The comprehension of more and less in educable mentally retarded children.

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University of Windsor

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LA THÈSE A ÉTÉ MICROFILMÉE TELLE QUE NOUS L’AVONS REÇUE

THIS DISSERTATION HAS BEEN MICROFILMED EXACTLY AS RECEIVED
THE COMPREHENSION OF "MORE" AND "LESS"
IN EDUCABLE MENTALLY RETARDED CHILDREN

by
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B.A., University of Toronto, 1982
B.Ed., University of Toronto, 1983

A Thesis
Submitted to the Faculty of Graduate Studies Through the Faculty of Education in Partial Fulfillment of the Requirements for the Degree of Master of Education at the University of Windsor Windsor, Ontario, Canada

1985
ABSTRACT

The comprehension of the relational terms "more" and "less" was investigated in educable mentally retarded children in order to examine the developmental stages these children proceed through in their acquisition of these terms. Three groups of EMR children ranging in age seven to 11 were tested with two different sets of material: quantities of water and arrays of poker chips.

The results indicated that "more" is acquired before "less", and those children who do not know "less" treat it as a synonym for "more". These results are similar to those observed with normal children although the EMR children performed better on the "less" questions than expected.

The results are discussed in terms of a developmental delay and classroom experience which was found to minimize this delay.
ACKNOWLEDGEMENTS.

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A note of thanks to Donald DiUbaldo of the Windsor Separate School Board for his help in the initial contact of the subjects. As well, a special word of appreciation to the school principals and teachers for their assistance and cooperation.

My parents deserve a big thanks for their continuing love and support throughout my university career. Their interest and involvement have been greatly appreciated.

Finally, I would like to extend a special word of thanks to my husband, Mark. His continued love, advice, and support have provided me with much needed motivation and self confidence. He has been a true inspiration.
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CHAPTER 1

Introduction

Language acquisition in the mentally retarded has become a popular topic for investigation over the past two decades. Many researchers (e.g., Lackner, 1968; Lenneberg, Nichols, and Rosenberger, 1964; Dooley, 1968) have attempted to describe the language of this population, however few have investigated the process whereby the mentally retarded acquire certain stages of language development. There is a general acceptance in the literature that the language of many mentally retarded children is developmentally delayed (Rosenberg, 1982), however it is suggested that these children follow through the same semantic and syntactic patterns as normal children and may even use the same learning strategies (Ryan, 1975).

Many definitions of "mental retardation" have been put forth (Heber, 1961; Mercer, 1973) but one of the most widely accepted by most authorities is the one used by the American Association of Mental Deficiency. It reads as follows: Mental retardation refers to significantly subaverage general intellectual functioning existing concurrently with deficits in adaptive behaviour, and manifested during the developmental period (Grossman,
1973, p. 11.).

The words "subaverage general intellectual functioning" in the above definition refer to performance on a standardized test of intelligence that is more than two standard deviations below the mean.

One classification of the mentally retarded that is used primarily for the school systems is "educable" mentally retarded. Generally speaking the educable mentally retarded (EMR) refer to those retarded people who can be taught basic academic subjects. Their IQ scores usually fall within the range of 50 to 75. It is this subgroup of mentally retarded individuals that this present research will examine.

A central focus of research in mental retardation has been language development. There are several reasons for this. Firstly, a review by Spradlin (1963) revealed that well over half of the institutionalized retarded can be expected to have speech and language problems. This situation was not as severe for retarded children in special education classes (eight to 26 percent of retarded children in noninstitutionalized settings were found to have communication dysfunctions); yet the prevalence is higher than in the general population. It is hoped that knowledge of the process whereby retarded children acquire language might provide assistance with developing teaching strategies for these children. Secondly, the study of
language development of retarded children could further our understanding of language development with normal children. In other words, the observation of delayed language development can lead to greater understanding of the stages of language acquisition.

Literature Review

Language acquisition in the mentally retarded has been studied extensively using a variety of techniques and different etiological subgroups. As this particular study is interested in the educable mentally retarded and their ability to comprehend relational terms, this review must be limited in scope. It is of importance to discuss briefly the kinds of studies that have evolved in the area of language development and the mentally retarded. Of interest as well will be an overview of studies which have found evidence of a developmental delay in some aspects of the mentally retarded's language acquisition. Finally it is necessary to examine the literature dealing with the acquisition of relational terms in normal children as it is this particular aspect of language development with which this study is concerned. It is important to emphasize that no study, as far as this investigator is aware, has been undertaken to examine this linguistic ability in mentally retarded children. This study is
intended to fill the gap in this particular area.

Descriptive Research. Lenneberg, Nichols and Rosenberger (1964) studied sixty-one Down's Syndrome individuals in the chronological age (CA) range 3;0 to 22;0 who were being raised at home by their parents. The subjects were observed at various times over a three year period although no longitudinal findings were presented. The observations included medical, neurological, and psychological testing, measures of spontaneous speech and articulation, sentence-repetition, vocabulary, command-understanding, and vocalization testing. The researchers found that these children, who had IQ scores between 20 and 70 passed through all of the "milestones" in the usual order, with the relationships of language development to motor development roughly preserved, at least in the younger children. They also found that performance on various sentence repetition tasks was identical to that of normal children; they made similar kinds of mistakes and reconstructions based on their grammatical understanding and did not show any unusual amount of blind parroting. Generally speaking, Lenneberg et al. (1964) found no evidence of qualitative differences in language behaviour between their mentally retarded subjects and nonretarded children but rather developmental
arrest at earlier stages of normal language development.

Lackner (1968) studied five mentally retarded children, four of whom were institutionalized and the fifth was living at home and attending a special school. These children were in the mental age (MA) range 2;3 to 8;10 and the CA range 6;5 to 16;2. Some nonretarded children were also studied for comparison. The retarded children spent eight weeks in a clinic during which time samples of spontaneous speech were recorded. In addition the following tasks were administered to both the retarded and the nonretarded children: naming, sentence imitation, and sentence comprehension. The spontaneous speech samples were scored for, among other things, the following sentence types: declarative, question, negative, passive, negative passive, and negative passive question. The sentences used in the controlled observation procedures were consistent with the spontaneous speech and vocabulary data and syntactically more advanced than the structures apparent in the spontaneous speech data.

Generally speaking, it is clear from Lackner's results that from the standpoint of the linguistic structures examined, and regardless of MA level, no qualitative differences were found between the mentally retarded children and the nonretarded children in the syntactic rules that were operating in the spontaneous speech and in the controlled observation procedures.
Both of these early descriptive studies suggest similar development for retarded and nonretarded children in several aspects of language development. Further evidence for this conclusion results from controlled studies which have examined a wide variety of language functions including syntax, morphology and semantics. This research is examined in the following section.

Syntactic, Morphological and Semantic Development in Retarded Children. In terms of syntactical development, many studies support the notion of a delay theory. Wheldall (1976) used a comprehension test to study knowledge of a variety of syntactic structures in mentally retarded (special class) and nonretarded children. The tests contained sentences of varying length and grammatical complexity that illustrated fifteen syntactic structures, four sentences for each structure. Comprehension of each sentence was evaluated by having a subject choose from among three or four simultaneously presented pictures, the one that was equated in meaning with the key sentence. A child was assumed to have mastered a given structure when he or she performed correctly on at least three of the four sentences representing that structure. There were 86 retarded and 30 nonretarded children equated on mean vocabulary age based on the British version of the Peabody Picture.
Vocabulary Test. The mean verbal MAs were 53 months for the retarded and 51 months for the nonretarded children. The mean CAs in these two groups were, respectively, 12;6 and 4;0.

Among the findings in this study was that there were no instances in which a child, retarded or nonretarded, completed all the items on the test. In addition, both groups of subjects attained a similar overall performance. Total score correlated .81 with vocabulary age for the retarded and .84 for the nonretarded children. It is also interesting to note that the order of difficulty of the structures was similar for these two groups (r = .87). Thus, in this study, the performance of 12-year-old mentally retarded persons was similar to that of nonretarded preschoolers, indicating evidence of a developmental lag. Additional support for this lag among the mentally retarded in the area of syntax can be found in the following study.

The Carrow Experimental Test of Linguistic Comprehension (picture identification) was used by Bartel, Bryen, and Keehn (1973) to assess syntactic form class, grammatical morpheme, and sentential knowledge in a sample of special-class retarded individuals. Carrow (1968) in her study had used nonretarded children in the CA range 2;0 to 7;9. In Bartel et al's (1973) mentally retarded sample CA ranged from approximately 9 to 15, MA from 2;8
to 6;0, and IQ from 23 to 50. Thus the present sample was not very different from the sample of nonretarded children studied by Carrow on MA range.

Overall the performance of the mentally retarded children was inferior to the performance of Carrow's nonretarded sample, particularly on certain grammatical morphemes and on the passive construction. More importantly, both IQ and MA correlated highly with the raw score for the mentally retarded sample, the coefficients being .80 and .70 respectively. CA, on the other hand, did not correlate significantly with raw score (.17). Thus IQ and MA must have been related in the mentally retarded group.

In a review of this research area, Rosenberg (1982) concludes that the picture of syntactic functioning in the mentally retarded that emerges from an examination of performance on specific syntactic structures using both production and comprehension tasks is one of developmental lag. As a result, MA tends, for the most part, to predict syntactic performance better than CA in the mentally retarded. Little is known, however, about the details of syntactic development or the final achievements of syntactic development, due to the absence of longitudinal observations beyond the earliest stages of syntactic development and the absence of comprehensive studies of the syntactic capabilities of mentally retarded adults.
Morphology has been the topic of several studies using retarded children as subjects. These types of studies often employ Berko's (1958) "wug" test. In this test children are required to use the appropriate inflection. Usually the items to be inflected are nonsense words. Newfield and Schlanger (1968) compared normals and subnormals on the acquisition of morphological rules, using the Berko test. They found that the order of acquisition of the allomorphs used in morphological constructions was very similar for the two groups. Children in both groups had mastered the most regular and common allomorphs first. In other words, they concluded, retarded children learn morphology in a manner comparable to normal children. The learning pace is slower but the differences are merely quantitative rather than qualitative. This conclusion has been supported by a number of additional studies (Lovell and Bradbury, 1967; Bradbury and Lunzer, 1972).

Semantics is the study of those categories and relations of perception, action and thought, and their interrelations that can be expressed linguistically (Bowerman, 1978). It includes the area of lexical meaning (the content and organization of meanings expressed by individual words). Very little research has been conducted on the semantic development of retarded children. The question of how lexical semantic knowledge
develops and the question of how it is organized in mentally retarded individuals are issues that have seldom been systematically studied (Rosenberg, 1982).

Evidence of a developmental lag in lexical categorial identification and formation in mentally retarded students has been found by Winters and Brzoska (1976); and Cornwell (1974) noted MA-related increases in, among other things, the ability of Down's Syndrome children to designate the function of a concrete noun.

The application of a word association task to the study of lexical knowledge is exemplified in the work of Semmel, Barritt, Bennett and Perfetti (1968). These researchers found, among other things, evidence of developmental lag in educable mentally retarded children matched with nonretarded children on CA in the tendency to give same syntactic class (ie. paradigmatic) responses on a word association task. Presumably this difference reflects differential utilization of a semantic featural matching strategy, a difference in lexical semantic knowledge, or both.

A number of additional studies have been conducted which investigated semantic categorial capabilities in mentally retarded individuals (eg. Sperber, Ragain & McCauley; 1978; Glidden and Mar, 1978). These studies have found evidence for similar semantic development in mentally retarded and nonretarded children. Although this
conclusion appears to be consistent in the literature on semantic development it must be recalled that there is a limited amount of research in this area and further work is necessary to strengthen such conclusions.

The Acquisition of Relational Terms in Normal Children. Much research in language acquisition with normal children has focused on the study of the development of words and their meanings. One of the key questions has been whether or not there is a predictable sequence to this development across children. Clark (1973, 1974) has outlined a comprehensive theory of how word meanings are acquired. According to the "semantic feature hypothesis" children acquire the meanings of words by sequentially adding specific features. When the child first acquires a word it has only some semantic features. Gradually the child adds more and more components until he achieves an adult-like knowledge of the word. The first components learned are the more general ones, while later features are more specific.

Clark's theory makes certain predictions about the order in which knowledge of word meaning is acquired. First, it predicts that more general features will be acquired before more specific ones. Second, it predicts that if two words are hierarchically related such that all the meaning components of the first are shared by the
second, but the second has additional components, then the child will understand the first word earlier and may initially treat the second word as if it were synonymous with the first word.

The bulk of research on the hypothesis that feature learning proceeds from general to specific has employed relational terms. These are terms that involve comparison and include such linguistic structures as "more"/"less", "big"/"little", "long"/"short", etc. The hypothesis predicts that words referring to overall size (eg. "big"/"little") are learned before those referring to height and length (eg. "thick"/"thin", "wide"/"narrow"). These predictions have been supported by a number of studies assessing the accuracy of children's comprehension of these terms (eg., Clark, 1973; Bartlett, 1976). In one such study, Rileers, Oller, and Ellington (1974) assessed the comprehension of the terms "big"/"little", "long"/"short", and "wide"/"narrow" by normal children between the ages of 2;6 and 3;6; They simply asked them to "give me the _____ one" from a pair of appropriate objects. The results showed that there were fewer errors on "big"/"little" than on "long"/"short" and fewer on "long"/"short" than on "wide"/"narrow", confirming the trend from general terms to specific ones.

In terms of Clark's second prediction regarding a stage where antonymic pairs may be treated as synonyms,
she (1971) conducted a study involving the acquisition of the terms "before" and "after". Her experiment included both a comprehension and a production task. Clark found clear evidence for a stage in which "after" was treated as a synonym for "before" prior to "after" being fully understood.

A great deal of research has been conducted on the acquisition of the relational terms "more" and "less", the results of which add to the complexity of this discussion. Donaldson and Balfour (1968) performed one of the earliest studies designed to test the comprehension of "more" and "less". In their seminal study, children were presented with two cardboard trees in which cardboard apples could be hung. Children between 3;5 and 4;1 were given various active and passive (judgmental) tasks in several different contexts, in which the number of apples on the two trees varied. The active tasks included such instructions as to put more (less) apples on one tree than the other, and the passive tasks asked the child to judge "Does one tree have more (less) apples on it than the other?" and to state "Which tree has more (less) apples?" (Donaldson and Balfour, 1968: 463).

The most obvious finding of this study was that children largely responded to "less" as if it meant "more". That is, for example, when the children were confronted with two trees having equal numbers of apples
and were asked to make one of the trees have less apples than the other, the children frequently placed additional apples on the tree, making it have more, rather than less, than the other tree. Or when asked of two trees with unequal numbers of apples, "Which tree has less apples on it?" the children often picked the tree which had a greater number of apples on it.

The researchers concluded that some of their subjects were indeed at a stage in which "more" was correctly understood but "less" was treated as if it were a synonym of "more" rather than an antonym.

Palermo (1973) confirmed the above findings in a similar study and further reported that the confusion for these two terms persists at least for some children until age seven.

Contradictory results regarding the treatment of "less" as a synonym for "more" have been reported by Weiner (1971) and Griffith, Shantz and Sigel (1967). Weiner's study was designed specifically to replicate the findings of Donaldson and Balfour (1968) using different materials and procedures. She investigated the comprehension of "more" and "less" with 2- and 3-year old children. The subjects were asked to examine rows of toys that differed in the number of objects arranged in one-to-one correspondence to the point of inequality. Her results indicated that "more" is understood before "less"
but there was little support for the earlier findings of Donaldson and Balfour (1968) and Palermo (1973) of the existence of a stage where "less" is treated as if it means "more". Most of the children behaved instead at a chance level in most of the conditions where "less" questions were asked.

Griffiths, Shantz, and Seigel (1967) report that in judging weights, among other judgments, 4- and 5-year olds did not treat less weight as if it meant more weight and they used less correctly on 80 percent of the tests.

In a study designed to address the contradictory results of these studies Palermo (1974) hypothesized that different materials (ie. weights, linear arrays such as those used by Griffiths et al. (1967) and Weiner (1971) respectively) may provide contextual cues which facilitate the comprehension of the comparative terms involved. Palermo found that there was no difference in performance for each of the different stimulus materials used, thus he was unable to confirm his hypothesis. However, he suggested that other contextual variables such as the manner in which the experimenter interacted with the children may have led to the different results obtained.

Despite these contradictory results regarding the possibility of a stage where "less" is treated as if it means "more" it is possible to cite several consistent findings that appear in this research (Donaldson and
Balfour, 1968; Palermo, 1973, 1974). "More" is always acquired before "less" prior to three years of age. "Less" is incorrectly understood at three years of age, sometimes confused with "more", and performance on "less" increases with age. "Less" is sometimes not fully understood until seven years of age. Different stimulus materials have been found to yield equivalent results.

Statement of the Problem

This study will investigate the comprehension of the relational terms "more" and "less" in EMR children. Specifically this study has two focuses. First, this study will investigate the developmental stages that EMR children proceed through in the acquisition of the terms "more" and "less" by comparing three different age groups within this population. Second, it will attempt to discover whether, in relation to normal children, EMR children are delayed in their acquisition of these terms.

Restrictions of the Study

Due to school board policy, the researcher was not given permission to obtain IQ scores for the subjects in the sample. It can be assumed, due to the fact that the children were in either a Readiness Class or an
Opportunity Class, that they do exhibit slow intellectual development and a severe lag in academic achievement (Knight, A. 1982). These are the inclusion criteria for placement in these classes.

According to a psychometrist at the board (Personal Communication, 1985) the children in the Opportunity Class must have obtained IQ scores in the range of 65-80 on their previous testing date, and would be functioning approximately two to three grade levels below normal for their age. The children in the Readiness Class were identified by the classroom teacher as having limited attention spans, severe academic difficulties, and having IQ scores usually below 80. It was expected, according to the classroom teacher, that these children would be placed in Opportunity Classes for the following school year. It was necessary to select students from this class as they were the youngest group of children identified as EMR within the school board. Teachers' impressions of students' abilities assisted in identifying individual learning problems as some student profiles did not adhere strictly to the above criteria.

Statement of Hypotheses

Although the existing literature in the field of
semantic development in the retarded is sparse, several predictions as to the probable nature of the results can be formulated. Differences between the three experimental groups are expected as follows:

Hypothesis 1

(a) Significant differences will be obtained between the primary (youngest) group and the junior (middle) group on performance with "less" questions. (b) No significant differences will be obtained between these two groups on performance with "more" questions.

Hypothesis 2

(a) Significant differences will be obtained between the junior group and the intermediate (oldest) group on performance with "less" questions. (b) No significant differences will be obtained between these two groups on performance with "more" questions.

Hypothesis 3

(a) Significant differences will be obtained between the primary group and the intermediate group on performance with "less" questions. (b) No significant differences will be obtained between these two groups on performance with "more" questions.
In summary, each group will perform in a manner that is consistent with the performance that has been observed by normal children at comparable ability levels. Also, the sequence of stages observed in the EMR children should be similar to that observed with normal children. These expectations are based on a number of studies (e.g., Palermo, 1974; Donaldson and Ralfour, 1968) which have found that in normal children 1) "more" is acquired before "less", by approximately three years of age, 2) "less" is treated incorrectly (sometimes as a synonym for "more") from three years of age up until around seven, with performance improving with age, and 3) by seven years of age both "more" and "less" are treated correctly. Since some researchers have found that retarded children proceed through the same stages as normal children in other areas of language development (e.g., Ryan, 1975), it is expected that the above sequence will be observed with the EMR children in this study.
CHAPTER 2

Method

Subjects

Three groups of children were tested. The primary group consisted of 10 EMR children, mean age of 7;9. The junior group consisted of 10 EMR children, mean age of 9;9. The intermediate group consisted of 10 EMR children, mean age of 11;4. The four youngest children attend a "Readiness Class"; the other children attend "Opportunity Classes" within a private school board, located in an urban industrial community in Southwestern Ontario.

Apparatus

The apparatus consisted of a table, a set of white poker chips that were used in the poker chips task, two glasses and a pitcher of water that were used in the water glasses task. In addition, a cardboard square 30X30 centimetres, that was manipulated by the experimenter, served as a screen.
Procedure

The author experimenter spent several days at the schools getting acquainted with the children. On the third visit the experimenter took the subjects individually from his/her classroom to the experimental room. The experimenter and the subject were seated across from each other at a small table. Each subject was seen once for approximately ten minutes. Each session included a poker chips task and a water glasses task.

The poker chips task, modeled after Weiner (1971) employed poker chips presented on a table. A line of masking tape placed lengthwise across the table divided it into two equal halves in order for the poker chips to be displayed for comparison. The experimenter placed the screen in front of the table and set up two linear arrays of unequal quantity, one on the left side of the dividing tape and one on the right. The experimenter then removed the screen and asked, "Which side has more (less) wheels?". The experimenter performed this task a total of eight times, four times with a "more" question and four times with a "less" question.

The water glasses task, modeled after Palermo (1973) employed two .300-litre clear plastic glasses which were placed on the same table as indicated above. The glasses were lightly marked at seven points to identify levels for
the convenience of the experimenter. The marks were
approximately 1.0 centimetres apart. The experimenter
placed the screen in front of the glasses and poured
different amounts of water into the two glasses. The
screen was then removed and the experimenter asked, "Which
glass has more (less) water?". This task was performed a
total of eight times, four times with a "more" question and
four times with a "less" question.

Thus sixteen questions were asked of each subject,
eight "more" questions and eight "less" questions. In
order to guard against any bias in order of presentation
of tasks or any bias in the order of presentation of
questions, the tasks were alternated; i.e. poker
chips-"less", poker chips-"more", water glasses-"more",
water glasses-"less", and so on. In addition, the number
of correct responses on the right and left sides is equal
to guard against a response bias to either side. Table 1
presents the order in which the tasks were given,
specifying the quantities to be used, and indicating
whether the correct response is on the right or left side.

Note that each child performed the tasks in the
identical order. Also the quantities used in both tasks
ranged from one to seven and the differences between any
two water glasses or any two poker chip arrays remained
constant at three.
Table 1

Order of Presentation, Alternating Tasks, Specifying Quantity and Balancing Left and Right Correct Responses

<table>
<thead>
<tr>
<th>Order</th>
<th>Task</th>
<th>Question</th>
<th>Quantity</th>
<th>Correct Responses</th>
</tr>
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<tbody>
<tr>
<td>1.</td>
<td>P:</td>
<td>Less</td>
<td>4 7</td>
<td>Left</td>
</tr>
<tr>
<td></td>
<td></td>
<td>More</td>
<td>2 5</td>
<td>Right</td>
</tr>
<tr>
<td>2.</td>
<td>G:</td>
<td>More</td>
<td>3 6</td>
<td>Right</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Less</td>
<td>7 4</td>
<td>Right</td>
</tr>
<tr>
<td>3.</td>
<td>P:</td>
<td>More</td>
<td>4 1</td>
<td>Left</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Less</td>
<td>3 6</td>
<td>Left</td>
</tr>
<tr>
<td>4.</td>
<td>G:</td>
<td>Less</td>
<td>2 5</td>
<td>Left</td>
</tr>
<tr>
<td></td>
<td></td>
<td>More</td>
<td>1 4</td>
<td>Right</td>
</tr>
<tr>
<td>5.</td>
<td>P:</td>
<td>Less</td>
<td>7 4</td>
<td>Right</td>
</tr>
<tr>
<td></td>
<td></td>
<td>More</td>
<td>1 4</td>
<td>Right</td>
</tr>
<tr>
<td>6.</td>
<td>G:</td>
<td>More</td>
<td>5 2</td>
<td>Left</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Less</td>
<td>6 3</td>
<td>Right</td>
</tr>
<tr>
<td>7.</td>
<td>P:</td>
<td>More</td>
<td>6 3</td>
<td>Left</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Less</td>
<td>5 2</td>
<td>Right</td>
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<tr>
<td>8.</td>
<td>G:</td>
<td>Less</td>
<td>4 7</td>
<td>Left</td>
</tr>
<tr>
<td></td>
<td></td>
<td>More</td>
<td>4 1</td>
<td>Left</td>
</tr>
</tbody>
</table>

P: = Poker chips task  G: = Water glasses task
CHAPTER 3

Results

For all analyses the dependent variable was the total number of correct responses for each of the two types of questions asked: "More" and "Less". The main analysis was a three-group, one-way analysis of variance (ANOVA). The independent variable consisted of three age groups: Primary (mean age 7;9, range 7;2-8;6); Junior (mean age 9;9, range 9;2-10;8); Intermediate (mean age 11;4, range 10;9-11;9). The secondary analysis was a Scheffe's test to determine where the differences existed among the three groups. The third analysis was a Chi square test to examine the pattern of responding for those subjects who did not know "less".

Descriptive statistics for the number of correct responses for both "More" and "Less" questions are given in Table 2. The most striking feature of this table is the difference in standard deviations between "More" and "Less" questions across all groups. Specifically, there appears to be much more variation in responses to "Less" questions.

Separate analyses for "More" and "Less" questions were conducted in order to explore the differences in the number of correct responses among the three age groups.
Table 2

Table of Descriptive Statistics
for Correct Responses to "More" and "Less"

Correct Responses

<table>
<thead>
<tr>
<th>Group</th>
<th>&quot;More&quot;</th>
<th>S.D</th>
<th>&quot;Less&quot;</th>
<th>S.D</th>
</tr>
</thead>
<tbody>
<tr>
<td>Primary</td>
<td>7.3</td>
<td>1.18</td>
<td>3.3</td>
<td>3.13</td>
</tr>
<tr>
<td>Junior</td>
<td>8.0</td>
<td>0</td>
<td>7.9</td>
<td>0.3</td>
</tr>
<tr>
<td>Intermediate</td>
<td>8.0</td>
<td>0</td>
<td>7.1</td>
<td>2.38</td>
</tr>
</tbody>
</table>
The summary statistics for these two analysis of variance (ANOVA) procedures are presented in Table 3 (for "more" questions) and Table 4 (for "less" questions). No significant differences were obtained between the three groups for the total number of correct responses on "More" questions, $F(2, 27) = 3.13$, $p > .05$. Significant differences were obtained between the three groups for the total number of correct responses on "Less" questions, $F(2, 27) = 10.47$, $p < .01$.

In order to determine the source of this significant difference a Scheffe post hoc test was conducted. Significant differences were obtained for the primary and junior comparison, $F = 118.336$, $p < .01$, as well as for the primary and intermediate comparison, $F = 12.513$, $p < .01$. No significant differences were obtained for the junior and intermediate comparison, $F = .55$, $p > .05$.

Since previous research has indicated that some children who do not know "less" treat "less" as if it means "more" (Donaldson and Balfour, 1968; Palermo, 1973), a Chi square test was performed to determine whether this postulate holds true for the present population. Subjects were included in this analysis if they made more than one error on the eight "less" questions. Seven of the eight children were from the youngest group and the eighth was from the oldest group. Results from the Chi square
Table 3

ANOVA Summary Data

for Correct Responses to "More"

<table>
<thead>
<tr>
<th>Source of variation</th>
<th>Sum of squares</th>
<th>df</th>
<th>mean squares</th>
<th>F</th>
</tr>
</thead>
<tbody>
<tr>
<td>Among groups</td>
<td>3.27</td>
<td>2</td>
<td>1.635</td>
<td>3.13</td>
</tr>
<tr>
<td>Within groups</td>
<td>14.10</td>
<td>27</td>
<td>.522</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>17.37</td>
<td>29</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

F critical = 5.49 at .01
F critical = 3.39 at .05

p > .05
Table 4

ANOVA Summary Data
for Correct Responses to "Less"

<table>
<thead>
<tr>
<th>Source of variation</th>
<th>Sum of squares</th>
<th>df</th>
<th>mean squares</th>
<th>F</th>
</tr>
</thead>
<tbody>
<tr>
<td>Among groups</td>
<td>120.8</td>
<td>2</td>
<td>60.4</td>
<td>10.5**</td>
</tr>
<tr>
<td>Within groups</td>
<td>155.9</td>
<td>27</td>
<td>5.77</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>276.7</td>
<td>29</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

F critical = 5.49 at .01
F critical = 3.35 at .05

** p < .05
analysis are presented in Table 5. The analysis indicates that those subjects who did not know "less" pointed to "more" when asked for "less" a significantly greater number of times than would be expected by chance, $\chi^2 = 44.0, p < .001$.

Evaluation of hypotheses

In a comparison between the primary group and the junior group there was a significant difference in performance with "less" questions. This supports hypothesis 1(a). There was no significant difference in performance with "more" questions. This finding is in agreement with hypothesis 1(b).

In a comparison between the junior group and the intermediate group there was no significant difference in performance with "less" questions. This does not support hypothesis 2(a). There was also no significant difference in performance with "more" questions, which does support hypothesis 2(b).

In a comparison between the primary group and the intermediate group there was a significant difference in performance with "less" questions. This supports hypothesis 3(a). There was no significant difference in performance with "more" questions, a finding that is in agreement with hypothesis 3(b).
### Table 5

**Chi Square**

Response to "Less"

<table>
<thead>
<tr>
<th></th>
<th>Correct</th>
<th>Incorrect</th>
</tr>
</thead>
<tbody>
<tr>
<td>Observed</td>
<td>10</td>
<td>54</td>
</tr>
<tr>
<td>Expected</td>
<td>32</td>
<td>32</td>
</tr>
</tbody>
</table>

\[ \chi^2(2, N=8) = 44.0, \ P < .001 \]
CHAPTER 4

Discussion

The results of this study suggest that EMR children proceed through similar stages of development in their acquisition of the terms "more" and "less" in comparison with normal children however the extent to which this ability is delayed in these children is questionable.

The comparison between the three different age groups of EMR children assessing their comprehension of the term "more" revealed no significant differences. This finding is in keeping with the results found using normal children (aged three to seven) who perform similarly to one another on "more" questions having little difficulty comprehending this term. The finding in the present study supports the previously stated hypothesis that no significant differences would be observed between the three different age groups on their comprehension of "more".

The EMR children's comprehension of the term "less" yielded results that merit further discussion. It was expected that there would be significant differences between the three age groups as it was noted that, for normal children, "less" is a term that is difficult to master, and is acquired slowly with some children not fully comprehending it until age seven (Donaldson and

A significant difference was found between the primary group (mean age 7;9) and the junior group (mean age 9;9), and also between the primary group and the intermediate group (mean age 11;4). No significant difference was found between the junior group and the intermediate group. There are several possible explanations for this latter, unexpected finding. The junior group, mean age 9;9 was functioning at a mean MA of approximately 6;7, years based on the assumption that the IQ scores of these children were in the low seventies. Normal children at this age have difficulty with the term "less" yet the ten EMR children of comparable MA made a total of one error out of 80 of the "less" questions. These EMR children have three years of life experience beyond their nonretarded peers of the same MA and this experience or maturity appears to have readily aided them in their ability to comprehend the term "less".

Another possible explanation for the above finding is classroom experience. It was brought to the researcher's attention that all of the children included in the study had had some training differentiating between "more" and "less". More specifically the two older groups had been taught the skill for at least two years, the minimum length of time these children had been in EMR classes. Thus; the unexpected ease which most of the children in
the junior group displayed in answering the "less" questions may very well be due to the beneficial effects of classroom teaching. It is a skill that these children were taught and were obviously able to transfer outside the classroom setting.

Although it is evident that the youngest EMR children were delayed, in comparison to similarly aged normals from previous studies, in their acquisition of the term "less", the fact that the middle group performed so well attests to the importance of proper training and review. This has always been considered vital for EMR children and has shown itself to be true once again in this study.

A look at the pattern of responding by those subjects who did not know "less" revealed that "less" may be believed to mean "more". When asked to point to "less", this group of subjects pointed to "more" a significantly greater number of times than would be expected by chance. The choices were made with much conviction and it is interesting to note the comments of some children when asked why they chose "more" for "less": "...Because that side (meaning the "less" side) has more." indicating their belief that "less" means "more".

This particular stage in the acquisition of the term "less" has been demonstrated by several researchers using normal children (Donaldson and Balfour, 1968; Palermo, 1973) although there is an alternative explanation that
may account for this pattern of responding. It is possible that the subjects who did not know "less" simply preferred "more"; that is they had a preference bias for the side that had more items or greater quantity. In this study there is no way to determine which of the two explanations is correct but it is important to be aware that in a forced-choice situation such as the one employed in the present study it is impossible to positively ascertain the reason a particular choice was made. Do the subjects truly believe that "less" means "more" or do they simply prefer "more"? One way to test out the notion of a preference bias would be to ask the subject to point to "any". An assessment of their responding to this question would indicate if the greater quantity was indeed the preferred selection.

To summarize, the developmental sequence found for the EMR children in this study for the acquisition of the terms "more" and "less" is as follows: 1) "More" was learned before "less". The seven and eight year olds in this study already knew "more"; they made seven errors out of 80 on the "more" questions, whereas they made 47 errors out of 80 on the "less" questions. 2) There was evidence of a stage where "less" was confused with "more". Seven out of ten children in the youngest group thought, according to their responses and their comments, that "less" meant "more". 3) "Less" was acquired by
approximately 9;9 years of age as indicated by the fact that only three children in both the junior and intermediate groups made any errors on "less"; two of those children erred on the first question perhaps due to anxiety from the testing situation and the third child, who was described by her teacher as extremely low functioning, did not answer any of the "less" questions correctly.

The above sequence corresponds to the one found with normal children ages three to seven, thereby suggesting a developmental delay, as the seven year-olds in the present study did not perform as well as normal seven year-olds are reported to perform (Palermo, 1973). This delay appears to be reduced as age increases, as evidenced by the almost perfect performance of the two older groups.

One of the major problems with this study, and many others that employ mentally retarded subjects, pertains to homogeneity of sample. Although all children in this study had previously received a psycho-educational assessment and were then placed in a classroom for EMR students it was apparent that a wide variety of ability levels characterized the children in these classes. Teachers admitted that quite often students are placed in an EMR class until a more appropriate placement could be made based on teacher observation. This problem is especially evident in the youngest group of EMR children as screening
procedures for these students are not terribly accurate and school board personnel are reluctant to label these children prematurely.

Future research of this nature should attempt to employ tighter criteria for inclusion in an experimental group. This could be accomplished by first administering the Peabody Picture Vocabulary Test, obtaining a verbal IQ score for each child and then grouping the subjects based on their performance on this test. This procedure would provide for greater homogeneity within each group as well as across groups.

Another important factor to consider when studying the mentally retarded is classroom and life experience. One way to reduce the effects of this factor would be to replicate this study with younger EMR children perhaps as young as three and four. This might provide a clearer picture of the development of "more" and "less" and may even yield additional stages not present in this study. One difficulty with this suggestion is in obtaining EMR children at such a young age, as mentioned earlier. With the development of improved screening devices this may become more feasible.

An alternative way of diminishing the effects of school experience would be to employ relational terms that are not emphasized as much in classroom teaching. Terms such as wide/narrow or thick/thin might be learned much
later by EMR children than "more" and "less" as they are
not terms that would be as necessary for developing
adaptive skills, one of the goals of EMR classes. A
comparison of the acquisition of these sets of terms might
provide some interesting information concerning the
importance of classroom teaching.

The present research has proved valuable in
suggesting directions for further inquiry into the
acquisition of relational terms such as "more" and "less"
in EMR children. In addition, it has further strengthened
the view that these children are able to profit from their
experiences both in and outside of special class
placement. Educators would be wise to consider the
importance of this conclusion.
References


Clarke, E.V. (1971). On the acquisition of the meaning of "before" and "after". *Journal of Verbal Learning and Behaviour, 10*, 266-275.


VITA AUCTORIS

ARLENE SHERMAN POTASHNER was born August 31, 1960 in Downsview, Ontario to Fred and Gert Sherman. She graduated from Newtonbrook Secondary School in Willowdale, Ontario in 1979. In September, 1979 she enrolled at the University of Toronto. She graduated with the Bachelor of Arts degree (with distinction) in June, 1982. In September 1982 she enrolled at the Faculty of Education and graduated in June, 1983. In September, 1983 she enrolled in the Masters of Education program at the University of Windsor. She was awarded a Summer Research Scholarship in 1985 in recognition of high scholastic achievement.

Arlene is married to Mark R. Potashner, a graduate student in Clinical Psychology.