A COMPARISON OF INSTITUTIONALIZED AND NON-INSTITUTIONALIZED MENTALLY RETARDED CHILDREN AND INTELLECTUALLY NORMAL CHILDREN ON INCIDENTAL AND INTENTIONAL LEARNING TASKS

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Barry Mintzes

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James R. Engelhes
Major professor

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ABSTRACT

A COMPARISON OF INSTITUTIONALIZED AND NON-INSTITUTIONALIZED MENTALLY RETARDED CHILDREN AND INTELLECTUALLY NORMAL CHILDREN ON INCIDENTAL AND INTENTIONAL LEARNING TASKS

By

Barry Mintzes

The present study was conducted in order to determine whether or not the retarded are deficient in their ability to learn incidentally.

The study involved 144 subjects, 72 of whom were institutionalized and 72 of whom were not. Of these groups of 72, 24 were retarded, 24 were normals matched to the retarded group on chronological age, and 24 were normals matched to the retarded group on mental age. Within each group of 24, 12 received an intentional task and 12 received an incidental task.

The tasks were exactly the same with the exception of the instructions. The tasks consisted of the subjects being shown 10 series' of figures. The end figure in each series was similar to but significantly different from the others. In the incidental task the subject was merely instructed at the beginning of the first

series of figures to watch what the experimenter does. In the intentional task, the subject, in addition to being instructed to watch what the experimenter does, was also instructed to pay attention as the experimenter made the last figure in each series different.

After a three minute intermediary task the subjects were tested for their recall of the changes made in each series of figures.

It was found that institutionalized retardates were deficient in their ability to learn incidentally when compared to normals while the same was not true for non-institutionalized retardates.

It was also found that institutionalized retardates were also deficient in their ability to learn intentionally and this was the result of a LOW-MA-LOW-IQ deficit. Non-institutionalized retardates were not significantly different from non-institutionalized normals in their ability to learn intentionally.

Finally, subjects, in general, receiving the intentional task performed significantly better than subjects receiving the incidental task.

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Barry Mintzes

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CHAPTER I

INTRODUCTION

Introductory Statement

In recent years, a great deal has been written about the mentally retarded. Numerous definitions have been offered, various causes of retardation have been discussed and many comparisons have been drawn between retarded and normal individuals. There are many ways in which the retarded are different from normals. The retarded frequently have concomitant physical problems which are associated with impaired cerebral functioning. Among these may be visual problems, epilepsy, cerebral palsy, speech handicaps, hearing problems and numerous others. Psychological problems are also a concern, especially with regard to their self concept, family relationships, and peer relationships. Social factors also pose certain problems for the retarded, especially with regard to their functioning in the world of work, being a productive member of the community, and facing a fair degree of prejudice from others in the community. It is in the area of educational and vocational training, however, that the retarded probably face the greatest number of problems. It is here that they seem most obviously

different. In comparing a normal person of a given chronological age with a retarded person of the same chronological age, there is generally an obvious difference in terms of what the two are able to learn or comprehend. If one even looks only at the very name given to the disability, namely, "mental retardation", it seems obvious that something is amiss with regard to the mental development of the retarded individual. What necessarily follows from this as the obvious characteristic that would stand out is their differential ability to learn. The retarded just do not seem to be able to grasp facts, concepts, and ideas as quickly as normals. As a result, researchers in the field have attempted to take what is known about the nature of the learning process in normals, and apply it to the retarded in hopes of gaining a better understanding into the nature of specific ways in which the retarded are indeed deficient in their abilities to learn.

Since there are varying degrees of mental retardation, it would seem worthwhile at this point to discuss how the IQ range used in the present study was derived.

The American Association on Mental Deficiency classifies the degrees of retardation as follows:

Category	Binet IQ	Wechsler IQ
Profound	Below 20	Below 25
Severe	20 - 35	25 - 39
Moderate	36 - 51	40 - 54
Mild	52 - 67	55 - 69
Borderline	68 - 83	70 - 84

This study focused essentially on those classified as mild and borderline. These individuals are the ones who can benefit from vocational training and can often be a self-supporting unskilled or semi-skilled employee. Some borderlines can even live and function independently in the community. Furthermore, these two groups together are the most representative of the retarded in that they comprise approximately 90% of all those afflicted with mental retardation in the United States. This group is also frequently referred to as educable mentally retarded, the IQ range for which is generally given as 50 - 75.

Since it is apparent that there is much variation in classifying the mentally retarded, the present study did not refer to any specific categories. In order to include, however, all those considered to be retarded, yet capable of educational and vocational training, an IQ range of 50 - 85 was established for the purpose of defining the group of mentally retarded individuals to whom all references in this study was made.

Statement of the Problem

This investigation focused specifically on the incidental learning deficit which has been hypothesized to account for the inability of the retarded to learn as well as normals. It has been said that one of the reasons why the retarded do not learn as well as normals is because they do not pick up on cues that are not directly involved in the learning task at hand. Their attention must be specifically directed to whatever it is they are supposed to learn. Normals will generally learn a great deal just from interacting with their environment. This is especially important before one begins formal schooling. Throughout the course of any day in a child's life there are countless numbers of stimuli impinging upon his receptors. Although, for the most part, nobody is directing him to learn anything specifically, he is nevertheless absorbing, storing, assimilating, and integrating the diverse bits of information with which he is coming into contact. This is not the case, however, with the retarded person. He typically does not pick up most of this information unless his attention is specifically called to it. This puts him at a considerable disadvantage when he begins his formal schooling. While the normal child will have a backlog of events to draw upon in school, the retarded child often does not and consequently falls even further

behind. One question this raises is that of whether or not the retarded child would be able to learn as well as the normal child on intentional learning tasks. These would be tasks where both the retarded and normals would be tested on materials to which their attention had been called.

Hypotheses

The present study investigated the following hypotheses:

1. When attention is called to the stimulus object there will be no significant difference between normals and retardates on the mean number of items recalled correctly.

2. When no attention is called to the stimulus object, normals will have a significantly higher recall rate than the retardates.

Need for the Study

In order to help retarded individuals get the greatest possible benefit out of their formal education or vocational training, it is necessary to have a good understanding of the ways in which they learn. In order to improve teaching and training methods, however, it is also necessary to be aware of the ways in which they are deficient in learning. Once aware of what these learning deficiencies are, corrective methods can be instituted in an attempt to provide the maximum possible conditions in which learning may occur. The present study is important in that it attempted to shed further light on

a specific way in which retarded individuals are felt to be deficient in their abilities to learn, namely, with regard to incidental learning. To begin with, very few studies have been done investigating whether or not an incidental learning deficit does, indeed, exist in the retarded. In addition, that which is felt to be incidental learning in the present study is different from the kinds of incidental learning that have been researched in other studies. The kind of incidental learning investigated here is that which the author feels is more typical of the way it occurs in actual situations.

With the sole exception of the passive incidental task in Singer's (1963) study, every incidental learning task used by every previous experimenter has provided the subject with a set to respond though usually to a stimulus other than the one on which they will later be tested. It is felt that the passive incidental learning task which Singer used is more in keeping with the true nature of incidental learning as originally postulated by Denny (1964). This is confirmed by an example which Denny used to describe this deficit (Denny, 1966) wherein he referred to the passive incidental task in Singer's research, as well as in numerous recent personal communications with Dr. Denny.

This study attempted to seek further evidence of the existence of an incidental learning deficit among the retarded by using a passive incidental task only, so that at no time during the presentation of the task was the subject provided with a set to learn. Even in Singer's (1963) research, the passive incidental task was presented after the active incidental task and so the subject already had a set to respond since he was asked specific questions during the active task. This study was an attempt to eliminate the possible confounding variable of response set when viewing incidental learning. If we are saying that mentally retarded individuals are poorer performers because they are poorer incidental learners than normals, and further that consistent responding is necessary for incidental learning to take place, then we must provide a situation where we have not already begun to direct the subject to respond. In Benoit's framework the retardate tends to be a stimulus bound organism responding to the stimulus of the moment rather than maintaining internal stimuli or sets. Thus, to evaluate the incidental learning deficit it is important to make sure that no internal sets to respond are set up by the experimental procedure as has typically been the case.

Definition of Terms

Incidental Learning

The ability of an organism to respond to a stimulus when no attention is called to it.

Intentional Learning

The ability of an organism to respond to a stimulus when attention is called to it.

Response to a Stimulus

The accuracy of recall of the stimulus presented last in each series.

Mental Retardation

According to the American Association on Mental Deficiency "Mental retardation refers to subaverage general intellectual functioning which originates during the developmental period and is associated with impairment in adaptive behavior". The mentally retarded individual suffers from the disability known as mental retardation. He will be referred to as a MR. This study focused essentially on those MR's with IQ's from 50 - 85.

Normal

This refers to individuals not diagnosed as mentally retarded and having an IQ from 90 - 110.

CHAPTER II

REVIEW OF THE LITERATURE

General Research on Learning in the Retarded

The last decade has witnessed a marked increase in the amount of research devoted to studying the learning deficiencies of mental retardates. McPherson (1948) was able to list only a dozen studies devoted to a consideration of learning in mentally defective individuals. In a later study, he was only able to find twenty-eight articles on the subject between 1904 and 1958 (McPherson, 1961). Stolurow (1958) has stated how it is a strange paradox that while in the past fifty years there has been a considerable expansion in the psychology of learning, hardly any attempt at all had been made to understand the learning process of the mentally retarded or how they differ in learning ability from other children. More recently, however, an increased frequency of research has been appearing in the literature touching on virtually every area and aspect of learning as it relates to the retarded. Even so, however, Denny (1964) in his review of research in learning and performance on the retarded reports, "Data on learning

in the mentally retarded are not abundant, but the studies that have been done suggest that this is a field of great potential interest". He further suggests that because of this, little of a definitive nature can be said about learning in the retarded.

A fairly common observation concerning the abilities and skills of the retarded is that they inevitably learn more slowly and retain less than normal individuals. Educational programs have thus been developed on the assumption that the learning deficit experienced by the retarded is general and univariate, that is, he lacks "intelligence". The retardate is generally assumed to be inferior to the normal individual in all aspects of the learning process and it is also assumed that whatever may be causing the difficulty in one area is responsible for inferior performance in other areas. As a result, special education programs have generally consisted of providing the retarded individual with essentially the same materials in the same manner as is given to the normal individual, but in lesser amounts and at a slower rate.

Available research, however, suggests that the learning deficiency of mildly and moderately retarded persons is task-specific or related only to certain aspects of the learning situation. There is even some evidence to suggest that under certain conditions the

learning and retention of retardates are comparable to normals. This will be discussed later on in the chapter.

One might question whether distractability or poor retention represents a significant source of inferiority. Does the problem lie in inferior verbal mediation, perceptual difficulty, or poor discrimination? By the same token, however, there is an optimistic side to the problem. If we have a better understanding of the circumstances in which a retarded child performs better we may have uncovered a more effective means of educating and training him. If we are aware of the specific deficits in a given case, we may be able to either eliminate the deficit or create conditions such that the deficit will not interfere with learning. Robinson and Robinson (1965) report, "Detailed investigations of the learning of retarded children can answer a number of questions which are extremely relevant to understanding the basic kinds of handicaps from which they suffer, to planning their educational experiences, and to predicting the sorts of tasks which they can do more or less well". Mental retardation cannot be considered a general and unitary behavioral deficit. Rather, the mental retardate is one whose interaction with his environment is impaired in specific and special ways. The research evidence suggests that learning disability associated with mental deficiency is specific to particular processes

and tasks. Identification of such impairments, and the conditions under which they are available, is necessary for the development of efficient and effective training methods (Baumeister, 1968).

Attempts to Apply Learning Theory to Mental Retardation

Although there are large areas of agreement among psychologists who have proposed theories to explain the manner in which organisms learn, there are also heated disagreements. Up to this time, however, few of the theoretical controversies have been especially relevant to studies which have been carried out with retarded children (Robinson & Robinson, 1964). It has been fairly recent, in fact, that even the agreed-upon aspects have been recognized to have implications for understanding the field of mental retardation.

When existing research designs have been extended to retarded subjects, the general laws of learning have almost invariably been demonstrated to apply to them as well as to other organisms. In other words, studies with retarded children have lent confirmation to the accumulated evidence about the ways in which organisms acquire new behavioral patterns (Robinson & Robinson, 1965).

The learning phenomena reviewed by Robinson and Robinson include such concepts as the shape of the

learning curve, short-term retention, classical conditioning, operant conditioning, discrimination learning, stimulus generalization, paired-associate learning, and learning set. Baumeister (1968) reports, "Very few attempts have been made to formulate theories of behavior to account specifically for the inadequacies characteristic of retarded individuals".

In a review, (Zeaman, 1959) and in a theoretical article (Zeaman & House, 1963) attempts have been made to analyze the learning deficits of mental retardates in terms of an attentional model of discrimination learning. Their basic notion is that a chain of two fundamental processes underlies discrimination learning: (1) observing the various stimulus dimensions, and (2) making the instrumental response. By the term "dimensions", House and Zeaman are referring to broad classes of "cues" that have in common a stimulus property. Thus, color is a dimension while the specific colors are cues. The basic problem for the retardate is a low initial probability of attending to the relevant dimensions. The retardate's capacity to acquire an instrumental response is not in question, but rather his ability to attend to the relevant and critical stimulus dimensions that lead to making the appropriate discriminations. House and Zeaman point out, rather convincingly, that slow discrimination learning is not characterized by a low

rate of improvement in performance, but rather by the amount of time and practice needed for the learning to start (i.e., retardates experience relatively less difficulty in learning than in starting). They have offered some suggestions, based on their theory and research, for improving retardates' performance on discrimination learning tasks. Since they regard as the retardates' fundamental difficulty his inability to attend to the relevant stimulus dimensions, the remedial procedure is to increase the probability that he will observe the relevant dimensions.

Another theoretical point of view that has been focused upon the learning and retention disabilities associated with mental retardation involves the stimulus trace concept developed by Ellis (Ellis, 1963).

Two major constructs are proposed to account specifically for short-term memory deficits in the retardate, stimulus trace and nervous system integrity.

Ellis' notion of stimulus trace is roughly analagous to the reverberating circuit of neurophysiology. A stimulus, impinging upon a receptor organ, produces certain changes in the activity of the central nervous system. These electrical changes outlast the duration of the stimulus that initiated them, apparently by reverberating temporarily over various sequences of neurons.

The construct of central nervous system integrity is less well defined by Ellis. By this concept he is evidently referring to the comparative ability of an organism to maintain the trace. Thus, the retardate, by fault of "neuropathology" suffers impairment in his ability to maintain an adequate trace with respect to duration or amplitude. To the extent that learning and long-term memory are dependent upon consolidation of the trace, the organism with a debilitated central nervous system will be impaired in these functions as well.

Ellis views the noncontinuity of events to be associated as crucial to an explanation of learning and retention deficits in the retarded (i.e., if A and B are to be associated but are temporally separated, then strictly speaking B is associated with the trace of A).

If Ellis' analysis of mental deficiency in relation to short-term memory is correct, the best approach to training retarded individuals requires that effective measures be undertaken to improve their short-term memory. It does not seem likely that one can act directly upon the retardate to improve his ability to maintain a trace. Rather, the approach would be to arrange his environment to compensate for his inferior and impoverished trace.

The Russian theory of learning in the retardates, best expounded by Luria is known as verbal dysfunction theory and views mental retardation as the consequence of nervous system pathology around which learning occurs (Ellis, 1963).

According to Luria's theory, two primary signal systems subserve higher nervous activity. One of these systems is governed by direct signals from the environment and is characterized by its reflexive nature. The second signal system, possessing the properties of abstraction and conceptualization, involves language. This latter system develops to regulate responses to the direct signals. Thus the human subordinates his behavior to his "verbally formulated intentions". Verbal behavior in the normally functioning individual is pre-eminent over motor behavior. The retardate is characterized by a pathological weakness of these basic processes and thus acquires connections more slowly, will respond inappropriately, and will be easily disrupted by extraneous stimuli and fatigue.

While the mentally retarded do not appear to be able, in general, to learn as well as normals (slower learning and poorer short-term retention [Ellis, 1963]) one must also keep in mind that there are a number of responses which the retarded can sometimes learn almost as well as normals of the same chronological age. Along

similar lines, Denny (1964) has shown that there is little available evidence of an appreciable deficit in long-term retention when the mentally retarded are compared with normals, provided the two are matched on original learning. That is, both normals and retarded have learned the same amount of material initially.

On the other hand, the MR's clearly exhibit a number of deficits which relate both to learning and general functioning (Denny, 1966). One of the most basic deficits seems to involve duration of attention (Zeaman & House, 1963; Denny, 1964). Referring to this attention deficit Denny reports "Presumably the retarded lack the self initiated sets which typically make for consistent and continued responding in the normal", (Denny, 1966). The retarded also tend to be more stimulus bound than the normal--"more at the beck and call of each and every stimulus change" (Denny, 1964). As a result of this attention deficit a special kind of incidental learning deficit occurs. Denny continues, "When the mentally retarded are sufficiently well instructed or guided, as under intentional learning conditions, they often do not show a learning deficit. But when retarded children are unwittingly posed with a learning task which is not only incidental but requires responding to the same set of stimuli for ten to fifteen

seconds before the critical item appears and becomes learnable, then they show a marked deficit, whereas object or color identification which can be learned incidentally with a single glance may not show any deficit at all" (Denny, 1966). Support has been found for this in research done by Singer (1963).

In summary, it has only been in the past decade that research into learning principles and their application to the mentally retarded has received serious attention. Furthermore, most of the research that has been done has focused upon the usual areas of learning such as paired-associates, verbal mediation, classical and instrumental conditioning, etc. In addition, only a sparse number of attempts have been made to develop theories applicable to the learning deficits characteristic of defective individuals. In examining the ways in which the retarded are indeed deficient in their abilities to learn, Denny has postulated the existence of an incidental learning deficit, an area which had been researched before with normals (Jenkins, 1933; Saltzman & Atkinson, 1954; Brown, 1954; Gleitman and Kamsin, 1957; and Neimark & Saltzman, 1953), but never with retardates.

Theoretical Basis for Incidental Learning

The original hypothesis that mental retardates are poorer performers because they are poorer incidental

learners than normals was first set forth by Denny (1964). In developing this hypothesis he was greatly influenced by the work of Benoit (1957) who has applied Hebb's theory of Behavior (Hebb, 1949) to mental retardation.

Like Gestalt theory, Hebb's highly theoretical notions about the functions of the central nervous system begin with perceptual behavior but there the resemblance ends. Hebb's entire theory concerns the transmission of electrical impulses from one part of the nervous system to another over pathways which become increasingly integrated in the course of experience as they are used over and over in an orderly fashion. Hebb proposes that when a particular set of sensations is experienced over and over, some of the cortical cells within the brain begin to be organized into a simple corresponding functional unit called a "cell assembly". Hebb postulated that when particular combinations of cell assemblies are simultaneously fired over and over, they come to be integrated into increasingly complex functional units. The functional unit next larger than the cell assembly Hebb termed a "phase sequence".

Benoit, using Hebb's theory as a basis, states that the retardate is deficient in integrative sets and phase sequences. He translates this into practice by showing how in a general way it has implications for training the retarded. Hebb's emphasis on the

importance of attention, for example, suggests that it is imperative that the stimulus field be arranged so that the child's attention is focused on the material to be learned. A further aspect of Benoit's analysis is that the retardate is a stimulus bound concrete organism. Singer (1963) claims that this stimulus bound characteristic of the retarded is well known and is often used as a diagnostic indicator by those who work with the mentally retarded. This stimulus bound quality of the retardate reflects his tendency to respond to the stimuli of the moment and an inability to maintain internal stimuli or sets.

This stimulus bound characteristic is an important factor for learning in the framework of elicitation theory (Denny & Adelman, 1955). They report "For all practical purposes, learning occurs if and only if a response is elicited in a consistent manner. By consistent we refer to whether or not the response is elicited each time the stimulus is presented; the more often a response is elicited each time the stimulus is presented the more consistent the elicitation". In other words, according to elicitation theory, the organism must be made to respond consistently to changes in stimuli in order to be able to differentiate them.

Singer (1963) states, "The retardate often responds differently to the same stimulus, and the same way to

different stimuli. And if the retarded child will not respond consistently or repeatedly in an ordinary situation little incidental learning will take place. We would expect little consistent responding because the retardate is bound to the fleeting stimulus of the moment and cannot maintain an internal set". What this means is that the retardate is unable to maintain a set to respond. His attention must be directed by another person as he will very rarely respond on his own. Response here need not mean any more than recognizing or becoming aware of something.

In summary then, from elicitation theory it follows that the retarded child who, in a typical situation is unable to respond consistently to the same stimulus fails to learn incidentally that which the normal child does. Since during the first few years of life most of the learning which takes place is not intentional but rather incidental, the retarded child does not respond to all of the cues in the environment that the normal child is aware of and thus is already behind at the time when formal schooling begins. By consistent responding to stimuli the normal child builds up a good background of data upon which to build when the directed learning tasks begin in grade school. The retarded child, however, does not incidentally acquire this background

information and hence begins at an initial disadvantage from which he never recovers.

Research on Incidental Learning in the Retardate

Most of the research that has been done with the retarded has focused on directed learning tasks (also referred to as intentional learning tasks) and has failed to show consistent differences between normals and retardates. Very little research, however, has been done to investigate the difference between the two groups on incidental learning tasks.

The first of these studies was done by Goldstein and Kass (1961) who studied incidental learning in retarded (mean CA 10.3 years, mean IQ 72) and gifted children (mean CA 4.8, mean IQ 136). They used a picture of a street scene with several numbers incorporated such as car licenses, street numbers, etc. The subjects were told to locate the numbers and were later tested for what they learned of the scene. Goldstein and Kass found no difference between the groups on the intentional learning task or the incidental learning task.

In another study, Hetherington and Banta (1952) used colored pictures of common objects mounted on five by seven inch cards. The subjects were a normal group (mean IQ 101), an organic retarded group (mean

IQ 60, mean CA 118 months), and a nonorganic retarded group (mean IQ 60, with a mean CA of 120 months). In their incidental task each subject named the color of the object on the card as it was presented and after an exposure to the series of fifteen cards, he was given five minutes to name as many of the objects as he could. The intentional task consisted of presenting a similar series of fifteen cards and to instruct the subject to remember as many of the objects as he could. The subject was then given five minutes to recall as many of the objects as he could. It was shown that non-institutionalized educable organics manifested a significant incidental learning deficit when compared with normals ($p < .01$), whereas educable familials did not. On intentional learning of the object-picture material, the differences among all three groups were not statistically significant ($p < .01$).

Baumeister (1963) attempted to compare normals and retardates, matched on the basis of CA, with respect to incidental learning and retention. In the intentional learning situation, each subject was shown ten pictures, one at a time, of common objects with the instructions to remember the objects. Subjects in the incidental learning task were shown the same pictures, but instructed to remember the colors of the objects. All subjects were given a free recall test

on the names of the objects immediately after the ten pictures had been presented. Following a 48 hour period, recognition tests were administered in which the subject selected the original picture when presented along with three distractors. The results indicated that the normals performed significantly better on both immediate recall tests ($p < .05$). After the 48 hour period, the groups were equal on the recognition test of the incidental material. However, in retention of intentional learning, the retardates were superior ($p < .01$). It was suggested that the learning deficit in the mentally retarded is task specific.

Oliver (1963) attempted to determine whether or not there was a difference between educable mentally retarded children and intellectually normal children in their responses on an incidental learning task. In the intentional task the subjects were instructed to observe and remember the stimulus material presented. In the incidental task the subjects were engaged in an orienting task which directed their attention to the stimulus material but did not require their remembering or learning it. Retention was assessed immediately and after a 24 hour period. Oliver found that the mentally retarded subjects did not differ significantly from the intellectually normal subjects of the same

mental age or same chronological age in the ability to learn incidentally. This finding was present for both immediate and delayed recall performance. Also, the retarded subjects and subjects of chronological ages 10 - 12 learned significantly more under intentional learning conditions than they did under incidental learning conditions. This finding was present for immediate recall performance only. Normal subjects of chronological ages 6 - 9 duplicated the above finding for both immediate and delayed recall performance. Intellectually normal subjects of differing chronological ages did not demonstrate a significant difference in their performance under incidental learning conditions. This result was present for both immediate and delayed recall. Intellectually normal subjects of differing chronological ages did not demonstrate a significant difference in their performance under intentional learning conditions. This finding was present for both immediate and delayed recall. All subjects in this study, under incidental learning conditions, demonstrated a significant loss in retention during the 24 hours that elapsed between the two testing periods.

Singer (1963) investigated three types of incidental learning presumably of different degrees of difficulty in younger and older normal and younger and older retarded children. A test of intentional learning was also given.

The active incidental task involved the subject playing a game and then answering questions about what transpired. The passive incidental task, and the most difficult of the three, involved the subject watching the experimenter draw some designs, and answering questions about what transpired. The misdirected incidental task consisted of the subject naming objects of doll furniture and later being asked what color the objects were. It was found that on the CA match, the retarded subjects were significantly poorer incidental learners than the normals ($p < .001$), but on the MA match, there were no significant differences between the retarded and the normals on incidental learning for both the younger and older groups. No significant differences were found between any of the groups on the intentional learning task.

In summary, it is apparent that at best what little research has been done investigating the existence of an incidental learning deficit in the retarded, has yielded conflicting evidence. Where there does seem to be uniformity of opinion, however, is on the intentional learning tasks, the retarded and the normals not being found to differ significantly.

In addition, incidental learning has been looked at in a number of different ways each changing the meaning of the concept slightly. Hence there has not even been uniformity of opinion regarding what constitutes incidental learning.

CHAPTER III

METHODOLOGY

Subjects

The present study contains 12 groups of 12 subjects each for a total of 144 subjects. Of these 144, 72 were institutionalized and 72 came from the public schools. Within each group of 72, there were three subgroups of 24 each. One subgroup contained retarded subjects with a mean chronological age of approximately 15 1/2 years, while the other two subgroups contained normal subjects, one matched with the retarded subgroup on chronological age, the other matched with the retarded subgroup on mental age. Within each subgroup, 12 subjects received the intentional learning task while the other 12 received the incidental learning task. Subjects were randomly assigned to treatment conditions and were also randomly tested so that there was no particular order regarding how many consecutive times a given task was given within a subgroup.

The retarded subjects were selected randomly from among all those at the institution or school having an IQ between 50-85 and falling between the ages of 13-17.

The normal subjects were selected in a similar fashion from among all those having an IQ between 90-110 and falling between the ages of either 13-17 or 8-12.

The institutionalized retardates came from Lapeer State Training Home, Lapeer, Michigan, the older institutionalized normals came from Boys Training School, Lansing, Michigan, and the younger institutionalized normals came from St. Francis Home for Boys, Detroit, Michigan.

All of the non-institutionalized subjects came from the Ovid-Elsie school system in Ovid, Michigan, and Elsie, Michigan.

Since both Sarason (1953) as well as Spitz (1954), among others have raised questions concerning the possible detrimental effects of institutionalization upon children it was felt that some control for this variable was in order. This was the reason for using both an institutionalized as well as a non-institutionalized sample. Those selected for the institutionalized sample had to have been living in the institution for at least six months immediately prior to the study in order to be included in the population from which the random sample was drawn.

Since Hetherington and Banta (1962) found that organic retardates performed significantly more poorly than familial retardates on an incidental learning task,

the case histories of each retarded subject was reviewed. A subject with any mention of organic brain damage as part of the etiology was automatically eliminated from the study. Therefore, only the familial retardates were the MR subjects in the present investigation.

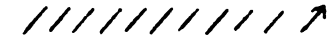
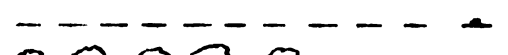
Materials and Procedures

The materials for the incidental and intentional tasks were exactly the same. They consisted of different series' of patterns which the experimenter (E) drew with pencil and paper while the subject (S) passively watched.

The basic idea for the patterns presented to the subjects was derived largely from the patterns used by Singer (1963) in his passive incidental task. A number of the patterns used here are identical to some that Singer used. Essentially, the patterns were derived on the basis of their simplicity, and ease of making one similar to but significantly different from the others in the series. While Singer used 7 series' of patterns, he had a number of other tasks to fill up the subjects' time before they had to recall the changes made in the last figure of each series. In the present investigation, 10 series' of patterns were chosen largely on the basis of a pilot study done beforehand which indicated that by giving this many a better spread on the recall scores could be obtained. This was much

more important in the present study since the recall period was only three minutes while in Singer's study it was much longer as a result of the other tasks the subject had to complete before being asked to recall the changes in the passive incidental task.

The following series' of patterns were presented. Each series required approximately ten seconds to draw. The end figure in each series was slightly different from the preceding figures in the same series.

1. 
2. 
3. 
4. 
5. 
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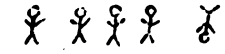
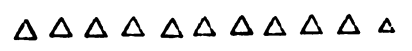
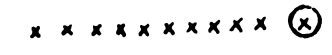
7. 
8. 
9. 
10. 

Only the procedures varied slightly.

For the incidental task, just prior to the presentation of the first series of patterns, the following instructions were given, "Now watch what I do". Nothing more was then said by E until after the last series of patterns was presented. At that time

the intermediary task was presented. This was true for both the normal and retarded subjects.

For the intentional task, just prior to the presentation of the first series of patterns, the following instructions were given, "Now watch what I do". As in the incidental task, these instructions were not repeated. In the intentional task, however, at the end of each series, during the presentation of the last figure (the odd one), the following instructions were given, "Now watch what I'm doing to this one", thereby calling attention to the change. This was true for both normal and retarded subjects.

After the subject was shown all ten series' of patterns, an unrelated task (intermediary task) was presented to him to use up exactly three minutes before testing him on recall. This was found to be necessary as a result of the pilot study in order to get a better spread on the recall scores. This task consisted of presenting S with an inverted L-shaped figure  . S was asked to close his eyes while E guided his hand with a pencil in it up through the figure 25 times. E then removed the figure, asked S to open his eyes, and presented him with a T-shaped figure  . S was then instructed to start at the bottom and draw a line up through it. He was also instructed to turn and continue all the way to one of the ends. This was to

see whether or not S would draw his line the same way in which his hand was forced by E in the L-shaped figure. This had nothing to do with the experiment and no hypotheses were offered regarding this. Upon concluding this task, S was tested for his recall of the odd figures drawn at the end of each series with which he was presented.

For each series, E drew one of the figures for S and said, "Remember when I drew these?" "What did I do to one of them?" "Tell me or show me". If S indicated correctly what the change was he received a score of one. If he indicated that he did not remember what the change was or indicated the change incorrectly, he received a score of zero. All S's received a score based on the number of items recalled correctly out of the ten series' presented. Hence, the highest score one could receive was ten; the lowest, zero.

Study Design and Analyses

The primary goal of this study was to determine whether or not the retarded subjects would indeed show themselves to be deficient in their abilities to learn incidentally when compared with groups of normal subjects. A secondary goal of the study was to determine whether or not the retarded subjects could learn as well as the normals on an intentional learning task.

In order to examine the results of the data, the design used was a three dimensional model which was completely crossed and balanced. The independent variables were as follows:

I - Institutionalization

I_1 Institutionalized

I_2 Non-institutionalized

G - Type of subject

G_1 MR - CA 13-17, IQ 50-85

G_2 Normals - CA 13-17, IQ 90-110

G_3 Normals - CA 8-12, IQ 90-110

T - Treatment

T_1 Intentional learning task

T_2 Incidental learning task

The dependent variable was the number recalled correctly by each subject.

The data was analyzed by a three-way analysis of variance as performed by the FACREP routine of the AOV program on the Control Data Corporation 3600 computer at the Michigan State University Computer Center. Scheffe post-hoc comparisons were also made where there were significant main effects. Since this was a fixed effects model, generalizations are necessarily limited to the levels of the independent variables (Hays, 1963).

CHAPTER IV

RESULTS

This chapter will present the results of the data collected in order to examine the hypotheses under investigation. The two hypotheses predicted that on incidental learning, retardates would do worse than normals, while on intentional learning there would be no differences between the groups. Appendices A - D provide a complete breakdown for the reader of the means and standard deviations of chronological ages, mental ages, IQs, and years institutionalized for all groups and treatments.

Table 1 presents how each of the groups compared on the dependent variable, namely, recall scores. It can be seen that the institutionalized group of retardates (I_1G_1) did worse than any of the other groups in the study on both the intentional (T_1) and the incidental (T_2) learning tasks with their worst performance being on the incidental task.

The row means indicated that the older normals had the best performance. The older institutionalized normals (I_1G_2) ranked first on recall scores on the intentional task and third on recall scores on

TABLE 1.--Means and standard deviations for institutionalized and non-institutionalized mentally retarded subjects and intellectually normal subjects on recall scores for incidental and intentional learning tasks.

	Institutionalized (I_1)				Non-Institutionalized (I_2)				
	Intentional (T_1)		Incidental (T_2)		Intentional (T_1)		Incidental (T_2)		Row Means
	Mean	S.D.	Mean	S.D.	Mean	S.D.	Mean	S.D.	
Retarded (G_1) IQ 50-85 CA 13-17	4.83	1.22	3.25	1.47	6.50	1.60	5.33	1.60	4.97
Normals (G_2) IQ 90-110 CA 13-17	7.33	1.12	5.92	1.59	6.75	1.92	7.08	1.66	6.77
Normals (G_3) IQ 90-110 CA 8-12	6.08	1.56	6.58	1.39	5.83	1.41	5.00	2.27	5.87
Column means	6.08		5.25		6.36		5.81		

the incidental task. The older non-institutionalized normals (I_2G_2) ranked first on recall scores for the incidental task and second on recall scores for the intentional task.

The non-institutionalized groups (I_2), in general, did only very slightly better on both learning tasks combined than the institutionalized groups (I_1). The retarded groups (G_1), in general, did somewhat poorer than the normal groups (G_2 and G_3) on both learning tasks combined. Further, all subjects did better, in general, on the intentional task than on the incidental tasks.

Whether or not some of these differences were significant will be discussed throughout this chapter with specific reference to the various analyses which were made.

Table 2 shows the results of the analysis of variance which was done comparing the institutionalized retardates and normals on the incidental learning task. A significant F-ratio was obtained ($P < .01$). Table 3 presents the results of t-tests based on the findings reported in Table 2. It can be seen here that on incidental learning, the retardates performed significantly worse than both the older normals ($p < .01$) and the younger normals ($p < .01$). There was no significant

TABLE 2.--Analysis of variance of recall scores for institutionalized mentally retarded subjects and intellectually normal subjects on an incidental learning task.

Source of Variance	Sum of Squares	d.f.	Mean Square	F	Significance
Between	74.67	2	37.34	15.37	$p < .01$
Within	80.08	33	2.43		
Total	154.75	35			

TABLE 3.--T-tests analyzing the differences between the three types of institutionalized groups on the incidental learning task.

Comparison	Difference	T-value	Significance
Retardates vs. older normals	-2.67	4.05	$p < .01$
Retardates vs. younger normals	-3.33	4.89	$p < .01$
Older normals vs. younger normals	- .66	1.03	$p > .05$ N.S.

difference, however, between the older normals and the younger normals.

Table 4 shows the results of the analysis of variance which was done comparing the institutionalized retardates and normals on the intentional learning task. A significant F-ratio was also obtained here ($p < .01$). Table 5 presents the results of t-tests based on the findings reported in Table 4. It can be seen here that on intentional learning the retardates performed significantly worse than the older normals ($p < .01$). The younger normals, however, also did significantly worse on intentional learning than did the older normals ($p < .05$). There was no difference between retardates and younger normals. Thus, the older normal group performed significantly better than both the younger normal group and the retarded group.

Table 6 shows the results of the analysis of variance which was done comparing the non-institutionalized retardates and normals on incidental learning. This resulted in a non-significant F-ratio indicating no differences between the non-institutionalized groups on incidental learning.

Table 7 shows the results of the analysis of variance which was done comparing the non-institutionalized retardates and normals on intentional learning. This also resulted in a non-significant F-ratio

TABLE 4.--Analysis of variance of recall scores for institutionalized mentally retarded subjects and intellectually normal subjects on an intentional learning task.

Source of Variance	Sum of Squares	d.f.	Mean Square	F	Significance
Between	37.50	2	18.75	10.08	$p < .01$
Within	61.25	33	1.86		
Total	98.75	35			

TABLE 5.--T-tests analyzing the differences between the three types of institutionalized groups on the intentional learning task.

Comparison	Difference	T-value	Significance
Retardates vs. older normals	-2.50	5.00	$p < .01$
Retardates vs. younger normals	-1.25	1.84	$p > .05$ N.S.
Older normals vs. younger normals	+1.25	2.16	$p < .05$

TABLE 6.--Analysis of variance of recall scores for non-institutionalized mentally retarded subjects and intellectually normal children on an incidental learning task.

Source of Variance	Sum of Squares	d.f.	Mean Square	F	Significance
Between	27.55	2	13.78	3.26	p > .05 N.S.
Within	139.67	33	4.23		
Total	167.22	35			

TABLE 7.--Analysis of variance of recall scores for non-institutionalized mentally retarded subjects and intellectually normal subjects on an intentional learning task.

Source of Variance	Sum of Squares	d.f.	Mean Square	F	Significance
Between	5.39	2	2.70	.90	p > .05 N.S.
Within	98.92	33	3.00		
Total	104.31	35			

indicating no differences between the non-institutionalized groups on intentional learning.

Table 8 shows the results of the overall three-way analysis of variance. The finding of importance here with regard to the incidental learning deficit theory is the lack of a significant interaction between type of group and type of treatment (GT) which is graphically illustrated in Figure 1. This tells us that the differences found within the retarded groups on incidental vs. intentional learning was not significantly greater than the differences found within either of the normal groups.

Other findings of interest in Table 8 include the fact that there was a significant main effect for type of treatment (T). Inspection of the data indicates that subjects, in general, who received the intentional task did better than subjects who received the incidental task. Also of interest here is the lack of a significant main effect for the institutional dimension (I) but a significant interaction between the institutional dimension and type of group (IG) was found. This is graphically represented in Figure 2. What this tells us is that while institutionalization, in general, did not play a significant role in learning, the combination of what group one was in and whether or not he was institutionalized did make a difference. This was demonstrated more specifically earlier in this chapter

TABLE 8.--Analysis of variance of recall scores for institutionalized and non-institutionalized mentally retarded and intellectually normal subjects on incidental and intentional learning tasks.

Source of Variance	Sum of Squares	DF	Mean Square	F-statistic	Approximate significance probability of F Statistic	*
I**	6.25000	1	6.25000	2.25513	0.136	
G***	77.04167	2	38.52083	13.89909	< 0.0005	significant
IG	47.04167	2	23.52083	8.48679	< 0.0005	significant
T****	17.36111	1	17.36111	6.26424	0.014	significant
IT	0.69444	1	0.69444	0.25057	0.618	
GT	9.18056	2	4.59028	1.65626	0.195	
IGT	14.34722	2	7.17361	2.58838	0.079	
Remaining error	365.83333	132	2.77146			
Total	537.75000	143				

*.05 level of confidence used for decision making

**Institutional factor (I)

***Type of Group (G)

****Type of treatment (T)

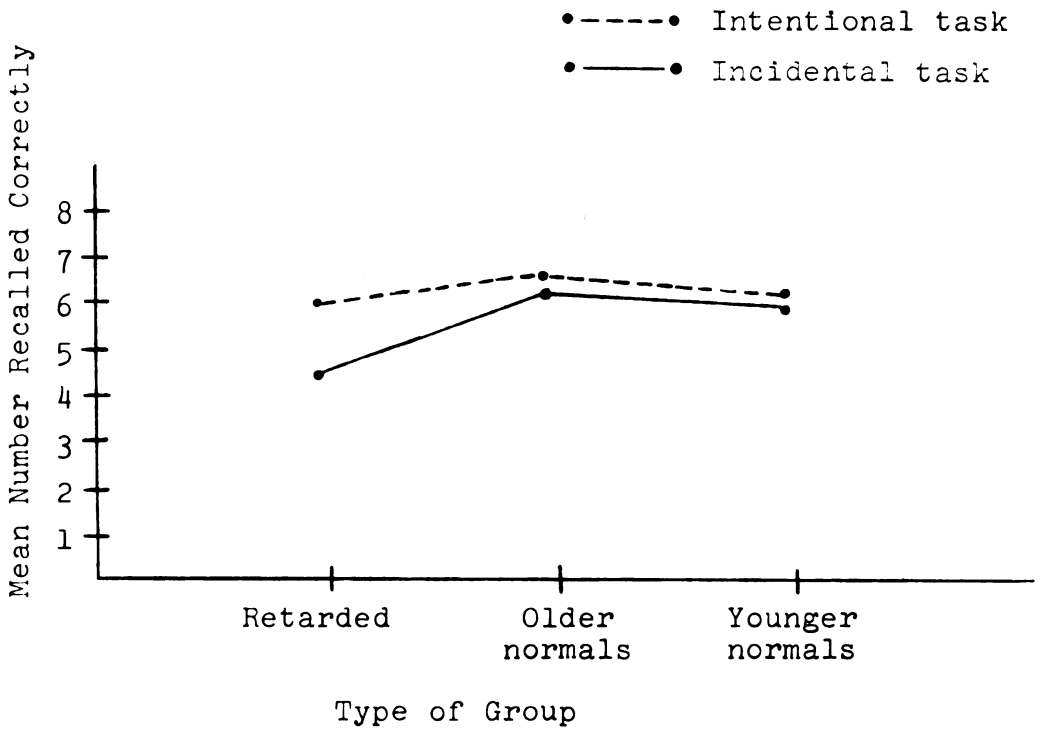


Figure 1.--Graphic representation of the interaction between type of group (ret., older normal, younger normal) and type of treatment (intent., incident).

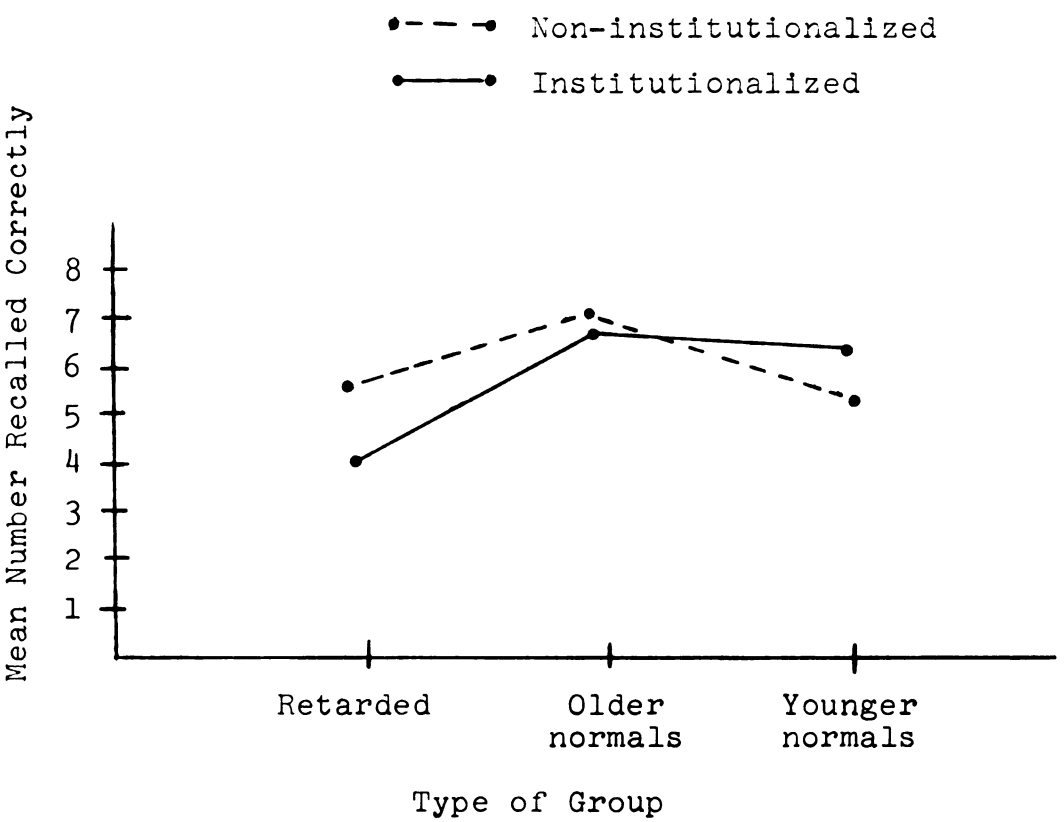


Figure 2.--Graphic representation of the interaction between institutional dimension (inst. and non-inst.) and type of group (ret., older normal, younger normal).

where it was shown that institutionalized retardates were deficient in both incidental and intentional learning whereas non-institutionalized retardates were not deficient on either task when compared with normals.

In summary, the following practically significant results were found:

1. On incidental learning, institutionalized retardates performed significantly worse than institutionalized normals matched on chronological age (older normals).
2. On incidental learning, institutionalized retardates performed significantly worse than institutionalized normals matched on mental age (younger normals).
3. On incidental learning, institutionalized older normals were not significantly different from younger normals.
4. On intentional learning, institutionalized retardates performed significantly worse than institutionalized older normals.
5. On intentional learning, institutionalized younger normals performed significantly worse than institutionalized older normals.
6. On intentional learning, institutionalized retardates were not significantly different from younger normals.

7. On incidental learning, non-institutionalized retardates were not significantly different from non-institutionalized normals.
8. On intentional learning, non-institutionalized retardates were not significantly different from non-institutionalized normals.
9. Differences found within the retarded groups on incidental as compared to intentional learning were not significantly greater than the same differences found within each of the normal groups.
10. Subjects, in general, who received the intentional task performed significantly better than subjects who received the incidental task.

CHAPTER V

DISCUSSION

The major purpose of this study was to determine whether or not the retarded are deficient in their ability to learn incidentally. This chapter will discuss the major findings of the present investigation in terms of their meaning, their practical implications and how they relate to the hypotheses and the stated purpose. All other findings of interest will also be discussed in this chapter along with their meanings and implications.

Essentially, what the first hypothesis says is that normals and retardates will not differ on the intentional learning task.

In the present study, support was found for this hypothesis within the non-institutionalized sample. Here the analysis of variance indicated that there were no differences among the groups on the intentional task. This hypothesis was not confirmed, however, within the institutionalized sample. Here it was found that the retardates as well as the younger normals both did significantly worse on intentional learning than did the older normals, but did not differ significantly

from one another. What this indicates is that institutionalized retardates manifest a LOW-MA-LOW-IQ deficit with regard to intentional learning.

The second hypothesis states that on the incidental learning task, the normals will do significantly better than the retardates. Support was found for this hypothesis within the institutionalized sample. Here it was found that retardates performed significantly worse than the older normals on incidental learning and significantly worse than the younger normals on incidental learning. The older normals were not significantly different from the younger normals on incidental learning. This indicates that institutionalized retardates manifest a LOW-IQ deficit with regard to incidental learning. No support, however, was found for this hypothesis within the non-institutionalized sample.

The focus of the two hypotheses stated above has been on comparing one group to another on specific tasks. Another way of examining the incidental learning deficit is to compare how a single group did on one task with how that same group did on the other task. The GT interaction discussed in the previous chapter made precisely this comparison. It compared the differences between the retardates' performance on the incidental task vs. the intentional task and both groups of normals' performance on the incidental vs. the intentional task.

Even though the retardates appeared not to learn as well incidentally as they did intentionally, the difference was not significantly greater than the differences for either group of normals when comparing their relative abilities to learn incidentally compared to intentionally.

In summary, evidence was found to support the existence of an incidental learning deficit among institutionalized retardates. No such deficit, however, was found among non-institutionalized retardates. Furthermore, evidence was found to support the hypothesis of no differences between normals and retardates on intentional learning only among the non-institutionalized groups. Within the institutionalized groups the retardates manifested an intentional learning deficit which was a LOW-MA-LOW-IQ deficit in nature.

Practical Implications

On the whole, what these results seem to indicate is that institutionalization affects retardates in their ability to learn incidentally as well as intentionally. The nature of these deficits are slightly different, however. With regard to the incidental learning deficit among the institutionalized retardates, it is clearly the result of a LOW-MA-LOW-IQ deficit. What this means is that on intentional learning among institutionalized retardates, simply the fact of having a lower IQ does not result in one's doing poorly but rather the combination

of having a lower IQ as well as a lower mental age. This is confirmed by the fact that the younger normals matched on mental age with the retardates were not significantly different from the retardates. Simply having a lower IQ is sufficient to cause the deficit on incidental learning among institutionalized retardates. This is confirmed by the fact that the retardates performed significantly worse than both the older normals as well as the younger normals on the incidental learning task.

In essence, the above seems to imply that among institutionalized subjects, one's mental age appears to play a significant role in his ability to learn intentionally whereas IQ alone is the key variable in one's ability to learn incidentally. What this means is that with regard to the intentional learning task, institutionalized retardates will do worse than normals matched on chronological age not necessarily because they are retarded but because they have lower mental ages. This, then, would naturally be true for younger normals who because of their lower mental age would perform worse than older normals. On incidental learning, however, simply being retarded, thereby having a lower IQ, and being in an institution, is enough to cause one to show a learning deficit.

This, has implications for the education and training of the retarded in institutions. First, in terms of education it means that their attention must be directed to materials and information rather than assume that he will assimilate them on his own. This pertains to such things as information on bulletin boards, table displays, and other such cues which may be available in his environment which would facilitate his learning if he were aware of them. They must be called directly to his attention and their significance pointed out to him if he is to make use of them effectively.

Second, in terms of vocational training there are many facets to any kind of job including not only the specific tasks involved but things going on in the work environment in general. In teaching the retarded a particular skill or job it is not enough to merely show him how to do it but every step must be explained or else he will miss it. This would even pertain to relatively routine things which may have multiple steps involved.

The preceeding discussion must necessarily limit itself to those tasks which in some way parallel the incidental tasks performed in the present study. The reason for this is that others have defined incidental learning in other ways and tasks falling within these other definitions may not be applicable here.

Other Findings

Another important finding already mentioned in the previous section is the effect that institutionalization seems to have on the retardate. The institutionalized retardates in the study manifested both an incidental as well as an intentional learning deficit while the non-institutionalized retardates manifested neither deficit. This means that given the condition of mental retardation and given two relatively easy learning tasks as in the present study, a retarded individual in an institution will do worse on both tasks than normal institutionalized individuals, while a non-institutionalized retarded individual will do as well as non-institutionalized normal individuals.

In addition, it was found that individuals, in general, who received the intentional task did better than those who received the incidental task. This would seem to indicate that regardless of chronological age, mental age, or IQ, institutionalized or non-institutionalized, if attention is called to a stimulus object there is a greater likelihood of it being remembered than if no attention is called to it.

Practical Implications

From the results mentioned above, there appears to be something about the fact of being institutionalized that has a differential effect upon a retardate's

ability to learn incidentally as well as he does intentionally. Furthermore, this seems to affect retardates more so than it affects normals. It is impossible to make any definitive statements here regarding why institutionalization affects retardates this way. It might be speculated, however, that this could reflect philosophical differences between institutional goals for the retarded and institutional goals for normals. It seems probable that institutionalized retardates are not viewed as having much potential thereby making the goals of the institution more maintenance than rehabilitation oriented. Institutionalized normals, on the other hand, are probably not viewed as terminal residents but rather as individuals with potential who must be trained to take their place in society outside of the institution.

The finding that individuals, in general, do better on intentional than on incidental learning leads one to the conclusion that attention to various stimuli should be called to an individual's attention whenever possible since one is more likely to miss something not pointed out to him than something that is.

Limitations of the Study

This study is limited in that it is a fixed effects model and generalizations are therefore necessarily limited to the levels of the independent variables.

Hence, one is only able to generalize these results to the populations from which they were drawn.

The study was also limited by the fact that while the institutionalized retardate did significantly worse on both the intentional as well as the incidental learning task than did the other institutionalized groups, they had been institutionalized for a noticeably longer period of time. Furthermore, the institutionalized retardates had a much lower mean IQ than the non-institutionalized retardates who in turn did not differ significantly from non-institutionalized normals. These are some factors which could have contributed to the effects in this study and consequently make it somewhat more difficult to interpret the results adequately.

Implications for Further Research

The relative paucity of information on the incidental learning deficit in the retarded is itself sufficient to justify the need for more research in this area.

It would also be worthwhile to replicate the present study especially in view of the surprisingly low scores of the younger non-institutionalized normals. It would also be interesting to replicate half of the present study just to confirm the deficits that appear to exist among the institutionalized retardates.

The finding that subjects, in general, did better on the intentional task than on the incidental task also provides a basis for further research. One might test this using only retarded subjects or only normal subjects and see whether an incidental learning deficit is specific to one group or the other. The present study would seem to support the view that this is specific to the retarded but it is difficult to say since the data for the normals in this respect was not consistent as it was for the retarded.

Summary

The present study investigated whether or not the retarded are deficient in their ability to learn incidentally.

It was found that institutionalized retardates are deficient in their ability to learn incidentally when compared to normals, while the same is not true for non-institutionalized retardates.

It was also found that institutionalized retardates are also deficient in their ability to learn intentionally and this is the result of a LOW-MA-LOW-IQ deficit. Non-institutionalized retardates were not significantly different from non-institutionalized normals in their ability to learn intentionally.

Finally, subjects, in general, receiving the intentional task performed significantly better than subjects receiving the incidental task.

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APPENDICES

APPENDIX A.--Means and standard deviations for institutionalized and non-institutionalized mentally retarded subjects and intellectually normal subjects on chronological age for incidental and intentional learning tasks (in years).

	Institutionalized				Non-Institutionalized				
	Intentional		Incidental		Intentional		Incidental		Grand means for row means
	Mean	S.D.	Mean	S.D.	Mean	S.D.	Mean	S.D.	
Retarded IQ 50-85 CA 13-17	16.22	.94	15.91	1.24	15.50	.78	15.43	1.15	15.77
Normal IQ 90-110 CA 13-17	15.63	1.05	15.36	1.39	15.39	1.09	15.77	1.05	15.54
Normal IQ 90-110 CA 8-12	10.35	.80	10.65	.58	10.47	.83	10.22	1.34	10.42
Grand mean for column means	14.07		13.97		13.79		13.81		

APPENDIX B.--Means and standard deviations for institutionalized and non-institutionalized mentally retarded subjects and intellectually normal subjects on mental age for incidental and intentional learning tasks (in years).

	Institutionalized				Non-Institutionalized				
	Intentional		Incidental		Intentional		Incidental		Grand mean for for means
	Mean	S.D.	Mean	S.D.	Mean	S.D.	Mean	S.D.	
Retarded IQ 50-85 CA 13-17	10.36	1.65	9.87	1.30	11.68	1.30	11.71	1.38	10.91
Normal IQ 90-110 CA 13-17	15.41	1.52	15.07	1.25	15.34	1.44	15.80	1.69	15.41
Normal IQ 90-110 CA 8-12	10.25	1.11	10.58	.90	10.40	1.11	10.19	1.60	10.36
Grand mean for column means	12.01		11.84		12.44		12.57		

APPENDIX C.--Means and standard deviations for institutionalized and non-institutionalized mentally retarded subjects and intellectually normal subjects on intelligence quotient for incidental and intentional learning tasks.

	Institutionalized				Non-Institutionalized				
	Intentional		Incidental		Intentional		Incidental		Grand mean for row means
	Mean	S.D.	Mean	S.D.	Mean	S.D.	Mean	S.D.	
Retarded IQ 50-85 CA 13-17	63.58	7.22	61.92	5.06	75.50	8.77	76.00	7.15	69.25
Normal IQ 90-110 CA 13-17	98.58	6.94	98.17	2.47	99.58	5.54	100.25	7.04	99.15
Normal IQ 90-110 CA 8-12	99.00	6.01	99.33	6.79	99.08	6.04	99.50	4.76	99.23
Grand mean for column means	87.06		87.47		91.39		91.92		

APPENDIX D.--Means and standard deviations for institutionalized mentally retarded subjects and intellectually normal subjects on years institutionalized for incidental and intentional learning tasks (in years).

	Intentional		Incidental		Grand mean for row means
	Mean	S.D.	Mean	S.D.	
Retarded IQ 50-85 CA 13-17	2.66	2.09	5.58	2.25	4.12
Normal IQ 90-110 CA 13-17	.91	.15	1.25	.64	1.08
Normal IQ 90-110 CA 8-12	1.08	.55	1.58	1.04	1.33
Grand mean for column means	1.55		2.47		

APPENDIX E.--Raw data for institutionalized mentally retarded and intellectually normal children on incidental and intentional learning task recall scores.

	Intentional		Incidental	
	Subject #	Recall Score	Subject #	Recall Score
Retarded IQ 50-85 CA 13-17	1	6	1	3
	2	5	2	3
	3	4	3	4
	4	7	4	3
	5	2	5	2
	6	4	6	7
	7	5	7	3
	8	5	8	5
	9	6	9	3
	10	4	10	1
	11	5	11	3
	12	5	12	2
Normal IQ 90-110 CA 13-17	1	7	1	9
	2	7	2	5
	3	7	3	7
	4	6	4	5
	5	9	5	5
	6	7	6	4
	7	7	7	9
	8	6	8	4
	9	9	9	6
	10	9	10	5
	11	8	11	6
	12	6	12	6
Normal IQ 90-110 CA 8-12	1	6	1	6
	2	6	2	7
	3	5	3	4
	4	8	4	8
	5	4	5	7
	6	7	6	8
	7	8	7	9
	8	6	8	7
	9	3	9	7
	10	7	10	5
	11	5	11	5
	12	8	12	6

APPENDIX F.--Raw data for non-institutionalized mentally retarded and intellectually normal children on incidental and intentional learning task recall scores.

	Intentional		Incidental	
	Subject #	Recall Score	Subject #	Recall Score
Retarded IQ 50-85 CA 13-17	1	6	1	8
	2	7	2	3
	3	9	3	6
	4	9	4	8
	5	7	5	4
	6	6	6	4
	7	5	7	5
	8	7	8	4
	9	5	9	7
	10	3	10	6
	11	7	11	5
	12	7	12	4
Normal IQ 90-110 CA 13-17	1	6	1	8
	2	6	2	6
	3	3	3	7
	4	6	4	8
	5	8	5	9
	6	8	6	8
	7	4	7	3
	8	6	8	5
	9	9	9	7
	10	10	10	7
	11	8	11	8
	12	7	12	9
Normal IQ 90-110 CA 8-12	1	7	1	2
	2	7	2	7
	3	5	3	4
	4	5	4	7
	5	5	5	2
	6	8	6	7
	7	4	7	7
	8	4	8	5
	9	8	9	2
	10	5	10	9
	11	5	11	4
	12	7	12	4