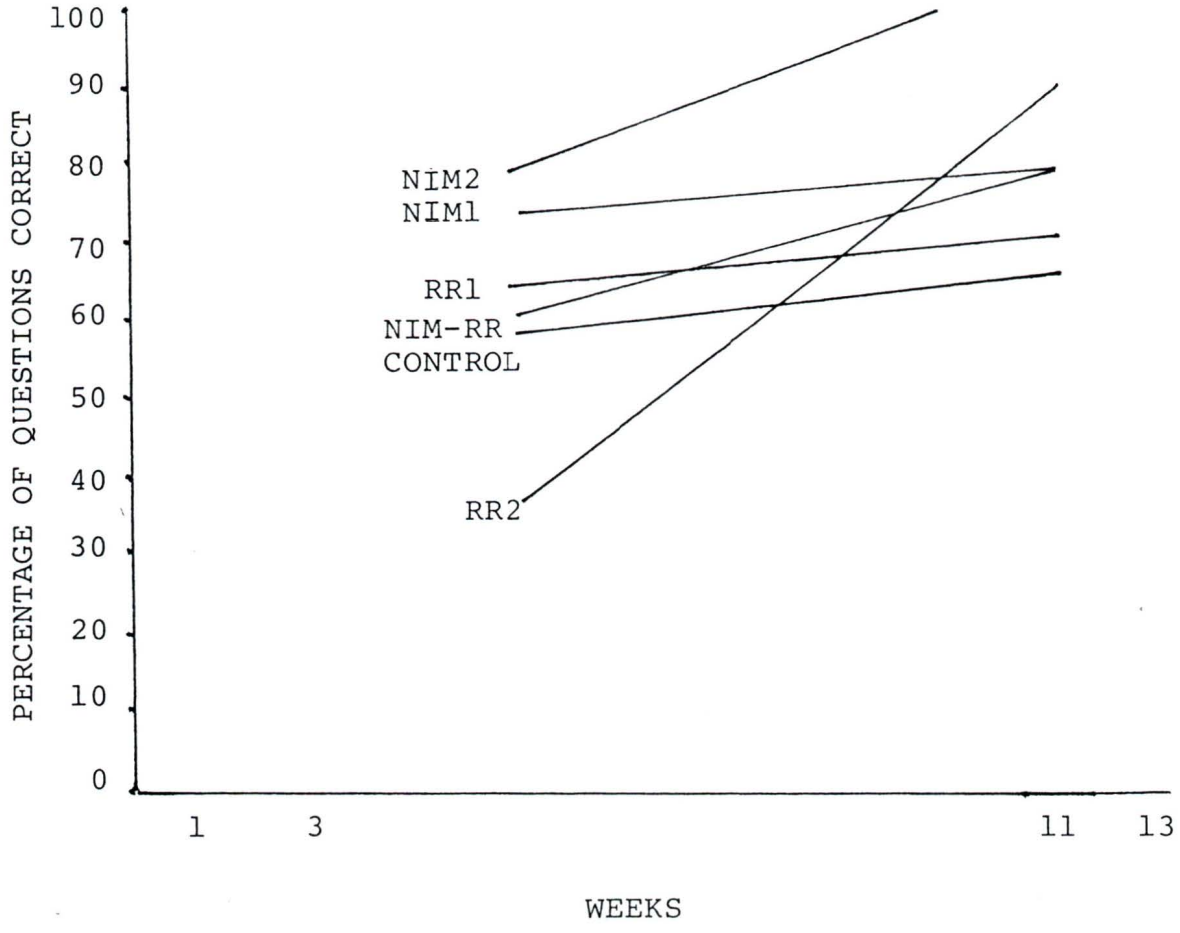

Figure 7: Group 1 - Performance on Repeated Measures of Silent Reading Comprehension

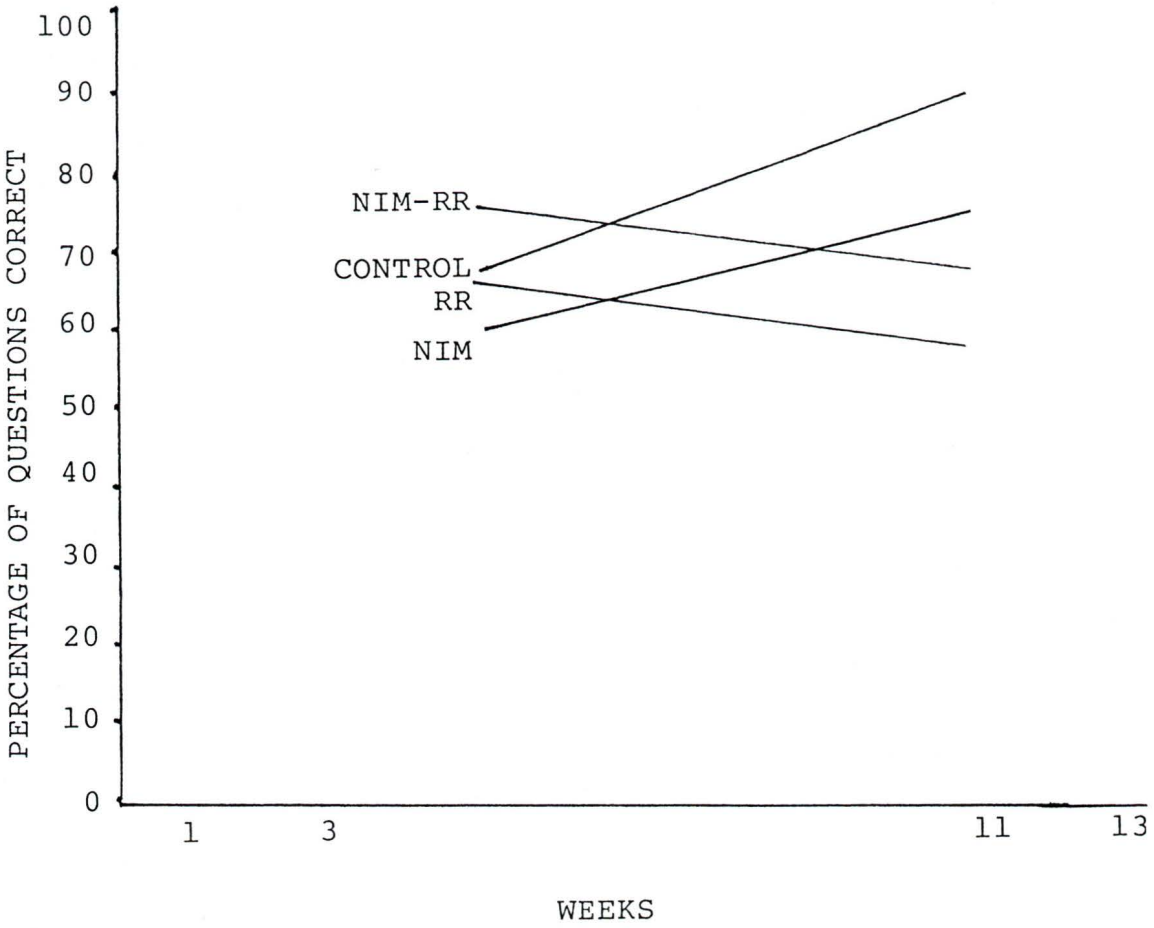

Figure 8: Group 2 - Performance on Repeated Measures of Silent Reading Comprehension

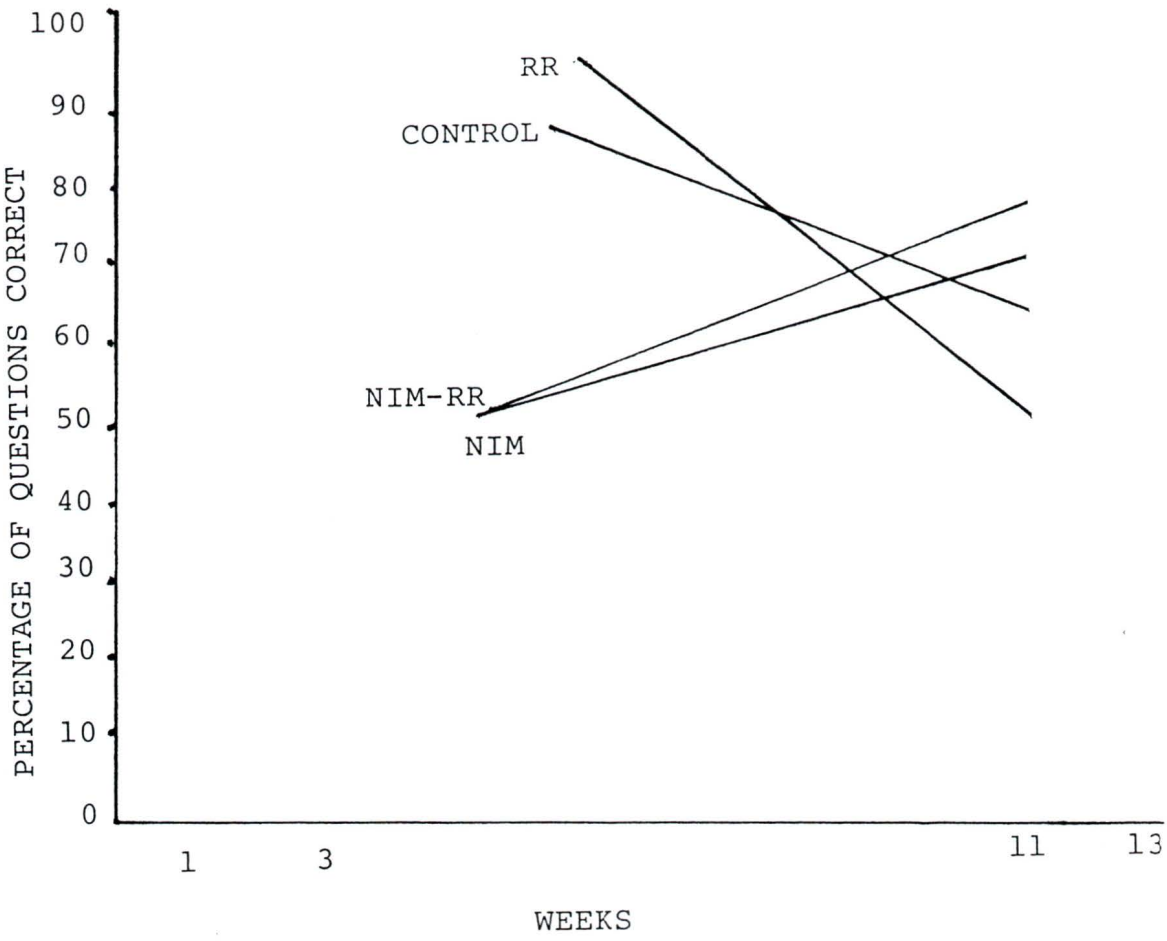

Figure 9: Group 3 - Performance on Repeated Measures of Silent Reading Comprehension

Summary

During Experiment 1, data collection and analysis were completed in order to make a general comment on inferior and superior readers from a limited sample in each group. The focus of the investigation was directed at the two domains of specific reading skills and cognitive abilities related to processing speed and attention and memory capacity. Average scores and standard deviations were calculated for each group across reading and cognitive domains. Individual scores were compared through a non-parametric analysis in order to assess the statistical significance and external validity of results.

During Experiment 2, data collection and analysis were completed in order to make a comment on individual reading performance in a control condition and three experimental conditions. The focus of the investigation was directed at an assessment of the impact of treatment conditions across reading ability levels and reading skills of oral fluency and silent reading comprehension. Because individual progress is of key importance in a remedial environment, results were plotted on an individual profile. A large number of measurements were taken for each subject in order to produce the highest degree of

internal validity in the results. The use of several subjects in each treatment condition produced a replication effect that increased the external validity of the experiment.

Each experiment has provided implications through its own results and in combination. Results of both experiments have provided mixed support to the hypotheses around which each was constructed. Results also have raised questions concerning reasons for reading delay and failure. A synthesis of findings from the experiments has suggested caution in the selection of a method of remediation. Moreover, results have presented a challenge to determine when, and if, remediation should be initiated.

Chapter 5: Discussion

Two interrelated experiments provided the focus of this study. A comparison of poorer and better readers was carried out at the beginning of the study. The purpose of this experiment was to analyze possible reading skill and cognitive ability differences between the two groups. The objective from the experiment was a better understanding of the characteristics of, and difficulties faced by, developmental and remedial readers.

Results from the first experiment on measures of oral reading speed, oral reading fluency and silent reading comprehension were also used to make a final selection of 14 poorer readers for the second study. Subjects were assigned randomly to three remedial and one control reading group. The purpose of this experiment was to analyze the relative effectiveness of treatment conditions with deficient readers. The objective from the experiment was to suggest an effective approach to the remediation of reading disabilities across the varying skills of reading and across varying levels of reading delay.

The results of this study need to be set in perspective. The purpose of the study was not to provide

the definitive answer to an educational problem. Few studies are of a definitive nature. Nor was the purpose of this study necessarily to provide successful remediation to all subjects involved. The focus was on suggested trends from the results. Most studies form merely one frame of a longer reel that plays from the beginning to the end of a scientific problem. Each frame can hope to suggest trends and possibilities that will be developed in subsequent investigations. This study gained direction from prior research. Some of the findings from this research might, in turn, guide practitioners and researchers.

Experiment 1

A comparison of reading performance between poorer and better readers also was used to justify the inclusion of 14 poorer readers in the second experiment. At the same time, the results illustrated another dimension to the classification of reading-delayed. One dimension of reading delay can be seen in a student's reading scores, normed on several thousand students in other classrooms and schools. A second dimension to reading delay can be seen in a comparison of poorer readers' performance scores to those of better reading classmates. The

reality of a child's day-to-day classroom and school situation might be more accurately reflected in the latter dimension.

A statistical analysis of individual scores, in each of the poorer and superior reading groups, indicated untenable null hypotheses of no performance differences on measures of oral reading speed, oral reading accuracy and silent reading comprehension. Significant differences in these performance areas could have been anticipated on the basis of teacher recommendations and prior school results on the Gates-McGinitie Reading Tests. However, the significance and magnitude of performance differences reflect the disparity in performance level under which classrooms can operate; hence, the desirability of effective remedial methods that are cost efficient and easy to administer.

Poorer readers processed individual letters at a statistically significant slower rate than superior readers. However, on the associated informal record of errors of identification, virtually no difference existed. In fact, virtually no errors of identification were made by either reading group. The absence of identification errors is the performance level to be

expected at Grades 3, 4 and 5. A record of errors of identification was intended to indicate more basic weaknesses in the skills of poorer readers. Letter identification should have reached a stage of automaticity by the Grades 3 to 5 level. The absence of errors indicated a familiarity with the text and may be interpreted to suggest that individual processing speed was responsible for the performance difference.

The identification of the letters of the alphabet, randomly typed on a page of plain white paper, represents a relatively simple processing task. The counting of solid-colour squares on eight cards, to a total of 50, also represents a relatively simple processing task for 40 students in Grades 3 to 5. The card counting task was administered immediately after the letter identification task in each testing session. If a significant difference were to appear in the speed of processing alphabet letters, the card counting task would suggest whether processing differences were general or specific to print.

On the counting task, the difference in individual scores between the poorer and superior groups was not statistically significant at $p > .10$. Moreover, no performance difference appeared in the accuracy of counting.

In each group 9 of 20 students correctly counted 50 squares. Neither group had a superior result in counting in the final outcome. Differences in the speed of processing did not extend on a general level beyond letter processing.

The memory portion of the Counting Span Test was used to measure the subjects' ability to attend to a task and their memory capacity. Poorer readers demonstrated a statistically significant difference in ability to attend to a task and to perform on memory capacity. Cohen (1983) has demonstrated also that reading-disabled children produce inferior short-term memory performance, more specifically to short-term memory tests involving serial recall.

The difference in performance between the two reading groups on attention and memory capacity is important. LaBerge and Samuels' (1974) Theory of Automaticity in reading provides the theoretical underpinnings to the RRM. These results do not dispute the theory. However, the results may be interpreted to suggest a further consideration. The Theory of Automaticity may have general application. However, attention and memory capacity are not constant variables.

Repetitive practice can make basic operations more efficient and decrease demands on processing space (Case, Kurland & Goldberg, 1982), thereby increasing available memory space for storage. For poorer readers, however, success may be limited by less attentional and memory capacity in the first place.

In summary, on a statistical basis, significant performance differences appeared between each group of readers. Certain significant differences were to be anticipated on the basis of subjects' prior performance record, particularly in the areas of oral fluency and silent reading comprehension. However, certain significant differences in letter processing speed and attention and memory capacity could not have been anticipated as easily. Moreover, statistically insignificant differences in counting speed provided a specific dimension to processing differences between poorer and superior readers. As groups, the poorer and superior readers presented identifiable differences in processing, attention and memory that deserve further study in the context of reading deficiency.

Experiment 2

The basis for assessing the null hypotheses is different for the group of remedial readers. Each of the

14 subjects represents a form of case study. Each individual result has its own degree of internal and external validity. The internal validity of this study is based on the control of variables and the greater precision inherent in a large number of repeated measures. The external validity of this study is based on the replication of treatment conditions across skill areas and reading ability levels. Overall validity, however, requires many more replications of this work. In this small-n study the probability level on hypotheses for such divergent small groups cannot be assessed. Rather, the results may be interpreted to suggest further hypotheses.

First, retention of the null hypothesis of no performance difference between experimental treatments does not receive support. Results suggest a difference in treatment effect in a comparison of the NIM, RRM and combined NIM-RRM. The RRM provided the least positive effect across skill areas. The fact that the results are derived from a large number of repeated measures provides some precision to this conclusion. The total number of measurements on which this result was based equals 116 for each of the NIM and RRM and 84 for the combined NIM-RRM.

Second, the null hypothesis of no performance difference between experimental and control conditions receives support for retention. Control subjects performed across skill areas equal to NIM-RRM subjects, slightly superior to NIM subjects and substantially better than RRM subjects. Results were based on 116 measures of NIM and RRM subjects, 84 measures of NIM-RRM subjects and 86 measures of control subjects.

Third, the null hypothesis of no difference in total treatment effect between reading ability groups does not find support. All treatment conditions, experimental and control, appear to have had a significantly lesser impact on the most-severely delayed readers in Group 3. Results were based on a total of 174 measures of subjects in Group 1, 116 measures of subjects in Group 2, and 114 measures of subjects in Group 3.

Fourth, the null hypothesis of no difference in treatment effect across skill areas is rejected. Including both experimental and control subjects, the impact of treatment was greatest in oral reading speed and silent reading comprehension, and least in oral reading accuracy. Results were based on 126 measures in each of oral reading speed and oral reading accuracy, as well as 110 measures of silent reading comprehension.

In summary, the use of any one of the experimental conditions, under similar circumstances of reading disability, does not offer the same potential remediation effect. In addition, the application of a technique similar to that employed in the control condition, offers the same potential benefit as the best of the experimental treatments. Finally, the same benefits of treatment cannot necessarily be expected across skill weaknesses and across levels of reading disability.

Two cautions are necessary in the interpretation of data from repeated measures. First, it is important to repeat that, using the quarter-intersect method of data interpretation, each line represents a profile of progress and not a series of raw scores. Each line of progress is drawn through two points, each representing a median value and middle recording point in each half of the data. Therefore, each subject's initial and terminal performance level is not necessarily equal to the level of performance suggested by each end of the line.

Second, certain profiles of progress suggest a decline in the level of performance. Any suggestion that a subject's level of reading performance declined

through a particular treatment method is superficially logical, but very tenuous. The explanation lies again in the nature of the quarter-intersect profile. The quarter-intersect will provide a correct general indication of positive or negative progress. However, unless read as a general profile of positive or negative progress, the extent of progress can be exaggerated.

In addition, on a purely empirical basis, the novelty of the remedial situation appeared to have an impact on all subjects. Herein lies the importance of a study of sufficient duration to allow any possible regression effects to materialize. Possibly a more appropriate explanation for a negative slope would be children who failed to maintain or build on performance levels after the initial novelty effect diminished. Where the initial performance level was high and the subsequent decline substantial, an alternative explanation other than reading skills might be pursued for previous deficient performance.

The incorporation of pre- and post-test Extended Scale Scores had a specific purpose. Almost all our reading is done silently. Comprehension represents the most important skill and end objective of reading.

Pre- and post-test scores on silent reading comprehension from the Gates-McGinitie Reading Tests were intended to provide a comment on the validity of silent reading comprehension scores from repeated measures.

The problem in this study was to determine what constituted a legitimate remedial improvement in silent reading comprehension. An average yearly growth in Extended Scale Scores for silent reading comprehension is 37 points at the Grade 3 level, 27 at the Grade 4 level, and 25 at the Grade 5 level. Average gains in Extended Scale Scores decrease at higher grade levels since the rate of achievement growth tapers off during the school years (Gates-McGinitie Reading Tests, 1976). An average increase in Extended Scale Scores, over a 10-week study, should equal one-quarter of total yearly growth, based on a 40-week school year. Average Extended Scale Score growth during treatment, in order to reflect normal growth, should have been 9 points for Grade 3 students, 7 points for Grade 4, and 6 points for Grade 5. These calculations are derived through a certain licence since children's growth in achievement does not follow a linear progression during the year. Maintaining a normal rate of growth in a remedial situation should be a bare

minimum goal. Ideally, an effective remedial environment should narrow the gap between actual and expected levels of performance. In this study, satisfactory improvement in silent reading comprehension occurred when the differential in pre- and post-test scores was clearly in excess of normal expected growth in achievement. On that basis, in Group 1, both NIM subjects, both RRM subjects and the control subject demonstrated acceptable improvement. In Group 2, only the NIM subject demonstrated acceptable improvement. In Group 3, the NIM, RRM and control subject provided acceptable improvement. With limited exceptions, the pre- and post-test Extended Scale Scores confirmed results of repeated measures during treatment on silent reading comprehension.

Several comments are in order with respect to each of the treatment procedures. First, the traditional NIM demonstrated a generally positive effect across reading levels and skills. During the NIM intervention, Heckelman has stressed that the child should be motivated by the variety inherent in massive inputs of information. The NIM subjects in this study confirmed the essential soundness of that thought. Each day and each passage was fresh and, over the course of treatment,

the NIM subjects appeared to become the least bored in the three experimental treatments.

In his description of the NIM, Heckelman also discussed simultaneous auditory feedback with either the instructor or student reading slightly ahead. It is important that the confusion be resolved. Reading was smooth and effective when the process occurred simultaneously, regardless of whose voice was dominant. When either of the readers was delayed, the reading process was broken and unnatural.

Heckelman has stressed also that the success of the NIM comes through assistance in impressing the correct patterns of reading, while erasing incorrect procedures through massive practice in the process of reading. That effect might occur in fact. However, two other aspects of the NIM should be considered. First, the accompaniment of another more skilled reader appeared to provide a sense of confidence. Second the NIM and control subjects performed in the environment with least pressure. Control subjects also showed a general improvement across reading levels and skills. The NIM and control subjects simply read to enjoy the story without the concern of meeting passage-by-passage performance criteria.

The general success of the NIM suggests further

study of Schreiber's view of reading. Schreiber proposed that it is the sense of structure and prosodic cues in written language, not just improved word recognition, that assist in effective reading. Perhaps the modelling that occurs over massive amounts of reading has a similar effect to the repetitive component in the RRM. The success of control subjects who did not benefit from the same modelling of prosodics, in the form of stress, pitch and juncture, would appear to contradict this point. The answer is unclear. However, a remedial programme that incorporated a greater emphasis on prosodics of reading, and less emphasis on criteria achievement, might be more productive in long-term results.

Several principles of the RRM require further consideration. Samuels (1979) has suggested a criterion level of 85 WPM per passage on oral reading speed. For some students that figure is understandably not practical. Each student needs to begin at a level of oral reading speed and accuracy carefully determined on the basis of a prior diagnosis of skills and weaknesses.

The length of practice passages also need to be carefully controlled, based on a child's existing reading ability. Samuels' recommendation of passages

50 to 200 words in length was an appropriate figure in almost all instances in this study. The longer passages were more suited to the marginally-delayed readers and the more seriously delayed readers responded positively to the briefer passages.

Samuels (1979) has made three statements on the effectiveness of the RRM. First, an increase in oral reading speed produces improved silent reading comprehension. Second, an improvement in oral reading accuracy parallels an increase in oral reading speed. Third, the initial speed in each new passage is faster than the initial oral speed of the previous passage.

The support for each principle is limited. One RRM subject improved in oral reading speed but not in silent reading comprehension, while another RRM subject improved in silent reading comprehension, but not in oral reading speed. One other RRM subject improved in no areas. Only one RRM subject demonstrated a relationship between improved oral reading speed and improved silent reading comprehension.

Further, RRM subjects who improved in oral reading speed did not necessarily improve in oral accuracy. In fact, only one RRM subject improved in oral reading

accuracy. Day-to-day observations of criteria attempts by RRM subjects confirmed this characteristic of performance. Improved oral reading speed was often accompanied initially by greater errors in reading. Oral accuracy was the skill area of least improvement overall for RRM subjects. However, the possibility exists that improved oral accuracy comes on a delayed basis with practice and is not readily measured in improvement on a shorter study.

In addition, the day-to-day graph of subjects' performance in the RRM reflected a mountain and valley appearance as criteria were achieved and new passages begun. On consecutive passages at the same readability level, there was no certainty that the initial reading of a new passage would be faster than the initial reading of the previous passage.

Samuels' analysis of the motivational effect of graphing one's own progress was borne out. However, herein lay one of the problems of the RRM. It was easy for subjects in the RRM to lose sight of the long-range objective in reading each day. The day-to-day graph of performance became all-consuming. Some students in the RRM and combined NIM-RRM competed with each other

using day-to-day performance measures on their graphs. Performance appeared sometimes to be situation specific. The position of the dots on the graph became paramount in the short term while the long term improvement in reading skills became secondary. Students were too motivated for the wrong reasons.

The combined NIM-RRM proved to be generally effective across reading levels and skill areas. Reasons for success are not precisely clear. Compared to subjects in the RRM, subjects in the combined NIM-RRM made an equal number of attempts at criteria on a day-to-day basis, and the graph was equally motivating. However, the instructor had closer control over the reading process and the subject had the confidence of reading with a proficient reader. The twinning of the NIM and RRM procedures was novel and any speculation on reasons for success is tentative and requires further study.

The leap from improved oral fluency to improved silent reading comprehension has seemed so inescapably logical that some researchers have yielded to testimonials at the expense of hard scientific data. A relationship between improved oral fluency and improved silent reading comprehension can be seen in this experiment;

however, on an inconsistent basis. Using repeated measures data, of the 10 subjects who reflected improvement in silent reading comprehension, 7 reflected a parallel growth in oral reading speed and 5 showed a parallel growth in oral reading accuracy. Four subjects demonstrated an improvement across all three skill areas.

When Extended Scale Scores were employed, 9 students demonstrated an improvement in silent reading comprehension. Of these 9 students, 5 demonstrated a parallel increase in oral reading speed and 3 showed a parallel growth in oral reading accuracy. Two subjects demonstrated an improvement across each skill area. Perhaps the process of simultaneously reading massive amounts of printed material, or repetitive practice on controlled passages, is too simplified a remedial procedure for some students. For some children, successful remedial reading involves a more systematic skills approach.

In summary, three of the four null hypotheses of no performance difference were not tenable in Experiment 2. Measured differences appeared in performance between subjects in the experimental treatments of the NIM, the RRM and the combined NIM-RRM. Further, differences in treatment effect were measured across reading ability levels and reading skills. Only the null hypothesis

of no performance difference between experimental and control conditions was tenable. The control subjects performed equally to subjects in the NIM and combined NIM-RRM.

The NIM and control condition proved to be generally effective across skills and reading ability levels. These procedures were characterized by closer instructor supervision, a variety of reading passages and limited pressure in performing. The RRM proved to be least effective across reading skills and reading ability levels. The RRM was characterized by greater subject independence, less variety of reading passages, and greater day-to-day pressure to perform. The combined NIM-RRM proved generally effective across skills and reading ability levels. The NIM-RRM was characterized by closer instructor supervision, less variety of reading passages, and greater day-to-day pressure to perform.

A key investigation in Experiment 2 was the relationship between improved oral fluency and improved silent reading comprehension. Too many prior studies on the NIM and RRM had made an implied connection. This study demonstrated an inconsistent relationship across subjects. Reading is too complex a group of skills on which to make casual implied connections.

Educational Implications

The single, most important recommendation developing from this study pertains to the need for a fine-grained diagnostic analysis of students' strengths and weaknesses. This diagnosis does not presuppose purely reading skills. A number of results dictate the importance of a careful diagnosis, rather than a general screening, followed by a course of remediation.

In the first place, there appears to be no universal method of instruction in developmental reading. Similarly, there appears to be no universal approach to the remediation of reading disability. If these four treatment methods are representative of all remedial approaches, it is important to observe the variable effects of treatment across reading skills and reading ability levels. Careful diagnosis is necessary in order to match specific weakness with specific remedial approaches that have demonstrated success.

The results of Group 3, the most seriously-delayed readers are a case in point. Treatment procedures had limited impact on this group. The RRM demonstrated no effect in remediating skill deficiencies in this group.

Whereas the needs of Groups 1 and 2 appear to have been more in the areas of oral reading speed and accuracy, the needs of Group 3 appear to have been centered more in the area of basic decoding skills. Speed is important in delivering a remediation service; however, not at the expense of careful diagnosis and flexibility of approach. Group 3 could possibly have benefitted more from modifications of the basic techniques employed. For example, Group 3 might have been a productive opportunity to assess Heckelman's simpler Presenting Method of neurological impress.

Careful diagnosis and flexibility in analysis and remedial approach are important for an added reason. If comprehension is the ultimate objective of the reading process, for some students it appeared that their deficiencies were not based on skills directly inherent in the reading process. A common characteristic of the poorer reading group was lower attentional and memory capacity. Particularly was this true for the poorest readers in the poorer reading group. Remedial work on the basic skills inherent in reading were not necessarily going to improve the comprehension ability of these subjects. Automaticity is an important concept;

however, automaticity is not going to be as helpful for children who do not initially have a high attentional and memory capacity.

Parents and practitioners can readily cite examples of children who demonstrate an inverse relationship between oral fluency and comprehension. The control subject in Group 3 demonstrated a comprehension ability considerably superior to an oral fluency that produced numerous errors and a painfully slow reading rate of approximately 20 WPM. Conversely, the NIM-RRM subject was able to achieve levels of oral fluency that were not matched in comprehension. Attention and memory capacity offer a possible answer. The control subject scored 20 of 30 items correct on the memory capacity section of the Counting Span Test. The NIM-RRM subject scored 8 of 30 items correct.

Morphett and Washburn (1931/1983) in a study of great historical significance to primary education in North America (Ollila, 1983), argued that reading instruction should not begin until children attained a mental age between 6.5 and 7.0 years. During the intervening years, Morphett and Washburn's study has largely been discredited. The current consensus reflects the feeling that children should begin to read when they

demonstrate the interest and readiness skills. However, reading is more than the sum of phonetic skills and sight-word vocabulary. Some of the poorer readers in this study demonstrated a lack of cognitive abilities, or a cognitive immaturity, that hindered their progress to a higher level of reading skill, namely comprehension. Therefore, it is essential to carefully define the precise nature of a child's weakness. A further dose of phonics, structural analysis or sight-word development is not likely to be highly productive with a child who is cognitively immature.

The need for careful diagnosis and a close monitoring of progress was illustrated further by empirical observations on the part of this author. It appeared during the course of treatment that a number of poorer readers possessed a particular speed of processing. Subjects were able to improve their performance on measures of oral reading speed. However, the feeling existed that the gains were purely situation specific and would not persist. The situation is comparable to athletes who rise above a general level of personal performance for a specific contest. There is possibly here an explanation for the failure of apparent skill development to generalize

beyond the specific remedial situation.

Poorer readers in this study demonstrated a statistically significant slower rate of orthographic processing. Three questions result from this observation. First, to what extent is slow cognitive processing subject to remediation or, more appropriately, acceleration. Second, if slow processing speed reflects a cognitive immaturity, to what extent is it desireable to attempt acceleration? Is speed of processing a fixed quantity and, if not a fixed quantity, is development purely a maturational process? Third, if remediation is attempted within a context of reading deficiency, it is essential to recognize that the weakness is cognitive in origin and not in the subject's grasp of other skills inherent in reading. Similar to the case of low attention and memory capacity, remediation based on further word attack skills, sight word development, or even oral reading, is not necessarily going to be productive.

Although no remedial procedure appears to exist that covers all areas of weakness, the NIM, combined NIM-RRM and control treatments produced the greatest general effect. The common denominator in each method was close instructor support and control; support in the form of simultaneous reading or control in the form of correcting

reading mistakes as they occurred. Characteristics also common to the NIM and control condition were great variety of reading passages and less day-to-day pressure in performance. A remedial approach to problems of oral fluency, incorporating these qualities, could offer a greater possibility of remedial improvement. Whether close support and control could originate from peers, rather than the instructor or other adult, is an important question to consider.

For practitioners wishing to use the RRM, certain recommendations could be made. Emphasis should be given to varying passages across books, rather than selecting various passages from one book. The result would be exposure to a greater variety of topics and modes of language expression. The graphing of progress is important; however, the competitive aspect should be deemphasized, and the long-range purpose of reading kept in focus. Finally, the 15-minute remedial sessions were based on recommendations specific to the NIM. Practitioners might consider employing a longer, 20-minute session for the RRM, if conditions permit.

Schreiber's view of the importance of prosodic understanding in reading remains unresolved. However, on the basis of results from at least the NIM, two

recommendations could be made. Any remedial instruction, classified as reading, should have the reading of connected discourse as a component. It is not sufficient to drill on phonics or sight-words out of context. Second, when reading is occurring, some modelling of proper reading should be done, including proper prosodics as well as correct word identification. The best reader, in the person of the instructor, should be fully utilized to demonstrate the proper reading process.

Careful diagnosis of ability levels is necessary in order to begin remediation at appropriate levels of oral reading speed and oral reading accuracy. Children cannot begin at some arbitrary, general criterion level. Each remedial subject needs to be individualized in criteria and experience quick success.

This study suggested a degree of relationship between improved oral fluency and improved silent reading comprehension. However, the relationship was inconsistent. Therefore, it is necessary to plan specific remedial exercises directed at improving comprehension. Improvement of oral reading fluency does not guarantee generalization to comprehension. In addition, it is important to identify the specific reason for poor comprehension. Is the subject deficient in the skills

required to be proficient at the varying levels of comprehension? Or, is the subject's weakness in the cognitive area and related to attentional and memory capacity? The remedial approach would be specific to the etiology.

In summary, several key points of consideration have developed. Just as there is no universal methodology for teaching developmental reading, there appears to be no all-encompassing method of remediating reading problems. Each treatment, both experimental and control, had an impact on the subjects. The impact varied, however, across treatments, reading groups and skills. Treatments which incorporated the most direct instructor support, greatest variety of reading and least pressure demonstrated the greatest effect.

As a result of the variability of effect, a more detailed diagnosis of children's skills and weaknesses is necessary in order to provide the closest match between reading problem and remedial solution. Further, it cannot be assumed that reading deficiency emanates from a weakness in skills directly inherent to reading. Poorer and better readers showed significant differences in attention and memory capacity. Even within the poorer reading group, differences in attention and memory were

significant in influencing prospects of producing better readers. Attention and memory capacity appear to be cognitive components of maturity that affect the development of efficient readers.

The attractiveness of each experimental technique and the control procedure lies in the simplicity of application and the cost-effectiveness. No specialized training is required and no additional costly materials are needed. Because of the varied effects of treatment conditions, and the novelty of a combined NIM-RRM, further research is warranted. Particularly important in further studies is the long-range durability in gains. In addition, because of the increasing costs of education and the spiraling demand for remedial services, worthwhile studies would investigate the impact of these procedures on a small- and large-group basis.

References

Allington, R. (1983). Fluency: The neglected reading goal. The Reading Teacher, 36, 556-561.

Arena, J. (1980). An interview with R.G. Heckelman. Academic Therapy, 15, 491-498.

Arnold, R. (1972). A comparison of the neurological impress method, the language experience approach, and classroom teaching for children with reading disabilities. (Report No. 1-E-023). Lafayette, IN: Purdue Research Foundation. (ERIC Document Reproduction Service No. ED 073 428)

Arnold, R. (1977). Neurological impress: Good news or bad? Paper presented at the Annual Meeting of the Great Lakes Regional Conference of the International Reading Association, Indianapolis, IN. (ERIC Document Reproduction Service No. ED 151 721)

Ashby-Davis, C. (1981). A review of three techniques for use with remedial readers. The Reading Teacher, 34, 534-538.

Biemiller, A. (1977). Relationships between oral reading rates for letters, words, and simple text in the development of reading achievement. Reading Research Quarterly, 2, 224-251.

Carver, R. & Hoffman, J. (1981). The effect of practice through repeated reading on gain in reading ability using a computer-based instructional system. Reading Research Quarterly, 16, 374-390.

Case, R. Kurland, M., & Daneman, M. (1979). Operational efficiency and the growth of M-space. Paper presented at SRCD, San Francisco.

Case, R., Kurland, M., & Goldberg, J. (1982). Operational efficiency and the growth of short-term memory span. Journal of Experimental Child Psychology, 33, 386-404.

Chomsky, C. (1978). When you still can't read in third grade: After decoding, what? In S.J. Samuels (Ed.), What research has to say about reading instruction (pp. 13-30). Neward, DE: International Reading Association.

Cohen, R. (1983). Reading disabled children are aware of their cognitive deficits. Journal of Learning Disabilities, 16, 286-289.

Cook, J. & Earlley, E. (1979). Remediating Reading Disabilities. Germantown, PA: Aspen System Corporation.

Cook, J., Nolan, G., & Zanotti, R. (1980). Treating auditory perception problems: The NIM helps. Academic Therapy, 15, 473-481.

Durkin, D. (1983). What classroom observations reveal about reading comprehension instruction. In L.M. Gentile, M.L. Kamil, & J.S. Blanchard (Eds.), Reading Research Revisited (pp. 287-329). Columbus, OH: Charles E. Merrill. (Original work published 1978)

Ekwall, E., & Shanker, J. (1983). Diagnosis and remediation of the disabled reader. Newton, MA: Allyn/Bacon.

Gates-McGinitie Reading Tests. (1976). Toronto: Nelson.

Gardner, C. (1965). Experimental use of the impress method of reading habilitation. (Report No. CSOS-R-292). Sacramento, CA: California State Department of Education. (ERIC Document Reproduction Service No. ED 003 838)

Gibbs, V. & Proctor, S. (1977). Reading together: An experiment with the neurological impress method. Contemporary Education, 48, 156-157.

Gibbs, V. & Proctor, S. (1982). Read me a story: The presenting method works. Academic Therapy, 17, 619-622.

Gonzales, P. & Elijah, D. (1975). Rereading: Effect on error patterns and performance levels on the IRI. The Reading Teacher, 28, 647-652.

Goodman, Y., & Burke, C. (1980). Language and psycholinguistic bases. In P. Lamb & R. Arnold (Eds.), Teaching reading: Foundations and strategies (pp. 79-103). Belmont, CA: Wadsworth.

Guralnick, M. (1978). The application of single-subject research designs on the field of learning disabilities. Journal of Learning Disabilities, 11, 415-421.

Guszak, F., & Hoffman, J. (1980). Comprehension skills. In P. Lamb & R. Arnold (Eds.), Teaching reading: Foundations and strategies (pp. 309-338). Belmont, CA: Wadsworth.

Guthrie, J., Seifert, M., & Kline, L. (1978). Clues from research on programs for poor readers. In S.J. Samuels (Ed.), What research has to say about reading instruction (pp. 1-12). Newark, DE: International Reading Association.

Hagedorn, C., & McLaughlin, T. (1982). Assisted reading: a review and analysis of its effectiveness with remedial readers. B.C. Journal of Special Education, 6, 311-320.

Hammill, D. & Bartel, N. (1982). Teaching children with learning and behaviour problems. Boston: Allyn/Bacon.

Heckelman, R. (1966). Using the neurological impress remedial reading technique. Academic Therapy, 1, 235-239, 250.

Heckelman, R. (1969). A neurological-impress method of remedial-reading instruction. Academic Therapy, 4, 277-282.

Henk, W. (1981). Neurological impress and reading: How and why? Paper presented at the Thirteenth Annual Three Rivers Reading Conference, Pittsburgh, PA. (ERIC Document Reproduction Service No. ED 220 815)

Henk, W. (1983). Adapting the NIM to improve comprehension. Academic Therapy, 19, 97-101.

Hersen, M. & Barlow, D. (1976). Single-case experimental designs: Strategies for studying behaviour change. Oxford, England: Pergamon.

Hinkle, D., Wiersma, W., & Jurs, S. (1979). Applied statistics for the behavioural sciences. Boston: Houghton/Mifflin.

Hollingsworth, P. (1970). An experiment with the impress method of teaching reading. The Reading Teacher, 24, 112-114, 187.

Hollingsworth, P. (1978). An experimental approach to the impress method of teaching reading. The Reading Teacher, 31, 624-626.

Jenkins, J., & Heliots, J. (1981). Reading comprehension instruction: Findings from behavioural and cognitive psychology. Topics in Language Disorders, 1, 25-41.

Johns, J. (1981a). Basic Reading Inventory. Dubuque, IA: Kendall/Hunt.

Johns, J. (1981b). The development of the revised Dolch word list. Illinois School Research and Development, 17, 15-23.

Johns, J. & Berglund, R. (1982). Repeated readings: Help for poorer readers. The Tar Heel Reading Journal, 2, 26-28, 30.

Jordan, W. (1967). Prime-O-Tec: The new reading method. Academic Therapy, 2, 248-250.

Kretschmer, J. (1976). Updating the Fry readability formula. The Reading Teacher, 29, 555-558.

Kibby, M. (1979). Passage readability affects the oral reading strategies of disabled readers. The Reading Teacher, 32, 390-396.

LaBerge, D. & Samuels, J. (1974). Toward a theory of automatic information processing in reading. Cognitive Psychology, 6, 293-323.

LaBerge, D. & Samuels, S. (1983). A critique of, a theory of automaticity in reading: Looking back: A retrospective analysis of the LaBerge-Samuels reading model. In L.M. Gentile, M.L. Kamil & J.S. Blanchard (Eds.), Reading Research Revisited (pp. 39-61). Columbus, OH: Charles E. Merrill.

Langford, K., Slade, K., & Barnett, A. (1974). An examination of impress techniques in remedial reading. Academic Therapy, 9, 309-319.

Lauritzen, C. (1982). A modification of repeated readings for group instruction. The Reading Teacher, 35, 456-458.

Lopardo, G., & Sadow, M. (1982). Criteria and procedures for the method of repeated readings. Journal of Reading, 26, 156-160.

Lorenz, L., & Vockell, E. (1979). Using the neurological impress method with learning disabled readers. Journal of Learning Disabilities, 12, 420-422.

Melton, L. (1983). Summary of D. LaBerge and S.J. Samuel's study: Toward a theory of automatic information processing in reading. In L.M. Gentile, M.L. Kamil & J.S. Blanchard (Eds.), Reading Research Revisited (pp. 37-38). Columbus, OH: Charles E. Merrill.

Mikkelsen, V. (1981). The effects of a modified neurological impress method on developing decoding skills. Paper presented at the East Carolina University Library Science Lecture Series, Greenville, NC. (ERIC Document Reproduction Service No. ED 209 638)

Morphett, M., & Washburne, C. (1983). When should children begin to read? In L.M. Gentile, M.L. Kamil & J.S. Blanchard (Eds.), Reading Research Revisited (pp. 163-169). Columbus, OH: Charles E. Merrill. (Original work published 1931)

Moyer, S. (1982). Repeated readings. Journal of Learning Disabilities, 15, 619-623.

Murphy, R., & Bryan, A. (1980). Multiple-baseline and multiple-probe designs: Practical alternatives for special education assessment and evaluation. The Journal of Special Education, 14, 325-335.

Neill, K. (1979). Turn kids on with repeated readings. Teaching Exceptional Children, 12, 63-64.

Ollila, L. (1983). A commentary on Gentile's critique of Morphett and Washburn's study: When should children begin to read? In L.M. Gentile, M.L. Kamil & J.S. Blanchard (Eds.), Reading Research Revisited (pp. 179-183). Columbus, OH: Charles E. Merrill.

Otto, W. (1983). A commentary on LaBerge and Samuels' retrospective analysis of the theory of automaticity in reading. In L.M. Gentile, M.L. Kamil & J.S. Blanchard (Eds.), Reading Research Revisited (pp. 57-61). Columbus, OH: Charles E. Merrill.

Samuels, S. (1979). The method of repeated readings. The Reading Teacher, 32, 403-408.

Samuels, S. (1981). Some essentials of decoding. Exceptional Education Quarterly, 2, 11-24.

Schreiber, P. (1980). On the acquisition of reading fluency. Journal of Reading Behaviour, 12, 177-186.

Silvaroli, N. (1976). Classroom Reading Inventory. Dubuque, IA: Wm. C. Brown.

Smith, D. (1979). The improvement of children's oral reading through the use of teacher modelling. Journal of Learning Disabilities, 12, 39-42.

Strong, M., & Traynelis-Yurek, E. (1983). Behavioural reinforcement within a perceptual conditioning program of oral reading. Paper presented at the meeting of the North Carolina Council of the International Reading Association, Winston-Salem, NC. (ERIC Document Reproduction Service No. ED 233 328)

Tierney, R., Readance, J., & Dishner, E. (1980). Reading strategies and practices: A guide for improving instruction. Boston: Allyn/Bacon.

White, O., & Liberty, K. (1976). Behavioural assessment and precise educational measurement. In N.G. Haring & R.L. Schiefelbusch (Eds.), Teaching Special Children (pp. 31-71). New York: McGraw-Hill.

Appendix A

Pretest and Posttest Results on Oral Reading Speed Measured in Words Per Minute

	Subject	Pretest	Posttest 1	Posttest 2
GROUP 1	NIM 1	70.0	97.7	83.7
	NIM 2	54.0	68.3	52.8
	RRM 1	60.0	73.0	67.1
	RRM 2	56.6	82.6	87.4
	NIM-RRM	44.4	64.7	71.3
	CONTROL	60.0	74.5	68.3
GROUP 2	NIM	23.0	31.9	37.0
	RRM	33.2	37.1	40.0
	NIM-RRM	36.6	58.3	49.4
	CONTROL	51.2	56.2	54.9
GROUP 3	NIM	27.3	42.7	36.0
	RRM	38.7	47.5	44.1
	NIM-RRM	12.3	19.4	22.3
	CONTROL	11.1	16.0	17.4

Appendix B

Pretest and Posttest on Oral Reading Accuracy Measured in Errors Per 100 Words Read

	Subject	Pretest	Posttest 1	Posttest 2
GROUP 1	NIM 1	4.1	2.1	5.6
	NIM 2	3.9	2.3	4.2
	RRM 1	5.5	5.1	7.9
	RRM 2	3.7	5.7	7.5
	NIM-RRM	16.0	8.7	7.5
	CONTROL	4.3	1.5	2.3
GROUP 2	NIM	20.2	18.8	16.0
	RRM	13.8	6.1	6.0
	NIM-RRM	11.4	6.4	5.6
	CONTROL	25.6	12.9	11.7
GROUP 3	NIM	9.3	5.5	6.8
	RRM	15.5	8.3	9.8
	NIM-RRM	19.0	11.2	7.5
	CONTROL	24.8	20.3	18.0

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REMEDIAL READING: AN INVESTIGATION OF THE NEUROLOGICAL IMPRESS METHOD, THE REPEATED READINGS METHOD, AND A COMBINED NEUROLOGICAL IMPRESS - REPEATED READINGS METHOD

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