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The Acquisition of Spelling by Developmentally Disabled Adults: An Examination of Some Variations of the Look-Cover-Write-Check Cycle

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THE ACQUISITION OF SPELLING BY DEVELOPMENTALLY DISABLED ADULTS: AN EXAMINATION OF SOME VARIATIONS OF THE LOOK-COVER-WRITE-CHECK CYCLE

by

Mark Stafford

A Thesis
Submitted to the
Faculty of The Graduate College
in partial fulfillment of the
requirements for the
Degree of Master of Arts
Department of Psychology

Western Michigan University
Kalamazoo, Michigan
June 1990
Five developmentally disabled adults were taught to spell groups of five words using the look-cover-write-check cycle, in which the subject looks at the word, covers it, writes the word, then looks at the word again to check the accuracy of spelling. Four variations of this procedure were used with each of the subjects including requiring the subjects to spell the words out loud in the "look" component. The results showed that the subjects required fewer sessions and fewer trials to spell the five words when the out loud requirement was in effect. Approximations generated as the subjects learned to spell indicated that intraverbal behavior played a major role in spelling with these subjects. Suggestions for future research and spelling training are made.
ACKNOWLEDGEMENTS

I would like first to thank Dr. Jack Michael, without whose leadership and guidance I would never have completed this project. Steven Braam's assistance with reliability data was a great help. The time he took from his own work is greatly appreciated. Mary Graham of Muskegon Community Mental Health deserves recognition for her assistance with approval from the behavior management committee.

I am deeply indebted to my wife Holly, and my sons Jordan and Brett for giving up some of the things they wanted in order to allow me time to work on this project.

Finally, I want to thank the clients of Goodwill Industries of Muskegon who participated in this study with enthusiasm. I have learned a great deal from their efforts.

Mark Stafford
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The acquisition of spelling by developmentally disabled adults: An examination of some variations of the look-cover-write-check cycle

Stafford, Mark William, M.A.
Western Michigan University, 1990
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CHAPTER I

INTRODUCTION

History of Spelling Research

Spelling is a topic which has had considerable study. An article by Horn (1969) included 245 references, not an all-inclusive list, and much has been written since. This large volume of literature seems appropriate for a class of behavior which is so important to our everyday communication yet so relatively weak for many in our culture. Horn (1969) states that dissatisfaction with spelling ability dates back to the thirteenth century. Spelling in schools has also been considered a major problem (Cripps, 1983; Fox & Eaton, 1946; Foxx & Jones 1978; Weber, 1974). Emphasis has been placed on the importance of developing good spelling skills. "Probably one of the most important services the infant teacher can offer her children is to help them to develop a strategy for learning to spell new words" (Cripps, 1983, p. 19). Weber (1974) states, "a skill which, if properly mastered, facilitates written expression and makes living more pleasant and more efficient "(p. 1).

Lee and Sanderson (1987) have pointed out a lack of behavior analysis in much of the literature available on spelling (e.g., Cripps, 1983; Gentry, 1984; Horn, 1969). This literature, therefore, does not concern itself with observable or measureable controlling variables. The behavioral literature has for the most part been concerned with increasing the number of correct spellings by manipulating the form of reinforcement (Axelrod & Paluska, 1975; Axelrod, Whitaker, & Hall, 1972; Lovitt, Guppy, & Blattner, 1969) or by the use of innovative training procedures (Blakeman,
1979; Broden, Beasley, & Hall, 1978; Foxx & Jones 1978; Neef, Iwata, & Page 1980; Nulman & Gerber 1984; Rayek & Nesselroad, 1972; Weber, 1974). To date only two articles (Lee & Pegler, 1982; Lee & Sanderson, 1987) have explored the contingencies involved in spelling acquisition. As Lee and Sanderson (1987) put it, "Spelling, as a dimension of writing, is an aspect of verbal behavior that an operant account must include" (p. 1).

Lee and Pegler (1982) showed that while textual behavior facilitated correct spelling when the words were dictated to the subjects it was not necessary for spelling and the two repertoires could be acquired separately. Lee and Sanderson (1987) discussed the contingencies involved in spelling and learning to spell. They introduced two concepts of particular relevance to the present paper. The first is the notion of learning to spell as a collateral effect of writing. By writing abundantly, without penalty for nonstandard forms (spelling errors), and accepting nonstandard forms as approximations to standard forms the student learns the standard forms as a function of writing for a reader (the student writer or another student). The authors see this as analogous to development of speech in a child. The child is reinforced for approximations to words and reinforced when the approximations more closely resemble the correct pronunciation. The second notion, following from the first, is the concept of a "read-write cycle" (p. 3). As Lee and Pegler described it, "the individual writes with effects on him or herself and on other people, and reads, again with various effects, writes again, and so on" (p. 3). It was such a cycle which produced positive results in the earlier study (Lee & Pegler, 1982, Experiment 2).

The Look-Cover-Write-Check Cycle

A special case of the use of a read-write cycle to learn to spell is the look-cover-write-check (LCWC) cycle. In this situation the student looks at a printed
word, covers it, writes it, and then checks his or her spelling against the original. This method of learning to spell is certainly common practice; many children and adults would engage in such behavior to learn to spell a new word. Several studies have used the LCWC procedure though it is not always referred to by that name.

Blakeman (1979) taught her subjects to use a LCWC procedure as a prerequisite skill to doing homework. Her subjects were multiply impaired (mentally impaired, physically impaired, speech and language impaired, hearing impaired) children ranging in age from 16 to 18. Though a LCWC procedure was used, the focus of this study was on contingency contracting versus other procedures to complete spelling homework assignments. The results therefore did not assess the efficacy of the LCWC procedure, but showed that contracting produced higher accuracy on in-class spelling performance than did homework alone or homework with a parent prompt.

Rayek and Nesselroad (1972) taught young handicapped children to spell using the following sequence: "First the child reads the word and the letters of the word from a study card. Then in a delayed matching sequence, he looks at the word, turns the card over, ...and immediately writes the word. After he has written the word, he exposes the model and checks his spelling" (p. 179). An error correction procedure accompanied this basic procedure in which an error anywhere in the procedure was corrected by requiring echoic responses from the subject. The results do not elaborate on the acquisition but simply state that "as the [two] children move through the program their progress becomes more rapid and stable" (p. 181) One child learned approximately 90 words, the other 45.

Cripps (1983) also used the LCWC cycle to teach children to write from memory rather than spelling letter by letter. Unfortunately, this is a descriptive report of an ongoing experiment and lacks detail in the description of both the procedure and results. Suffice to say that it was successful in teaching five-year-olds to spell single
words and to produce sentences and short stories.

Clearly, there are few reports on the use of the LCWC cycle as a procedure for teaching spelling. Those that exist lack detail in the description of either the procedure used, the subjects, or the results obtained.

Analysis of the Contingencies in the Look-Cover-Write-Check Cycle

Lee and Sanderson (1987) discussed the need to examine the successive approximations made as subjects repeated a read-write cycle. These authors were assuming that spelling will progress through successive approximations in much the same way that speech gradually improves through repeated attempts at saying words and the consequences of those attempts. They report the use the LCWC cycle to study spelling approximations with an eleven-year-old girl. The girl, however, learned the correct spelling too quickly to generate approximations which could be studied.

This rapid acquisition and the effectiveness of the LCWC method is no surprise when the contingencies in effect are examined. The LCWC sequence can be viewed as a basic stimulus-response-consequence contingency. Initially, some establishing operation or discriminative stimulus sets the occasion for spelling to be reinforced. For present purposes say a teacher has said "Spell ____." In the look component of the sequence a visual stimulus in the form of a printed word is made available to the student for a period of time and the student looks at it. The cover component is really of little interest here, but is simply a manipulation of the materials which prevents copying. The word can be removed from view by a teacher, the student, or the student can turn away from it. In any case the visual stimulus is no longer present. In the write component the student responds by writing the word. Last, the student checks his writing by again attending to the visual stimulus. This provides either a
reinforcing or punishing consequence depending on the similarity of the student’s writing to the original. An approximation which more closely resembles the original than previous attempts may be reinforcing whereas a less similar attempt may function as punishment.

Clearly, this is an oversimplification of what actually happens in any one instance. Since we would be dealing with a highly verbal individual there would no doubt be some covert echoic behavior occurring as the individual repeatedly spelled the word to himself; and covert intraverbal behavior as one letter functions as the stimulus for the next. But, most of this additional behavior would be covert and out of the experimenter’s control. Additionally, different kinds and amounts of this behavior would occur from cycle to cycle and from person to person. Moreover, none of this additional behavior is necessary for the cycle or acquisition of correct spelling to take place. Therefore, what is of concern in the present paper are the basic components of the cycle as those are always present, can be observed and manipulated, and are sufficient to produce standard spellings.

In the above example the LCWC cycle is used to transfer stimulus control from the visual stimulus in the look component to an auditory stimulus, "Spell _____." In most learning and testing situations the goal of the spelling program is to have the correct spelling, be it a written or spoken response, come under the control of the auditory stimulus. This is the purpose of the look-cover-write-check sequence: to transfer stimulus control from the visual stimulus present in the look component to the auditory stimulus of the teacher’s command. Michael (1982) has termed the relation involving the visual stimulus a duplic relation and the relation involving the auditory stimulus a codic relation.
Purpose of the Present Study

The look-cover-write-check cycle produced spelling quickly with the eleven-year-old girl mentioned by Lee and Sanderson (1987). Since it also appears that the contingencies in the cycle provide effective consequences the LCWC cycle may be an effective procedure for use with the developmentally disabled.

The present study explores the effectiveness of the LCWC cycle as a method to transfer stimulus control from a duplic to a codic relation with adult developmentally disabled subjects. The first question to be answered is: Will the LCWC cycle be useful and effective as a method to accomplish this transfer of stimulus control? There is little literature documenting the acquisition of spelling by the developmentally disabled. In addition to Blakeman (1979) only Neef, et al (1980) clearly worked with developmentally disabled individuals. Rayek and Nesselroad (1972) described their subjects as young handicapped children, and Nulman and Gerber (1984) worked with learning disabled individuals. Effective methods of spelling instruction with the developmentally disabled need to be demonstrated and the LCWC cycle may provide such a method.

A second issue to be addressed by this study is: Can the LCWC be made more effective by having the subject spell the word out loud in the look component and will spelling out loud be more effective than other modifications? Blakeman's (1979) procedure was effective as a homework procedure when contracting was also used. Some preliminary work with these procedures indicates that subjects more frequently spell the words correctly when they spell the word out loud while looking at it. This aspect has the advantage of setting up a situation in which the subject can make self-echoic responses in the absence of the visual stimulus. The echoic responses can be reduced by prompting so that they become subvocal and thus not present a distraction to others. The present study compared a procedure similar to Blakeman's
with no vocal behavior required to the same procedure with an out loud vocal requirement.

The nature of the procedures in this study is such that approximations to correctly spelled words were made by the subjects as they learned to spell correctly. Lee and Pegler (1982) and Lee and Sanderson (1987) have worked to analyze the contingencies involved in spelling and learning to spell by examining the nature of the approximations made as one acquires a correct spelling. These authors have looked for commonalities in the approximations in an attempt to gain knowledge about how one learns to spell. Since the developmentally disabled individual typically acquires new behavior at a slower pace, the problem of too few approximations encountered by Lee and Sanderson (1987) in attempting to study spelling approximations with an eleven-year-old girl may be resolved. A developmentally disabled population may require more cycles and thus provide more approximations to study. The approximations in the present study were examinined for such commonalities.

The present study will address these issues using variations of the LCWC procedure. The first procedure used was similar to the one used by Rayek and Nesselroad (1972). This basic LCWC procedure was modified to create two review procedures that vary the amount of time and the amount of behavior that occurs between the correct spelling of a word at the end of the LCWC cycle and the next trial on that word. This was done by first introducing a post-test following the LCWC procedure. A more rigorous review procedure was then introduced which shortened the amount of time from correctly spelling a word to the next trial on that word and required correct spelling of all words in the session to that point before proceeding. The second administration of the posttest procedure following the review procedure allows for the control of practice effects. A final modification was then made to the basic procedure which required vocal responding in the look component. Acquisition
of correct spelling which was consistently more rapid in any one of the conditions would indicate that features of that condition may be beneficial to the teaching of spelling.
CHAPTER II

METHOD

Subjects

Five developmentally disabled adults who were employees of Goodwill Industries of Muskegon, Michigan served as subjects. They were also served by Muskegon County Community Mental Health. They all spend a seven-hour day at Goodwill, an hour and a half of which is spent in a classroom setting in which sessions were conducted. All the subjects had a goal to improve spelling or writing skills in their Individual Plan of Service that was prepared and approved by an interdisciplinary team. All the subjects had demonstrated a prior ability to copy a text, read, recognize, and write all letters. Additional characteristics of the subjects are summarized in Table 1.

There were no risks to the subjects. Informed consent (Appendix A) was obtained from the subjects or their guardian and the nature of the study was explained to each subject. The subjects benefited by learning to spell some words which they will likely use and from the one-on-one attention they received. An increase in self-esteem may also result from having better communication skills and from the reinforcement received in the study. The study was approved by the Western Michigan University Human Subjects Institutional Review Board (Appendix B) and the Behavior Management Committee of Muskegon County Community Mental Health Developmental Disabilities Division (Appendix C).
Table 1

Subject Characteristics

<table>
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<tr>
<th>SUBJECT</th>
<th>SEX</th>
<th>AGE</th>
<th>DIAGNOSIS</th>
<th>READING GRADE</th>
<th>IQ</th>
<th>SPELLING GRADE</th>
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</thead>
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<td>F</td>
<td>32</td>
<td>Mild Retardation</td>
<td>2.1</td>
<td>68</td>
<td>2.2</td>
</tr>
<tr>
<td>2</td>
<td>F</td>
<td>36</td>
<td>Mild Retardation</td>
<td>2.6</td>
<td>70</td>
<td>1.8</td>
</tr>
<tr>
<td>3</td>
<td>M</td>
<td>29</td>
<td>Mild Retardation</td>
<td>2.8</td>
<td>60</td>
<td>2.2</td>
</tr>
<tr>
<td>4</td>
<td>F</td>
<td>28</td>
<td>Mild Retardation</td>
<td>1.5</td>
<td>42</td>
<td>1.0</td>
</tr>
<tr>
<td>5</td>
<td>F</td>
<td>52</td>
<td>Moderate Retardation</td>
<td>1.6</td>
<td>50</td>
<td>1.6</td>
</tr>
</tbody>
</table>

Materials and Setting

The materials consisted of 250 words printed on 7.5 cm. x 12.5 cm. cards, regular notebook paper for pretests and posttests, smaller sheets made by cutting notebook paper in quarters for writing review tests, and small pieces of paper on which the subjects wrote individual words (approximately 3-5 cm. x 7-8 cm); and pencils. The words used came from three sources; first, words that had been taught as "safety and survival" words; second, words useful to that particular subject such as his/her street name or job title; and third, words from the list the "Three Hundred Most Frequently Used Words In Rank Order" published by Shattuck (1985). Only words of four or more letters were used.

Sessions were conducted in the subjects' regular classroom at their regular classroom time. The experimenter was the regular instructor in this classroom and had worked with all subjects on a variety of tasks prior to the study. Each session was conducted in a one-to-one situation. The experimenter sat either across the table from
the subject or beside the subject at a classroom table. The experimenter and subject usually sat alone at a table but not physically separated from the rest of the class.

Two exceptions to this situation were subject 2 who preferred to remain seated with a group of friends and the examiner joined them. As this did not appear distracting to the subject there was no reason to ask the subject to move. The other exception was subject 1 who complained about noise and being distracted by classmates during the screening and was therefore worked with behind a divider. When subjects 1 and 5 were at approximately the midpoint of the study the classroom location changed. This did not greatly affect subject 5. Subject 1, however, had a change from a partially closed floor to ceiling divider which separated the experimenter and subject from the rest of the class to a portable folding divider approximately 1.75m high. In neither case was sound noticeably reduced from a no-divider situation and the subject could not see her classmates in either case.

The experimenter brought all the necessary materials to the session location, then asked the subject to join him. Session length varied greatly from one or two minutes when the subject correctly spelled all words correctly on the pretest to more than 45 minutes with the review procedure.

Procedures

Screening

The subjects were all given a screening test to determine their ability to read and spell each of the words. For reading, the words were selected one at a time at random and without replacement from the 250 cards. Each word was shown to the subject as he/she was asked to read it. Responses were recorded as correct or incorrect. Words which were not read correctly were omitted for that subject. Approximately 50 words
were presented in one session. When approximately 100 words had been read correctly the spelling portion of the screening was administered.

The spelling portion of the screening was conducted within two working days following the reading portion. The subject was given a pencil and full sheet of notebook paper. The words which the subject read correctly were dictated one at a time to the subject who wrote them on the paper. Initially, the words were stated, used in a sentence, and then stated again. This confused some of the subjects as they sometimes wrote other words in the sentence or responded intraverbally to the sentence. The words were then stated in isolation or with the instruction, "write the word____." If the subject did not respond in five seconds the word was repeated. This was continued until the subject wrote the word or an approximation to it or indicated that he or she did not know how to respond. In either case the experimenter provided no consequences but simply dictated the next word. Words spelled correctly were eliminated from the study.

When the subject had attempted to write all the words the experimenter scored the words and grouped them as described below. If more words were required for the study then the screening was continued with approximately the next 50 words. Only one subject was presented with all 250 words.

**Grouping of words**

After the subject completed the spelling portion of the screening the words for that subject were grouped into six groups of five words. As comparisons were made between groups it was necessary that the five words in one group be equated for difficulty with the words in the other five groups. Equating was accomplished by making two parameters equal for each group, word length and number of errors made in words of the same length.
Word length is considered to be "the best single predictor of spelling difficulty" (Bloomer, 1956 p. 533). Bloomer (1964) noted two references to word length and spelling difficulty. He paraphrased Hull (1952) by saying, "A spelling word is a heterogeneous response chain with terminal reinforcement. The longer such a response chain becomes, the lower the probability that all responses will be correct. Accordingly, word length is considered to be related to spelling difficulty" (p. 395). He also stated that Ayers (1915) "found a rank difference correlation of .88 between spelling difficulty and word length" (p. 395).

Word length was measured by the use of "bigrams." According to Lee and Sanderson (1987) a bigram is a "unit of letter order, indicating the presence of two adjacent items in a word, including the space before the first letter together with the first letter (one bigram) and the last letter with the space after the last letter (one bigram)" (p. 4). For example, the word "mouse" has six bigrams as follows: _m, mo, ou, us, se, e_. One bigram is scored for having the "m" first, one for the "o" following the "m", one for the "u" following the "o" and so on until the end of the word where one bigram is scored for the "e" in the final position. The bigram is suggested for use by Lee and Sanderson (1987) as a measure of the accuracy of spelling approximations. White and Haring (1976) were the first users of the bigram. They sought a scoring system which was more descriptive than simply correct or incorrect word or syllable spelling. Bigrams have also been used by Nulman and Gerber (1984) and by Deno, Mirkin, Lowry, and Kuehnle (1980) who showed them to be valid in comparison to standardized tests. In the present study all words with 50% or less correct bigrams were included for possible use. These were first grouped by the total number of bigrams in the correctly spelled word.

The second parameter for equating difficulty between groups was the number of errors made by the subjects on words of equal length. If two words are to be
considered of equal difficulty for a particular subject then they also must contain the same number of correct bigrams. After the potential words were grouped by length in terms of bigrams the experimenter counted the number of correct bigrams in each word and wrote that number next to the word. Those words were then equal in terms of the number of bigrams in the correctly spelled word and in terms of the number of errors the subject made on that word in the screening. Each one of the equated words was then assigned to one of six groups, such that the first word of one group was equal in length and difficulty to the first word of the other groups. The words were distributed among the groups in this manner until there were five words in each of the six groups. Each subject then had a unique set of six groups of five words, however some words (16) were assigned to more than one subject.

Prior to the beginning of the experiment proper the structure of the study was such that it required two sets of words with each set consisting of three groups of words of equal difficulty. However, it was preferable to create the groups such that all six groups would be of equal difficulty. Therefore, if six words of the same length and number of errors were available one went into each of the six groups. If three were available of one length and number of errors and three others were available with a different length and number of errors then two unequal sets of three equal groups were formed. For subjects 1, 3, and 5 there was a sufficient number of words to have six groups each with the same number of bigrams. Subject 2 had three groups with 29 bigrams and three groups with 30 bigrams. Subject 4 had three groups of 28 bigrams and three groups of 34 bigrams. Later, after the groups were formed, the two sets of equal groups were not required due to a change in the structure of the study. The study was at that time in its present form and required five groups of words of near equal difficulty. For the subjects who had three groups of one difficulty and three others of another difficulty the least difficult (fewest bigrams) groups were used first.
The first three conditions for subject 2, therefore, consisted of 29 bigrams with the last two conditions consisting of 30 bigrams. Likewise, the first three conditions for subject 4 consisted of 28 bigrams per group and the last two conditions had 34 bigrams in each group.

Pretest

Each session after the screening began with a pretest on the five words being used in that session. Only the subject's ability to spell the words was tested. Each of the five words was dictated to the subject as in the screening. The subject was given as much time as necessary to write the words. When all five words had been attempted the subject was told which ones were correct and which were incorrect, praised for general session behavior and a comment was made regarding improvement over past performance if any had occurred. No consequences were provided following the spelling of each word, and the subject was not given the correct spelling at that time. Training was then conducted on words that were spelled incorrectly with one of the procedures which follow. Correctly spelled words received no further attention except as noted below. Pretest performance was the main dependent variable and it was measured by the number of words correct and percent correct bigrams.

Look-Cover-Write-Check

This procedure is the basis for the other three procedures which constitute the independent variables in the study. The Look-Cover-Write-Check (LCWC) procedure was implemented immediately following the pretest on the five words. The first stimulus word the subject spelled incorrectly on the pretest was presented to the subject and the instruction, "Look at the word." After about five seconds the word was placed face down on the table (cover) and the subject was then instructed to write
the word on one of the smallest pieces of paper. When the subject had finished writing or indicated he/she did not know the correct spelling the stimulus card was again shown to the subject and the subject was asked, "How did you do?" indicating that the subject was to check his/her work. In most cases the subjects accurately assessed their spelling as correct or incorrect. On the rare occasions that they identified an incorrectly spelled word as correct the experimenter pointed to the error and the corresponding location in the correctly spelled word presented. This always resulted in the subject accurately assessing his/her writing. If the word was spelled correctly the small paper was collected, the stimulus card was put aside and the next word spelled incorrectly on the pretest was presented. If the subject had misspelled the word the small paper on which he or she had written was collected and after a pause of at least ten seconds the procedure was repeated. The procedure was repeated until the subject spelled the word correctly. When all the words spelled incorrectly on the pretest were spelled correctly on the small pieces of paper the session ended.

**Look-Cover-Write-Check + Posttest**

This procedure, which will be referred to as Post I, was conducted in the same manner as the LCWC procedure except that after completing the LCWC a posttest was conducted. The posttest was conducted in the same way as the pretest. All five words including those spelled correctly on the pretest were presented again immediately following the spelling of the last word trained. When all five words were spelled or attempted in the posttest the subject was told which were correct and which were incorrect, the paper was collected and the session ended.

**Look-Cover-Write-Check + Posttest + Review**

This procedure, hereafter called the "review" procedure, consisted of adding a
review component to the LCWC procedure described above. Immediately following the pretest the LCWC procedure was implemented as above. When the first two words were successfully spelled with the LCWC procedure the review component began. The subject was given one of the medium size pieces of paper and the first of the two words just spelled with the LCWC procedure was dictated to the subject. When the subject finished writing the first word the second word was dictated to the subject. If either or both of these spellings were incorrect the LCWC was repeated with the misspelled word(s). When the word(s) were again spelled correctly with the LCWC procedure the review component was repeated with the same words. If either or both were incorrect in the review component the LCWC procedure was repeated, followed again by the review component, and so on until both words were spelled correctly in the review component. Both the words had to be spelled correctly in the review component before the third misspelled word from the pretest was introduced. The LCWC procedure was then carried out with the third word. When correct the review component was then conducted using all three words in their original order. All three words had to be spelled correctly in the review component before the fourth misspelled word was introduced. The procedure of alternating from the LCWC component to the review component was continued until all words misspelled on the pretest had been spelled correctly in the review component. The posttest was then conducted as in the Post I condition unless all five words were spelled incorrectly on the pretest. If all five words were misspelled on the pretest then the last review component would consist of spelling all five words correctly which would be identical to a posttest.

The purpose of this procedure was to gradually increase the amount of time and behavior which occurred between the time the word was spelled correctly with LCWC and the next opportunity to write the word. Lee and Sanderson (1987) suggest
another task intervene between reading and spelling. This procedure accomplishes that to some degree. In this case the intervening task is spelling another word and it follows spelling the word and checking it, not just reading the word.

**Look-Cover-Write-Check + Out Loud + Posttest**

This procedure was the same as the Post I described above but in this procedure the subject spelled the word out loud during the look component of the procedure. Misspelled words from the pretest were shown to the subject with the verbal stimulus, "Look at the word and spell it out loud." The subject then was required to vocalize all the letters in the word. If the subject misspelled the word or if it was unintelligible the verbal stimulus was repeated and the experimenter pointed to the letters one at a time as the subject vocalized them. The remainder of the procedure was identical to the Post I procedure.

**Follow-up Test**

Approximately eight weeks following the last session in the out loud condition a follow-up test was given to assess the subject's retention of the words learned in each of the conditions. This procedure was identical to the spelling portion of the screening except that only the words trained in the study were presented. The experimenter dictated all the words that each subject had acquired in the study and the subject wrote each word on a sheet of notebook paper. There were no consequences following any of the words. At the end of the follow-up the subjects were thanked for participating and informed that they had finished their work on spelling.

**Experimental Design**

The design is a within-subject design with replication across subjects. Each of
the subjects was exposed to the above procedures in the following order: LCWC, Post I, review, Post II, out loud. The Post II condition was implemented to assess for practice effects after exposure to three procedures and because it was more effective than the LCWC alone. The out loud procedure presents difficulty with design because it is not possible to have another procedure follow that procedure. Even if instructed to remain quiet it is possible that the subject would spell the words subvocally, thus confounding the condition that followed.

For subjects 2, 3, and 4 each condition ended when a criterion of 100% correct bigrams was attained for two consecutive sessions. Each condition for these subjects began with a new set of words. Subjects 1 and 5 presented a problem for these conditions. When subjects 2, 3, and 4 had reached criterion for their first sets of words subjects 1 and 5 were only getting approximately 50% of the bigrams correct, and subject 5 was showing a decline in accuracy. It was desirable to teach the correct spelling of the words to these subjects if possible, yet continuing with the same procedure would have extended the study beyond the time available. It was, therefore, decided to proceed to the next condition with the same word group and without reaching the stated criterion of 100% for two sessions.

Reliability

Since the subject's behavior resulted in a permanent product and because it was difficult to have a reliability observer present during the sessions reliability data were taken at another time and location. At least one in five pretests but not less than two pretests in each condition for each subject were photocopied and delivered to a reliability observer. The reliability observer was trained in counting bigrams and in the procedures. He did not, however, know the order of the conditions nor which condition he was scoring at any time. The copies which were provided to the
reliability observer had been scored by the primary observer (the experimenter) but were not marked with the primary observer's scoring. Reliability was calculated by counting the number of words on which both observers counted the same number of correct bigrams and dividing those agreements by the total number of words written and multiplying by 100.
CHAPTER III

RESULTS

The data and results have been divided into two groups based on two distinct patterns of learning spelling. Subjects 1 and 5 required a much greater number of sessions and repetitions of writing the words than did subjects 2, 3, and 4. The data for subjects 1 and 5 are presented in Figures 1 through 4 as "Percent Correct Bigrams," "Number of Correct Words" and "Cumulative Number of Words Written". Figures 5 through 10 show the same data for subjects 2, 3, and 4.

Each data point represents data collected in the pretest before any training has been done that day. Therefore, the first time a new set of words is introduced a pretest is conducted prior to any training. These data are separated on the graphs and labeled as "B" or baseline. For subjects 1 and 5 where the same set of words was used across the first three conditions the last data point in the LCWC condition and in the Post I condition is from pretest data collected immediately prior to the first day of training in the following condition.

Subjects 1 and 5

Percent Correct Bigrams

Figures 1 and 2 show percent correct bigrams and number of words correct for subjects 1 and 5 respectively. For these subjects the same set of five words was used across the first three conditions. In the first condition, LCWC, subjects 1 and 5 made some slow progress, but both show some decrease in correct responding toward the
Figure 1. Percent Correct Bigrams and Number Correct Words for Subject 1.
Figure 2. Percent Correct Bigrams and Number Correct Words for Subject 5.
end of this condition. Some progress would be expected since the subject repeatedly views and responds to the stimulus words in the procedure. As the progress was relatively stable for these two subjects and for the reasons previously stated the decision was made to move on to the next condition.

The second condition for these subjects, Post I, showed little change from the first condition. Subject 5 made no progress. Subject 1 gained about 10 percentage points in accuracy across the condition. As the slope of the graph through this condition appears to be about the same as that in the LCWC condition there does not appear to be any change in performance. In the third condition, review, both subjects 1 and 5 achieved 100% correct. For subject 1 this change was relatively unremarkable, as the same slow progress as was seen in the first two conditions continues. Note, however, that this is the first time that there was no drop in accuracy throughout the condition. Subject 5 on the other hand showed a rather dramatic increase, through the first four sessions. The first session in the review procedure produced the largest increase in accuracy to that point in the experiment, approximately 30%. Performance for the remainder of that condition was rather slow progress until 100% accuracy was reached in sessions 32 and 33.

Subjects 1 and 5 each started with a new set of words for the first time in the study when beginning the Post II condition. In session 38 subject 1 reached 100% correct for the first time with the second set of words. The posttest procedure failed to maintain this accuracy as the percent correct varies between 75 and 100 throughout the next 11 sessions. Errors occurring during this time consisted almost entirely of a failure to put in order correctly the last three letters of the word "change". The letters "nge" were always present but did not occur consistently in that order. As it was apparent that practice effects were not an issue this condition was terminated without attaining two days of 100% accuracy.
The performance of subject 5 continued to increase in accuracy throughout this condition, although gains in accuracy in the last five sessions were smaller than in the first four. As this subject was behind the other four and no evidence of practice effects was seen with those subjects this condition was terminated after nine sessions even though progress was being made.

In the out loud condition Subjects 1 and 5 had their greatest one-day increase in percent correct bigrams between baseline for this condition and the pretest after the first training. Again the data are pretest so the baseline data point represents data collected on the first day of the out loud procedure. Progress was then slow but remained relatively steady until the end of the condition. The criterion of 100% was reached for Subject 1 in 12 sessions and for Subject 5 in 21 sessions, less than needed for the first set of words.

Cumulative Writings

Figures 3 and 4 show the cumulative number of times subjects 1 and 5 wrote approximations to the five words in the LCWC portion of each condition. Since the same set of five words is being used through the first three conditions for both subjects the graph continues upward across those conditions. These data include only the words written in the LCWC cycle and do not include the words written in the pretest, the posttest, or the reviews in the review procedure. Therefore, there is no baseline condition for each set of words.

Subject 1 wrote the words 190 times before correctly spelling the first set of five words, and subject 5 wrote the words 235 times before correctly spelling her first set of five words. Subject 1 wrote the words 140 times in the Post II condition and subject 5 wrote the words 79 times. Since neither subject reached criterion this condition cannot be meaningfully compared with the other conditions. In the out loud
Figure 3. Cumulative Words Written by Subject 1.
Figure 4. Cumulative Words Written by Subject 5.
condition subject 1 required 59 writings to write the five words correctly and subject 5 required 93. This represents 31% of the number of times the first set of five words was written for subject 1 and 40% of the time they were written for subject 5.

Subjects 2, 3, and 4

Percent Correct Bigrams

Figures 5, 6, and 7 show data for subjects 2, 3, and 4 respectively. These subjects were exposed to the same conditions in the same order as subjects 1 and 5, however, subjects 2, 3, and 4 started each of these conditions with a new set of words. Therefore, there is a baseline before each condition. All three subjects began in the LCWC condition and made rapid initial progress. Subjects 2 and 3 each show a one session decrease in accuracy before reaching criterion while subject 4 makes steady progress and reaches criterion in four sessions. Subject 3 reached criterion in 10 sessions and subject 2 reached criterion in six sessions.

In the Post I condition subjects 2 and 3 made steady progress until reaching 100% correct. Subject 4 reached 100% correct in two sessions then dropped to 93% correct before returning to 100% correct to finish the condition. Subjects 2 and 3 took three and seven sessions respectively to reach criterion in this condition, a decrease from the LCWC condition. Subject 4 required five sessions to reach criterion, an increase of one session over the LCWC condition.

In the review condition only subject 3 reached criterion in fewer sessions (four) than in the Post I condition. Two factors must be taken into consideration. First, subject 4 had an increase of eight bigrams beginning in this condition over the first two conditions. Second, both subjects 2 and 4 started out with a lower percent correct bigram score in the baseline prior to the review than in either of the first two baselines. This was a substantial difference for subject 2, 11% in review versus 48% in LCWC.
Figure 5. Percent Correct Bigrams and Number Correct Words for Subject 2.
Figure 6. Percent Correct Bigrams and Number Correct Words for Subject 3.
Figure 7. Percent Correct Bigrams and Number Correct Words for Subject 4.
and 53% in Post I. All subjects showed the typical pattern of rapid improvement in the early sessions with a slow down as they neared criterion.

In the Post II condition subjects 3 and 4 took longer to reach criterion (6 sessions and 10 sessions respectively) than subject 2 (3 sessions). Compared to the Post I condition subject 2 took the same number of sessions, subject 3 was shorter by one session, and subject 4 took twice as long with 10 sessions as compared to 5 in the Post I condition. The increased number of bigrams was at least partially responsible for this.

The last condition for all the subjects was the out loud condition. Subjects 2 and 4 required fewer sessions to reach criterion in this condition than in any of the other conditions, two for subject 2 and three for subject 4. Subject 3 met criterion in five sessions, one more than the shortest condition, the review procedure. The performance for subject 2 is notable since only 20% of the bigrams were correct in the baseline and the words were only written once each.

Cumulative Writings

Figures 8, 9, and 10 show the cumulative number of words written for subjects 2, 3, and 4 through the five conditions. The first condition, LCWC produced the greatest number of writings for subjects 2 and 3. Subject 4 on the other hand wrote a total of only eight words, the second fewest of any of the conditions. The Post I condition produced a decrease in number of writings required to reach criterion for subjects 2 and 3, but a slight increase for subject 4. The review condition required the greatest number of writings for subject 4 at 49 and produced the second most writings for subjects 2 and 3. In the Post II condition all subjects experienced a decrease in the number of writings from the review procedure. This was a small decrease for subject 3 at three words. For all subjects the out loud condition resulted in writing the words
Fig. 8. Cumulative Words Written by Subject 2.

Fig. 9. Cumulative Words Written by Subject 3.
the fewest number of times. Most remarkable is the separation between conditions for subject 4 where the out loud procedure required only 5 writings while the review procedure required 49.

Follow-up

Table 2 shows the percent correct for each subject in each condition in the follow-up test and the mean for each condition. A demonstration of improved retention of correct spelling by one procedure over the others would be an indication that it would be the procedure of choice. For the most part, however, there is little variability among these data. Subject 1 had the highest percent correct with 81% in the Post II condition. This was the group of words which were repeatedly written in attempt to spell "change" correctly. Subject 1 also had the lowest percent correct with 19% in the first three conditions. The Post II condition produced the highest percent
Table 2

Percent Correct in Follow-up

<table>
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<tr>
<th>SUBJECT</th>
<th>LCWC</th>
<th>POST I</th>
<th>REVIEW</th>
<th>POST II</th>
<th>OUT LOUD</th>
<th>MEAN</th>
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</thead>
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<tr>
<td>1</td>
<td>19*</td>
<td>19*</td>
<td>19*</td>
<td>81</td>
<td>44</td>
<td>36.4</td>
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<tr>
<td>2</td>
<td>62</td>
<td>69</td>
<td>23</td>
<td>65</td>
<td>63</td>
<td>56.4</td>
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<td>75</td>
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<td>65</td>
<td>50</td>
<td>53</td>
<td>44</td>
<td>55.4</td>
</tr>
<tr>
<td>5</td>
<td>41*</td>
<td>41*</td>
<td>41*</td>
<td>31</td>
<td>45</td>
<td>39.8</td>
</tr>
<tr>
<td>MEAN</td>
<td>48.6</td>
<td>47.6</td>
<td>40.4</td>
<td>57.2</td>
<td>54.2</td>
<td></td>
</tr>
</tbody>
</table>

* Scores for one group of five words used in three conditions.

correct with a mean of 57.2%, while the review procedure produced the lowest with 40.4%. Overall retention as measured by the follow-up was low, as none of the subjects scored above 60% correct.

Reliability

Mean agreement between observers across subjects ranged from 93% to 99%, and across conditions from 90% to 100% with an overall mean of 96%.

Summary

Figures 11 and 12 present a summary of the results as the mean number of sessions and mean number of words written in the LCWC component across subjects. Figure 11 shows these data averaged across subjects 1 and 5 for each of the sets of words, with the first three conditions (LCWC, Post I, and review) combined. Figure 12 shows the data averaged across subjects 2, 3, and 4 for each condition since each condition began with a new set of words.
Figure 11. Mean Number of Sessions and Cumulative Words Written Across Subjects 1 and 5.

Figure 12. Mean Number of Sessions and Cumulative Words Written Across Subjects 2, 3, and 4.
In Figure 11 the mean number of words written per set varies from a high of 212.5 for the first set of words in the three combined conditions to a low of 76 for the out loud condition. The mean number of sessions required to reach criterion varies from a high of 28.5 for the first set to a low of 16.5 for each of the Post II and out loud conditions. Although the Post II condition, had the same mean as the out loud condition, it must be noted that neither subject met criterion in the Post II condition, but did in the out loud condition.

In Figure 12 the mean number of words written per condition varies from a high of 29 in the third or review condition to a low of 7 in the fifth or out loud condition. The mean number of sessions required to reach criterion varies from a high of 8.7 in the review condition to a low of 4.3 in the out loud condition.

Overall, the out loud condition required fewer sessions and fewer writings of the words to reach criterion. This is not only the case for the subjects as a group, as depicted in Figures 11 and 12 but also for the individual subjects. All the subjects except subject 3 wrote fewer words and required fewer sessions in the out loud condition than in any other condition. Subject 3 took one less session in the review condition (four) to reach criterion than in the out loud condition (five). This subject, however, was observed to spell out loud prior to the out loud condition. Even with the extra session in the out loud condition subject 3 wrote only 12 words in that condition while 27 were written in the review condition. It therefore appears that the subjects reached criterion faster in the out loud condition than in any of the other conditions.
CHAPTER IV

DISCUSSION

This study examined spelling acquisition by developmentally disabled adults using the look-cover-write-check (LCWC) cycle and three variations of that cycle. Each variation produced improvement in spelling accuracy though a criterion of 100% correct was not reached with all subjects on every variation. There were two main issues to be addressed by this study: Would the LCWC cycle be an effective procedure for teaching spelling with developmentally disabled individuals by transferring stimulus control from the duplic relation to the codic relation? And, can the LCWC be improved by adding a requirement to spell out loud in the "look" component? It was also of interest to examine the nature of the approximations generated by the developmentally disabled subjects who participated in the study.

The Effectiveness of the Procedures

The data show that the LCWC procedure by itself was only moderately effective when compared to the variations of the LCWC used in the study. Subjects 2, 3, and 4 each learned to spell with this procedure, however, it was the longest condition for subjects 2 and 3 and required the greatest number of writings. Subjects 1 and 5 showed some progress but the gains were slow and both failed to reach criterion with subject 5 showing a decrease in accuracy in the last four sessions of this condition.

The posttest and review conditions had varied effects on the subjects' performance. With the posttest procedure subject 1 failed to reach criterion in
second and third greatest number of writings respectively for subject 4. On the other hand subjects 2 and 3 wrote fewer words in the posttest conditions than in any other condition except the out loud condition. The review procedure was the second longest for subjects 2 and 4 and required the greatest or second greatest number of writings for subjects 2, 3, and 4. However, it produced criterion performance for subjects 1 and 5 whereas the LCWC and Post I procedures had failed to do so.

Only the out loud condition produced a consistent effect across all subjects. All of the subjects required fewer writings to reach criterion in the out loud condition than in any other condition. This is particularly noteworthy for subject 4 where the out loud condition required only 5 writings as compared to 49 in the review and 30 in the Post II each consisting of 34 bigrams. Subject 2 wrote 4 of the five words once in the first out loud session then wrote no additional words as she scored 100% correct in each of the next two conditions. The out loud condition was also the shortest in terms of number of sessions to reach criterion for all subjects except subject 3 who required one more session in the out loud condition than in the review condition.

To return to the questions to be addressed in the study, it can be said that the look-cover-write-check cycle is effective in teaching spelling to some developmentally disabled individuals. The effect of the procedure is maximized by requiring the subjects to say the letters of the word out loud as they look at it. In all cases in this study the subjects reached criterion faster in terms of cumulative words written, and in all but one case faster in terms of percent correct bigrams in the out loud condition. The data presented here indicate that the LCWC procedure by itself or in combination with a posttest or a review is not as effective as the out loud procedure combined with the posttest.

The addition of the behavior of spelling out loud provides an opportunity for the subject to engage in behavior which may not otherwise be possible. In all conditions
except the out loud condition the subject's responding is much like copying a text or duplic behavior. The subject looks at the visual stimulus of the printed word, the word is then turned over, the experimenter says, "write the word _____," and the subject immediately writes the word. The only difference from copying a text is that the visual stimulus is not present in the environment at the same time. However, it has been gone for only one or two seconds before the subject begins to write. The subject has not responded in any observable way to the visual stimulus prior to its disappearance.

In the out loud procedure the subject not only looks at the word but makes a textual response, saying the letters, and then the card is turned over and the writing occurs. This additional response allows the subject to make additional responses to his own verbal behavior. Two types of verbal behavior seem plausible. The first is covert self-echoic behavior, repeating the spelling over and over to oneself. This might occur one or two times immediately following the removal of the visual stimulus (the printed word). Saying the letters overtly and/or covertly strengthens the second type of possible covert verbal behavior, intraverbal behavior. Once the subject has said, "p-a-i-n-t" even once there will be a tendency to say "n-t" after having just said or written, "p-a-i." Indeed, there is some evidence for the presence of the intraverbal relation which will be discussed later. In any case the subject is now taking dictation with his or her own covert behavior functioning as the verbal stimulus.

The out loud condition also has several advantages as a procedure. The experimenter or trainer is sure that the subject is complying with the procedure by actually looking at the word, and can see and identify all the letters in the proper order. In other conditions it was not always clear that the subject responded in any way to the visual stimulus. Subject 1 was observed to orient her head toward the card, however, her eyes could be seen to be oriented in directions other than at the card. It would also
be possible to prompt a subject to say the letters more and more quietly until the spelling becomes subvocal or at least an inaudible whisper. The subject could then respond to novel words without the aid of an instructor. In this way the subject has a method with which to study new spelling words.

Approximations

The developmentally disabled subjects in this study generated 1050 approximations. The difficulty encountered by Lee and Sanderson (1987), of a failure of the LCWC cycle to produce approximations, seems to be eliminated by having developmentally disabled subjects serve in the experiment. The study of these approximations was not a main purpose of this study but there are some observations worth mentioning.

First and most common to all the subjects is the relevance of intraverbal behavior to spelling. The intraverbal relation between letters had considerable impact on the subjects throughout the study. After learning one word with a particular letter combination that combination tends to occur when the initial letter of the combination occurs again. For example, subjects 2, 3, and 4 all spelled the word "poison," but later when asked to spell the word "police" all three had a strong tendency to begin by writing "poi." Subject 5 had spelled the words, "wait" and "stairs" then encountered the word, "danger" and began the word with "dai" three times in a row. These instances appear to be the result of a history with a letter in the word being attempted which was also present in a previous correctly spelled word. When that letter has been written there is a strong tendency to write the letters which followed in the previous word.

A second trend common among the subjects was that there seemed to be a rough upper limit to the number of letters a subject could look at and then repeat. That is, up
to a certain number of letters the subject could look at a word once and write it correctly; however, if just one more letter was added it made spelling the word much more difficult when the visual stimulus was removed. In session 25 subject 1 was to spell the words "more," with 4 letters, and "paint" with five letters. The pretest spelling of the word, "more" was "onen." In the first LCWC "more" was spelled correctly after looking at the word only once. "Paint" with just one more letter was spelled with an approximation which was much more close to correct, "paity," but subject 5 took five attempts with LCWC to spell it correctly, looking at the word prior to each attempt.

All the subjects except subject 5 in this study were able to write words of four letters correctly in the LCWC cycle after just one look at the word. The addition of just one letter would make the word much more difficult for the subjects. This jump in difficulty was far greater than that encountered by the addition of more letters. For example, subject 1, with an upper limit of four letters, required more sessions to spell "stairs" than to spell "hospital," with two more letters. Subjects 1, 3, and 4 all required as many or more sessions to spell "change" with six letters than the words "elevator," "gentlemen," and "December." This difference was probably in part due to some aspect of difficulty of the word "change," however, the difference in length of the words is still notable.

The developmentally disabled subjects who participated in this study generated a large number of approximations. It is fair to assume that other developmentally disabled individuals would also generate a large number of approximations. Researchers who are interested in the study of spelling approximations should consider work with this population. In examining the approximations made by the subjects in this study it is apparent that intraverbal behavior played a major role. The spelling instructor can strengthen the intraverbal relations by saying the word and
having the learner respond by spelling out loud and repeating the out loud spelling several times. This should strengthen not only the stimulus control over spelling exerted by the spoken word but also the intraverbal relation between the letters of the word. On the other hand words which are similar in form may be confused by the learner. The instructor should watch for this and provide specific training on possible points of confusion.

The Bigram as a Measure of Spelling Accuracy

The bigram has a number of clear advantages over the number of correct words as a measure of spelling accuracy. Most clear and obvious is that it is sensitive to changes within an incorrectly spelled word. This advantage can be seen in the data for subject 5 in Figure 5 in the LCWC condition. The percent correct bigrams ranges from 17% to 55% yet the number of correct words remains fairly stable at either "0" or "1." Bigrams also give credit to the speller for coming close to correctly spelling a word. The data show this for subject 4 in the LCWC condition. The number of correct words decreases in the second session yet the percent correct bigrams continues to increase, showing that the subject is coming closer to spelling the words correctly. A word which is a close approximation is likely to benefit the writer when his behavior is considered as that of a speaker (Skinner, 1957) as the reader (listener) is more likely to respond appropriately. For these reasons the bigram is a very appropriate measure for spelling accuracy.

The bigram also has a number of disadvantages. It does not give credit for correct letters in wrong order as opposed to the wrong letters. Following from the above discussion a reader is more likely to respond appropriately to a given approximation if that approximation contains the correct letters. For example, subject 1's approximations to the word "change" such as, "chagen" are probably more likely
to be responded to correctly than is, "chalrb." Yet both of these approximations have
the same number of correct bigrams (3). Another difficulty is that if a letter is
incorrectly doubled it does not change the number of correct bigrams. Subject 4
spelled "apple" as "applle," both spellings have 6 correct bigrams. A third and last
problem is that a word which has the same letter occurring several times in the correct
spelling may be given more credit than is due if the multiple letter occurs only once in
an incorrect spelling. The word "December" with 9 bigrams was misspelled "Dember"
which has 7 correct bigrams yet 3 bigrams were omitted. An alternative system which
would maintain the advantages of the bigram yet also take into account the correct
letters and number of letters would be useful. However, such a system would
probably require rather complicated counting and scoring rules which might render it
too cumbersome for use. The bigram still appears the best measure available for
spelling accuracy.

Directions for Future Research

There are a number of possible research projects which could follow from the
current study. A demonstration of a procedure which would teach the subjects to
study by spelling first out loud then at decreased levels of loudness until they spelled
"silently to themselves" would be valuable. A baseline would be conducted in which
the subjects would be pretested on a list(s) of words, told to study them in the absence
of the experimenter, then posttested to assess the effects of studying. Subjects would
be trained with the out loud procedure and prompted to spell more and more quietly
until their spelling was inaudible. The experimenter would also want to fade
him/herself out of the training situation. The final phase would consist of returning to
the baseline condition with the subjects being instructed to study the words as they had
learned.
Another demonstration of the out loud aspect of learning the spelling words with improved experimental control would be warranted. All subjects would first learn a short list of five words with a non-out loud procedure as a baseline. A multiple baseline design could be used to introduce the out loud procedure across subjects. The first subject would be exposed to the out loud procedure following the baseline procedure while the remaining subjects continue to learn lists of words with the non-out loud procedure. Then introduce the out loud procedure, with the second subject following learning a second list with the baseline procedure then begin the out loud procedure with the third subject and so on through the remaining subjects.

An experiment in which spelling out loud without the visual stimulus present was compared with spelling with the visual stimulus alone and with a combination of visual and auditory stimuli would also be of interest. It may be that the out loud aspect is only useful when used in combination with the visual stimuli.

Conclusions

This study set out to examine the LCWC cycle with developmentally disabled subjects, to determine if it could be used as a method of spelling instruction, and to determine what effect spelling out loud in the look component would have.

When the LCWC cycle consisted of looking at the word, covering it, writing the word, and then checking, it was an effective procedure for some but not all of the subjects in this study. All five subjects in this study showed some improvement in spelling accuracy but progress was slow for two of the five subjects. The addition of the posttests and review procedures improved spelling accuracy to criterion, however, these procedures required much more behavior on the part of both experimenter and subject.

The addition of the requirement to spell the words out loud in the look component
was effective in producing correct spelling with all the subjects in this study. For subjects where a comparison can be made this was accomplished in a shorter time and with fewer repetitions of the words than in the procedures without the out loud requirement. Therefore, when teaching developmentally disabled adults to spell and write, requiring the learners to spell out loud should be incorporated in the training procedure.

It should be pointed out that all variations of the LCWC procedure discussed in this study are procedures for teaching spelling by memorization. The author can think of no instance in which spelling by memorization would be preferable to spelling with a phonetic approach. There are, however, many developmentally disabled individuals who, for one reason or another, have failed to acquire a phonetic approach to reading or writing but are functioning in circumstances in which writing is necessary or convenient. Often these subjects need to learn a rather limited number of words, such as those necessary for completing an employment application or to fill out a form at work. The use of the procedures discussed here may be appropriate for such subjects.
APPENDICES
Appendix A

Informed Consent Forms
The Acquisition of Spelling by Developmentally Disabled Adults: Transfer of Stimulus Control from Visual to Auditory Stimuli

Mark Stafford - Principal Investigator
Jack Michael Ph.D. - Academic Advisor

Consent Form

My name is Mark Stafford. You probably know me as the instructor in the Work Activity Classroom at Goodwill Industries. I am doing a project and writing a paper which should help me and others be better spelling teachers. I would like you to help me by learning to spell some words and by giving permission for me to write about how well you do.

It was decided at your last annual staffing that spelling or writing are things you need to work on in class. Helping me with this project may help you do better at spelling and writing words you need to use.

You and I will work together at least three days each week during your normal classroom time. I plan to use three different ways of teaching you to spell to compare those ways of teaching. Each time we work on spelling I will ask you to spell a short list of words. Then I will collect those lists and will give you some small pieces of paper. I will show you the words you spelled wrong on the list and you will write each word on one of the pieces of paper. Then you will get to check to see how you did by either comparing your writing to the word I show or, just looking at the correct word, or by writing the word the right way next to the word I show you. I would like to start working with you about March 6, 1989, and will continue to work with you until sometime in the Summer. Each time we work we will work for about 20 minutes.

If you decide to sign below you are giving permission for me to write about how well you learn to spell when I teach you like I described. When I write about how you did I will not use your name and I will not tell anyone your name unless you say that is O.K. and sign a piece of paper giving me permission. All information with your name on it about how you do in spelling will be stored in a locked file drawer in my desk in the classroom at Goodwill. There will be other people in the
project and everyone's progress will be reported without their names as part of a master's thesis to Western Michigan University. The results of what you learn in the project will also become part of your file at Goodwill and Community Mental Health.

You may drop out of the project at any time or you may take back your permission at any time; this will not change what you do at Goodwill. You will still come to class and will still work on spelling and writing but I will not write about how you do in the project. You will get to see how well you did at the end of the project, I will show you the results. If you like you may have a copy of the paper that I write.

I would like to look at some information in your files at Goodwill and Community Mental Health. I would like to look at your Vineland scores, records about your education, psychological and social work reports, and other evaluations which have information about how well you can read, write, and spell.

Do you have any questions? If you would like to work with me then I need you to sign the next page.
Client Consent (When client is own guardian)

I _____________________________ consent to participate in the above study. The study has been explained to me as have the risks and benefits. I have been given the chance to ask questions and have understood the answers.

_________________________________________  _____________________________
Date                                              Client Signature

Witness

I _____________________________ have witnessed that the party consenting has done so willingly, with full knowledge of the risks and benefits, and to the best of my knowledge is his/her own guardian.

_________________________________________  _____________________________
Date                                              Witness Signature
Guardian Consent

I ______________________________ agree that my ward may be a subject in this study.

_________________________________________  ______________________________
Date                                           Guardian Signature

Witness

I ______________________________ have witnessed that the party consenting has done so willingly, with full knowledge of the risks and benefits, and to the best of my knowledge the person whose signature appears above is the guardian of the person participating in the study described.

_________________________________________  ______________________________
Date                                           Witness Signature
Client Assent (When client has a guardian)

I _____________________________ consent to participate in the above study. The study has been explained to me as have the risks and benefits. I have been given the chance to ask questions and have understood the answers.

_________________________  _____________________________
Date                        Client Signature
Appendix B

Western Michigan University Human Subjects
Institutional Review Board Approval
TO: Mark W. Stafford
FROM: Ellen Page-Robin, Chair
RE: Research Protocol
DATE: February 24, 1989

This letter will serve as confirmation that your research protocol, "The Acquisition of Spelling by Developmentally Disabled Adults: Transfer of stimuli Control from Visual to Auditory Stimuli" is now complete and has been signed off by the HSIRB.

If you have any further questions, please contact me at 387-2647.
Appendix C

Behavior Management Committee of Muskegon County
Community Mental Health Approval

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The Behavior Management Committee has approved, for your consideration, a research project proposed by Mark Stafford to meet his Master's of Psychology Thesis requirements at Western Michigan University. The initial review took place without Mark's presence on December 19, 1988. The committee members present for that discussion were Patti Groessl, John North, Ron Kidder, Cynthia Hassinger, Ruth Walkotten, Bruce Dach, and myself. We raised nine questions with regard to rights issues and seven concerns about the design of the project. These were forwarded for Mark's consideration in the minutes of the meeting. Mark attended the Behavior Management Committee meeting on January 9, 1989. He had incorporated most of our suggestions while revising his project. Other concerns were explained to our satisfaction. The committee members in attendance (Ron Kidder, Cynthia Hassinger, Mary Zmolek, Rick Smith, Bruce Dach, Pat Matuszak, Patti Groessl, and myself. Kelly Williams was also there as consultant for Recipient Rights) approved the project as meeting the following criteria:

- in conformance with the policies and procedures of the Department of Mental Health Administrative Manual, the Mental Health Code, Community Mental Health Services of Muskegon County, and federal law;

- consistent with sound research design and techniques;

- adequate consideration given and precautions taken to protect persons participating in the study and receiving services from the agency or its contractors;

- protections instituted relative to study documentation and agency records.

The BMC anticipates no impediment to your approval of the proposed study. The final draft of the study proposal accompanies this report. Specific concerns/questions mentioned above are available for your review in the BMC minutes.

Mary Graham
Behavior Management Chairperson

/s/ Mary Graham

Att.
MEMORANDUM

COMMUNITY MENTAL HEALTH SERVICES OF MUSKEGON COUNTY

Date: March 3, 1989

To: Richard Rienstra
From: John North

Subject: Approval of Research Project

DMH Guidelines require that any research project involving clients be reviewed by a human rights committee, and approved by the Director.

The attached research, to be conducted by Mark Stafford, will involve CMH clients at Goodwill. The protocol has been approved by Western Michigan University's Human Subjects Institutional Review Board. In addition, the CMH Behavior Management Committee has reviewed the project extensively with Mr. Stafford. The attached memorandum from Mary Graham summarizes the review. The Behavior Management committee meets all DMH criteria for the Human Rights Committee.

The relevant DMH Guideline has been met, and your approval is requested. Please sign below or contact me with questions.

Approved 3-4-89

Richard Rienstra

/jlt


Blakeman, C. M. (1979). Effects of homework assignments, parent prompts, and contingency contracting on classroom spelling accuracy of trainably mentally impaired and severely multiply impaired students. Unpublished specialist project, Western Michigan University, Kalamazoo, MI.


