# INCIDENTAL AND INTENTIONAL LEARNING IN RETARDED AND NORMAL CHILDREN

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ABSTRACT

INCIDENTAL AND INTENTIONAL LEARNING IN RETARDED AND NORMAL CHILDREN

by Ronald V. Singer

This study 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. Sixty subjects, fifteen in each of four groups were tested on four incidental learning tasks and one intentional learning task. The groups were chosen so that the younger normal and retarded were matched on MA, the older normal and retarded were matched on MA, and the old normals and young retarded formed a CA match. The results were analyzed by means of analysis of variance, with specific t-test comparisons.

Specifically, four major hypotheses were tested. Hypothesis I postulated an incidental learning deficit for the retardates of both age groups (MA controlled) on the active incidental task. This task involved S playing a game and then answering questions about what transpired. Hypothesis II postulated an incidental learning deficit for the retardeds on the more difficult passive incidental task.

This task involved S watching the E draw some designs, and answering questions about what transpired. The results confirmed these hypotheses. Hypothesis III postulated a retarded's deficit for the simpler misdirected color task. This task consisted of the S naming objects of doll furniture and later being asked what color the objects were. The overall F-ratio was significant, but the t-test comparisons revealed that this was due only to the retardates poorer learning on the CA match. When matched on MA there were no significant differences between the retardeds and the normals on incidental learning, for both the younger and older groups. Hypothesis IV postulated no significant differences in intentional learning between these groups. The hypothesis was confirmed.

The results were discussed pointing out that the retarded S's presumably lack the ability to consistently respond; and this accounted for their poorer ability to learn incidentally. It was pointed out that the retardates can learn quite well as evidenced by the intentional learning task but that they tend to overrespond and consequently are less accurate than the normal subjects. This was particularly true for the younger retardates. Such data support a "peanut brittle" model of mental retardation, that is, the retardates have the correct responses available,

but they are stuck together in an undifferentiated manner. The result is overresponding and poor accuracy by the retardates.

The younger S's in both the retarded and normal groups were consistently significantly poorer than the older S's in both groups. This indicates that the ability to learn incidentally increases with age, even in retarded subjects.

The implications of this research for education and some implications for future research were also discussed.

Approved M. Ray Denny
Major Professor

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# INCIDENTAL AND INTENTIONAL LEARNING IN RETARDED AND NORMAL CHILDREN

By

Ronald V. Singer

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To

Janet

and

Lynn

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# CHAPTER I

## INTRODUCTION

Little has been done on the applications of learning theory to mental deficiency. McPherson (1961) could find only twenty-eight articles on this subject between 1904 and 1958. Stolurow (1958) states that it is a strange paradox that in the past fifty years the psychology of learning has shown an accelerated expansion, but there has been almost no attempt to understand the learning process of the mentally retarded or how they differ in learning ability from other children.

In reviewing the studies that have been done on the learning process with retarded children it soon becomes evident that these children have much more learning ability than generally assumed. Johnson and Blake (1960) have recently published a book reporting studies using public school retardates (MA range 50 to 75) matched on MA with normal school children. Their findings included the following: (1) that there was no significant difference between normal and retarded S's in the rate of learning and retention of an intentionally learned six item series of easy to pronounce nonsense syllables; (2) no significant

difference in learning a letter-digit substitution task; (3) no significant difference in learning a simple puzzle assembly task; (4) a significant difference in favor of the retarded on a simple task of sorting cards of four different designs into four separate boxes. Woodrow (1917) in one of the earlier studies using a simple cancellation task found no significant difference in speed of learning between normal and retarded children. While several other similar studies could be cited, it is also obvious (Denny, 1960) that retarded children are poorer performers on many learning tasks. But just how do they differ in learning ability from normals?

## Background

It has been hypothesized that mental retardates are poorer performers because they are much poorer incidental learners than normals (Denny, 1960). This hypothesis seems related to the work of Benoit (1957). Benoit has applied Hebb's theory of behavior (Hebb, 1949) to mental retardation. Using Hebb's terminology Benoit says the retardate is deficient in intergrative sets and phase sequences. In practice this means that the retardate needs to be guided gradually in training, for without guidance (intentional learning) little or no learning takes place. Another aspect of Benoit's analysis is that the retardate is a stimulus bound concrete organism. This stimulus bound

characteristic of the retarded is well known and is often used as a diagnostic indicator by those who work with mental retardation. In essence this stimulus bound quality reflects the retardate's tendency to respond to the stimuli of the moment and an inability to maintain internal stimuli or sets.

The stimulus bound characteristic is an important factor for learning in the framework of elicitation theory (Denny and Adelman, 1955). They state,

> Thus, 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.

Therefore, according to this theory consistent responding is necessary for differential learning. By differential learning is meant the ability of the organism to respond differently to different stimuli. By consistent responding is meant the ability of the organism to respond in the same way to the same stimulus. The retarded 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 retarded is bound to the fleeting stimulus of the moment and cannot maintain an internal set. From elicitation theory it follows that the

retarded child who does not respond consistently to the same stimulus in an ordinary situation fails to learn incidentally what the normal child learns incidentally. Presumably the retarded child falls behind in the first few years of life and never catches up. That is to say, in the first years of life little directed learning takes place for most children. They are left on their own and not directly taught much of anything. But by consistent responding to stimuli the "normal" child picks up incidentally a vast background of general data about the world which he can use to build upon when directed learning begins in kindergarten or the first grade. The retarded, however, does not incidentally acquire this information and therefore has an initial handicap from which he never seems to recover.

## Incidental Learning

Numerous studies have been conducted on incidental learning with normal subjects. (Jenkins, 1933; Saltzman and Atkinson, 1954; Brown, 1954; Gleitman and Kamsin, 1957; Neimark and Saltzman, 1953.) If incidental learning is defined as "learning that takes place without formal instruction or intent to learn without ascertainable motive" (English and English, 1958 and a similar definition in McGeoch, 1942) then an interesting theoretical question is raised. In any Hullian-like theory drive reduction is

necessary for learning, and with no motive or drive there can be no drive reduction and therefore no incidental learning. Osgood (1953) and Postman and Senders (1946) have attempted to get around this difficulty by pointing out the present inability to measure or identify human motives. But the simplest way to look at it is that the incidental learner maintains a set to respond which includes the response to be incidentally learned. In a contiguity framework such as elicitation theory this is all that is important.

There is no externally induced set to learn in the early years of all children, but most children ("normals") maintain sets to respond in a particular direction over a somewhat extended period of time. In so doing they pick up incidentally a background of knowledge which other children ("retardates") are less likely to acquire.

For the purpose of this study incidental learning will be conceptualized into three levels of difficulty called misdirected, passive, and active orientations. The misdirected orientation is conceptualized as the easiest, the passive orientation as the most difficult and the active orientation as in between these two. In misdirected incidental learning the subject is asked to perform one task such as naming the color of an object and then later is tested on another task, his knowledge of the objects. This is the typical type of incidental learning design but least

related to the deficit that is posited to be present in the mentally retarded. Two recent studies have used this type of design with retarded and normal subjects, and these will be discussed below. The misdirected type is considered the easiest incidental task because S is instructed to make some kind of a response, even though it is not directly related to what is later tested. In passive incidental learning S is merely asked to watch what the experimenter does. Then later he is questioned about the details of what went on. The paper-and-pencil tasks to be used in the present experiment will serve as the test of passive incidental learning. This is considered to be a more difficult incidental task because S is instructed to watch the E, he makes no overt response, and S has no set to learn at all. In active incidental learning S performs some activity or partakes in some games, and is later questioned on some detail of what took place. This type of incidental learning is similar to misdirected incidental in that S is doing some task. It differs in that the S is not asked to learn anything, just to engage in some activity. Therefore this task is considered to be of intermediate difficulty. The mechanical tasks used in the present experiment will serve as our test of active incidental learning. The passive and active tasks are more closely related to the kind of incidental learning deficit that is being hypothesized as present in the retarded.

Recent Studies

In a recent study Hetherington and Banta (1962) attempted to test the incidental learning deficit hypothesis. They used colored pictures of common objects mounted on five by seven inch cards. The subjects were a normal group (mean IQ 101) and a non-organic retarded group (mean IQ 60, with a mean CA of 120 months). In their incidental task S named the color of the object of the card as it was presented and after one exposure of the series of fifteen cards S was given five minutes to name as many of the objects as he could. Their intentional task was to present a similar series of fifteen cards and to instruct S 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. On the incidental learning task the normal group made a mean of 6.33 correct responses (S.D = 1.96) and the retarded group made a mean of 6.20 correct responses (S.D. = 2.09); there were no significant differences between the groups on incidental learning. They also found no difference in intentional learning between the groups. For intentional learning the normal group had a mean of 7.63 correct responses (S.D. = 1.28) and the retardates a mean of 7.43 correct responses (S.D. = 1.33).

There are two points to be considered about the Hetherington and Banta study. First, the stimulus objects were artificial uni-dimensional objects. The flat cardboard

pictures leave much to be desired as far as any connection with real life situation is concerned. To correct for this, real life gamelike activities and multi-dimensional minature objects were used in the present research. Secondly, the incidental learning procedure included the "E's naming the object on each card as it was exposed." This may have made the incidental procedure similar to the intentional learning procedure. The mean scores (presented above) are rather similar and tend to indicate that their incidental task may have been quite similar to their intentional task. The above points suggest that their procedure possibly could have minimized or clouded any incidental learning deficit that existed. So with certain modifications the "misdirected" procedure might reveal an incidental learning deficit.

In another study Goldstein and Kass (1962) studied incidental learning in retardated (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 interspersed. The S's were told to locate the numbers and were later tested for what they learned of the scene. Goldstein and Kass found an incidental learning deficit when the criterion tasks were "recall naming" and "detailing the stimuli." In recall naming, the S recalled the stimuli completely from memory. In detailing the stimuli the S was asked to give details of the stimuli he had recalled.

The deficit was in terms of the retardates making significantly more incorrect responses than the normals. No deficit was found when S's only had to identify the original stimuli from a group of similar but new stimuli (recognition task). Also, there were no differences in total number of responses or number of correct responses, but the retardates made significantly more incorrect responses. Since there were no significant differences in the simpler identification task, it becomes clear that the incidental learning deficit, if it exists, can be hidden by the experimental procedure.

The procedure and design of the present experiment attempts to test the hypothesized incidental learning deficit in retardates by building on the studies cited above. This was done by using younger vs. older normal and retarded subjects, by giving more complex and difficult tasks, and by using the more difficult recall criterion, by using natural multi-dimensional and realistic stimuli, and by using a retarded group about forty points below the normal group.

Terminology and Hypothesis

If two groups, one normal and one retarded, are matched on MA by definition the normals have a higher IQ and a lower CA and the retardates have a lower IQ and higher CA. If the retardates perform significantly poorer

on some task, we can say that they have shown a low-IQ deficit, since their IQ is lower than the normal groups. This is a typical design in research on mental retardation. But if we also have another control group of normal S's with the same chronological age as the retarded group, (by definition the retarded will have a lower MA and IQ) then we can more accurately pinpoint the nature of the retardate's deficit. The CA match permits the identification of a Low-MA-Low-IQ deficit because the retardates have a lower mental age and lower IQ. A low IQ deficit implies a Low-MA-Low-IQ deficit, but the reverse is not true. On some tasks when matched on CA the retardates show a poorer performance, but when matched on MA they show no deficit (Denny, 1964). The use of two control groups, one normal group equated on MA with the retarded group and one normal group equated on CA with the retarded group allows us to more accurately look at the nature of the retardate's performance.

The following are the major, subsidiary and minor hypotheses.

Hypothesis I

> On the active incidental task, with MA controlled in both the younger and older groups, the retardates show less incidental learning than the normals as measured by number of correct recall responses (since these two groups have the same MA [i.e., MA controlled] this fits our definition of a Low-IQ deficit).

Subsidiary active incidental hypothesis.

1A. With CA controlled (young retardates compared with older normals) the retardates show less incidental learning (Low-MA-Low-IQ deficit).

1B. Developmentally, (young normals compared with old normals and young retardates compared with old retardates) the older groups in both comparisons show more incidental learning.

Hypothesis II

On the passive incidental task with MA controlled in both the younger and older groups, the retardates show less incidental learning than the normals as measured by number of correct recall responses (Low IQ deficit).

Subsidiary passive incidental hypothesis.

2A. With CA controlled (young retardates compared with older normals) the retardates show less incidental learning (Low-MA-Low-IQ deficit).

2B. Developmentally, (young normals compared with old normals and young retardates compared with old retardates) the older groups in both comparisons show more incidental learning.

Hypothesis III

On the misdirected incidental learning task, with MA controlled in both the younger and older groups, the retardates show less incidental learning than the normals as measured by number of correct recall responses (Low IQ deficit).

Subsidiary misdirected incidental learning hypothesis.

3A. With CA controlled (young retardates compared with older normals) the retardates show less incidental learning (Low-MA-Low-IQ).

3B. Developmentally, (young normals compared with old normals and young retardates compared with old retardates) the older groups in both comparisons show more incidental learning.

These three hypotheses follow from the theoretical discussion above postulating less incidental learning by the retarded than by normals. Data from a pilot study show

that the active and passive procedures are more difficult than the misdirected procedure, thus it is expected that these tasks may show a difference even if the misdirected procedure (Hypothesis III) does not. The procedure used in testing Hypothesis III was to some extent similar to the procedure used by Hetherington and Banta (1962). While they found no difference in incidental learning between normals and retardates, we are hypothesizing a difference since we used more realistic and multi-dimensional stimuli and did not name the objects as presented.

The subsidiary hypothesis (labeled "A") utilizes the CA control. If the more severe Low-IQ deficit is not found the less severe Low-Ma-Low-IQ deficit might still be present in the retarded subjects.

The "B" subsidiary hypothesis is a developmental one and from the work of Hebb (1949) and ordinary transfer considerations we might expect that learning (even incidental learning) would increase with age.

Hypothesis IV

> There is no significant difference in intentional learning between the groups.

This follows from the findings of Hetherington and Banta (1962), Johnson and Blake (1960), and Goldstein and Kass (1960). Also the pilot study data showed no significant difference on intentional learning for any of the procedures used.

The above are the major hypotheses, the following

are the minor hypotheses.

Hypothesis V

> On the active incidental learning tasks which involve the manipulation of colored objects (marbles, brightly colored balls, etc.) there is no significant difference between any of the experimental groups on the recall of the color of these objects (misdirected incidental learning for color).

In this task the subjects have at least fifteen seconds in which to view the marble, ball, etc., insuring fairly well that all S's perceive at one time or another the color which answers the criterion question. In other words the learning of color does not require S to maintain a consistent responding act. Thus the retardates should do as well as normals. It is assumed that the younger subjects will be more color oriented and incidentally pick up the correct color response more efficiently than older subjects, however since we have hypothesized that the older subjects learn better than the younger, the net result is no significant difference.

Hypothesis VI

> There are no significant differences between the experimental groups in intentional learning for total number of responses during free recall.

In hypothesis VI it is assumed from our prediction of no significant difference in intentional learning for number of correct responses that this would also hold for total responses.

# CHAPTER II

## METHOD

### Subjects

This experiment was designed with four groups of fifteen subjects each. It employed a young retarded group and a young normal group with the same mental age; an older retarded group and an older normal group with the same mental age. The groups were chosen so that the older normal group also served as a chronological age control for the young retarded group. Table I shows the MA's, CA's and IQ's of the four groups.

Since Sarason (1953), Spitz (1954) and others have raised the question concerning the possible detrimental effects of institutionalization of children, it was felt that some control of this variable was in order. Therefore, all subjects, both normal and retarded, were randomly selected from state and private children's homes where they had lived in an institutional setting for at least six months. All retarded subjects came from Lapeer State Home and Training School, Lapeer, Michigan. All of these subjects were diagnosed as having familial or idiopathic mental deficiency. Since Hetherington and Banta (1962) found differences in performance between organics and retardates on

an incidental task, the case histories of each subject were reviewed. A history with any mention of organic brain damage as part of the etiology eliminated that subject from the study.

Table 1

The Mean and Range of the MA, CA, and IQ for the Four Groups

| Groups | M.A. in Months | | C.A. in Months | | I.Q. | |
|---|---|---|---|---|---|---|
| | Mean | Range | Mean | Range | Mean | Range |
| Young Normals | 74.50 | 54-89 | 73.00 | 56-91 | 102.13 | 94-116 |
| Young Retarded | 68.39 | 41-85 | 133.95 | 116-154 | 51.06 | 37-60 |
| Old Normals | 128.22 | 101-145 | 126.13 | 107-144 | 101.66 | 92-109 |
| Old Retardates | 120.18 | 98-139 | 231.60 | 210-252 | 51.46 | 42-59 |

The normal subjects came from the Guardian Angel Home, the Salvation Army Children's Home, the Sarah Fisher and St. Vincents' Children's Home and the Evangelical Home for Children, all of Detroit. No subject with indications of organic damage or severe mental illness was included in the study.

Materials

In the active incidental learning six children's toys were used. The S's had to actively engage in some mechanical manipulations during this part of the testing. The test materials were: (1) A children's marble game where the S had to pull a lever to shoot a yellow marble. (2) A wooden clock with movable hands, the large hand painted green. (3) A six inch by six inch Tick-Tack-Toe board with black plastic O's shaped like doughnuts. The S moved the O's around. (4) A "skee ball" game where the S rolled a yellow ball into any one of nine holes. (5) A group of seven blue, plastic, bottlecap like objects which the S moved around to make a design. (6) A four inch by six inch peg board game with an orange peg which the S moved about and around several colored blocks.

The passive incidental learning consisted of seven different kinds of patterns (described below) which E drew with paper and pencil while S passively watched.

The misdirected incidental test material consisted of eight pieces of plastic doll house furniture. The S was asked to name the color of each piece and later tested on what the objects were that had been seen.

The intentional test materials consisted of eight pieces of doll house furniture, similar to but different from that used in the misdirected incidental procedure.

The results of a pilot study were used to choose the sixteen pieces of doll house furniture most often recognized. The furniture was then randomly assigned to either the incidental or intentional series. All subjects appeared to attend to the experimental tasks quite vigorously. The materials and their varied shapes and bright colors could have accounted for much of this attention.

Procedure

The active incidental task was presented first. This was followed by the passive paper-and-pencil task, then the misdirected task (doll house furniture). After naming the colors in the misdirected task the S's were immediately asked to recall the objects they had just seen. There were two minutes of free recall. The criterion questions for the active and passive tasks were then asked; this was terminally followed by the intentional learning series.

The experimenter (E) administered the tests and a recorder (R) recorded the data. Each S was encouraged with remarks such as "good," "that's fine," "you're doing fine," "uh-huh," etc. throughout the procedure. Also each S was given six pieces of candy at the end as a reward. Naive subjects were prevented from communicating with those already tested, but the future S's could see the candy which the former S's received as they left and this helped

maintain a high level of attention and responding.

Active incidental.--The first of the six active tasks was a children's marble game where the marble goes around for several seconds before falling into one of several slots. The E placed the game in front of the S and said,

> Now we are going to play some games. The first game is a marble game. If you shoot the marble just right it lands in one of these holes (E shoots the marble). See? Now you shoot the marble.

E then lets the S shoot the marble for a least fifteen seconds. The criterion questions asked later in the experiment after all the incidental procedures were finished are:

> Where did the marble land on your last shot just before I took the game away, and what color was the marble?

The second task was a children's wooden clock with movable hands, the large hand painted green. The child was shown the clock and it was recorded where the large hand was pointing. The E moved the hands around and then S moved the hands for fifteen seconds. The instructions were,

> Here is our clock. It is not like a real clock because you can move the hands without hurting it. You move the hands some.

It was recorded where the large hand was at the end. The criterion questions asked later were,

> Where was the large hand pointing when I took the clock away, and what color was the large hand?

The third task presented was the large sized Tick-Tack-Toe board with three black plastic O's shaped like doughnuts. The E said,

> Now here is a board with some O's on it. These O's can hop around. (The E moved the O's around.) Now you hop the O's around.

The S hopped the O's around for 15 seconds. It was recorded where the O's were at the finish. The criterion questions later asked were,

> Where did you leave the O's just before I took them away, and what color were the O's?

The fourth task was a small size "skee ball" game. The E said,

> Here is a ball game. When you roll the ball it lands in one of these holes. Now you roll the ball.

The S played with the game for fifteen seconds and the R recorded where the last roll landed. The criterion questions asked later were,

> Where was the ball just before I took the game away, and what color was the ball?

The fifth task presented was a group of seven blue plastic objects, shaped somewhat like bottle caps. The E said,

> See these things? They can be moved around to make a design or anything you want to make. Why don't you move them around and make something with them?

The S played with the caps for fifteen seconds. The final position of the caps was recorded and the criterion questions

asked later were,

> How did you leave the caps just before I took them away, and what color were the caps?

The last task was a four inch by six inch pegboard with an orange peg that could be moved between several colored blocks. The E said,

> Here is Mr. Peg. (He then moved the orange peg.) He can hop around. Why don't you move him around?

The S moved Mr. Peg for fifteen seconds. The final position of Mr. Peg was recorded and the criterion questions asked later were,

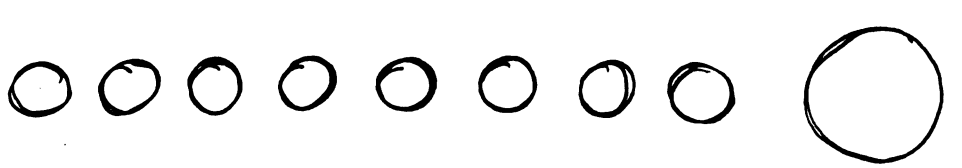
> Where did you leave Mr. Peg just before I took him away, and what color was Mr. Peg?

Passive Incidental.--The passive incidental tasks were presented immediately after the last active tasks. The E's instructions were,

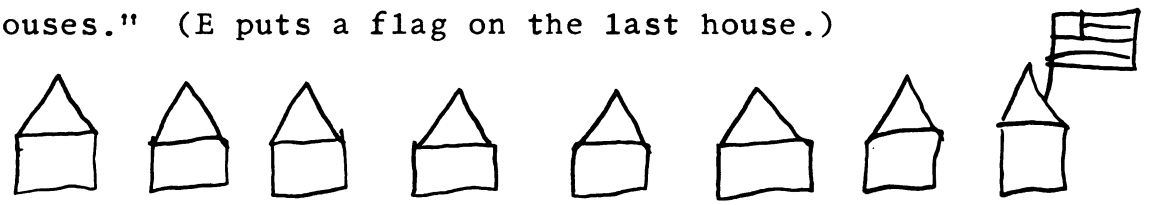
> Now I am going to draw some figures. You watch me draw these things.

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

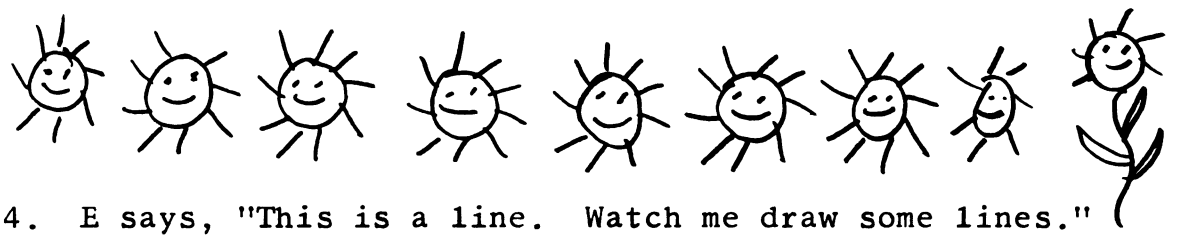
1. E says, "Here are some circles. Watch me draw the circles." (E draws the last circle larger.)



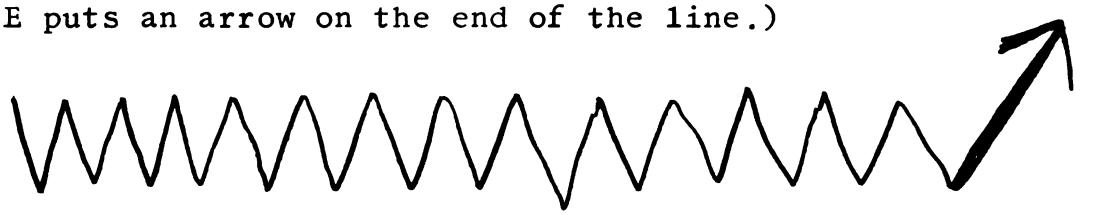
2. E says, "Here are some houses. Watch me draw the houses." (E puts a flag on the last house.)



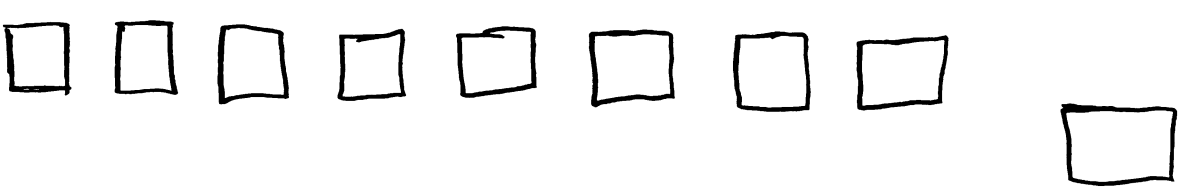
3. E says, "Here are some Mr. Suns. Watch me draw the Mr. Suns." (E makes the last Mr. Sun into a sunflower.)



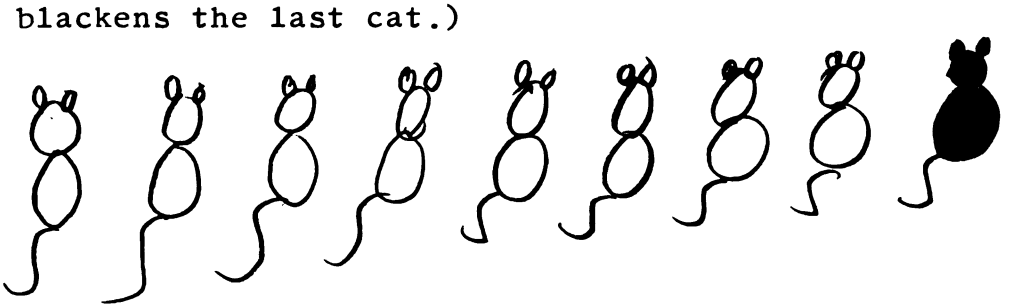
4. E says, "This is a line. Watch me draw some lines." (E puts an arrow on the end of the line.)



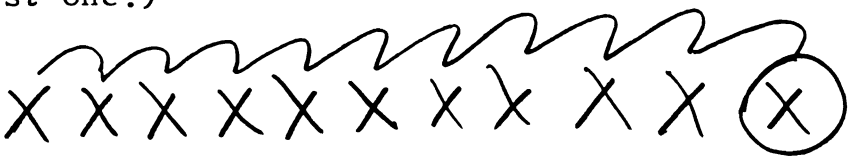
5. E says, "Here are some boxes. Watch me draw some boxes." (E drops the last box below the others.)



6. E says, "This is a cat. Watch me draw some cats." (E blackens the last cat.)



7. E says, "This is an X. Watch me draw some X's." (E draws ten X's. He then connects the tops and circles the last one.)



The criterion questions for the paper and pencil task to be asked later in the procedure were:

1. What did I do to the circle?
2. What did I do to the house?
3. What did I do to the sun?
4. What did I do to the line?
5. What did I do to the box?
6. What did I do to the cat?
7. What did I do to the X's?

Misdirected incidental.--The third incidental task utilized the plastic doll house furniture. The instructions were,

> Now I am going to show you some things and I want you to tell me what color they are. Do you think you can do that? Here's the first one.

Eight common objects (table, chair, etc.) were presented and the S named the color. Each object was presented for four seconds. After the last object these instructions were given,

> While you were looking at those objects and telling me what color they were, you saw a whole lot of different objects. Can you tell me exactly what some of those objects were?

If the S mentioned a color, the E said,

> Now you don't have to pay any attention to the color. Just tell me exactly what the objects were that you saw.

Each subject was given two minutes of free recall. If the S got all eight objects he was told, "Fine, that's all of them." Eight objects were used because in the pilot study it was found that older subjects correctly recalled about eight objects in the intentional learning situation when ten were presented. The younger groups recalled slightly less, but there was no significant difference between groups. Since it was shown that the memory span of all S's could handle about eight objects, any significant differences that might be found between groups cannot be attributed to a memory span factor. The pilot data agree with the findings of Hetherington and Banta (1962). They also found that normal and retarded children could recall about eight objects in a similar intentional learning situation when fifteen were presented. Thus there is good evidence that seven to eight objects apparently is the memory span of these children.

The second measure of misdirected incidental learning was obtained by asking what color the marble, ball, etc. was that was used in the active incidental procedure. This was the object that was present during all of the procedure and therefore sustained attention was not necessary to get the correct answer.

After S named the objects in the misdirected doll house furniture free recall, the stimuli used in the active incidental learning were represented, but with the parts that would aid in answering the criterion questions removed. Thus, the marble game was represented without the marble, the clock without the hands on it, etc. The criterion questions were then asked. Next the E took out a clean piece of paper and said, "Remember when I drew some circles on the paper? (The E drew a circle as before.) Now I'm going to ask you some questions." The criterion questions for the passive incidental learning were then asked. The stimulus was represented before each criterion question was asked.

To recapitulate in chronological order the procedure was as follows:

1. Some games were presented which the S engaged in (active incidental).

2. The E drew some figures on a paper (passive incidental).

3. The S was asked to name the color of some objects (misdirected to color doll house furniture incidental procedure).

4. The S was then asked to name the objects he had just seen (misdirected criterion question) so as to eliminate any confusion with the objects of the other task.

5. The games were represented in the original order and S is asked the criterion questions about what took place

and then the misdirected color criterion questions were asked.

6. The paper and pencil figures were represented individually and S was asked the criterion questions.

The number of tasks and order of presentation had a definite rationale. First, exploring an area where only a few studies exist dictated the use of a number of different tasks to tap the hypothesized incidental learning deficit. Second, it was impossible to administer the criterion questions after each task since that would change the set of S so that the next task presented could not be considered an incidental learning task. Therefore all of the criterion questions were presented after the S had performed the incidental learning tasks.

The final task was the intentional learning procedure. The instructions were:

> Now I'm going to show you some objects like the ones you saw before when you told me the colors. But this time you don't have to pay any attention to the colors. You just try to remember what the things are because I am going to ask you how many of them you can remember and I want you to get a good score.

The objects were presented for four seconds each with two minutes of free recall. If the S named a color the E said, "Now this time you don't have to care about the colors. Just tell me the objects you can remember." Color mentioning was not recorded as a response. No effort was made to control rehearsing, and several subjects did overtly rehearse.

# CHAPTER III

## RESULTS

Table 2 contains the results for the mean number of correct responses for all tasks for all groups. The total possible correct responses equals the number of subparts for each task (six for active incidental, seven for passive incidental, eight for the two types of misdirected incidental and intentional tasks). The analysis of variance between-groups effect shows significant F-ratios for the active incidental (games), passive incidental (paper and pencil designs) and misdirected incidental (doll house furniture) tasks. For misdirected incidental color learning (games) there were no significant differences between groups. For the intentional learning there were no significant differences.

Table 3 shows the t-tests for individual comparisons for the three measures where overall F-ratio significance was obtained.

Table 3 shows that for the passive incidental and active incidental condition both the younger retardates and the older retardates evidenced significantly poorer learning than the normals with the same CA (Low-IQ-Low-MA deficit). But more importantly these same groups also evidenced

Table 2

The Means Range and F-Ratio for the Three Incidental and One Intentional Condition Over the Four Groups for Correct Responses

| Measures | Young Normal | Young Retarded | Old Normal | Old Retarded | F-Ratio |
|---|---|---|---|---|---|
| Active Incidental | 4.6 | 2.6 | 5.6 | 3.9 | 22.49 |
| Range | 3-6 | 0-5 | 4-6 | 2-6 | Sign. at .001 level |
| Passive Incidental | 3.5 | 1.5 | 4.9 | 2.9 | 16.60 |
| Range | 2-7 | 0-4 | 3-7 | 0-5 | Sign. at .001 level |
| Misdirected Incidental | | | | | |
| a.Doll furn. | 3.5 | 3.1 | 4.9 | 4.4 | 5.9 |
| Range | 1-6 | 0-6 | 1-8 | 0-6 | Sign. at .01 level |
| b.Color | 4.9 | 4.0 | 4.9 | 4.3 | 1.84 |
| Range | 2-6 | 2-6 | 3-6 | 3-6 | Not Sign. |
| Intentional | 6.9 | 7.1 | 7.6 | 7.2 | 1.43 |
| Range | 4-8 | 5-8 | 6-8 | 6-8 | Not Sign. |

significantly poorer performance when matched on MA (Low-IQ deficit). However, on the relatively easier doll furniture color-oriented-object incidental task neither the younger nor the older groups show any significant difference when matched on MA. Thus we can say that the retardates had no

incidental learning deficit on this task when matched on MA (Low-IQ deficit). However, when matched on CA the retardates evidenced a significantly fewer number of correct responses indicating a deficit of the less severe Low-MA-Low-IQ type. In this particular task mental age is the critical variable. When subjects are matched on mental age there is no significant difference. When they are not matched, the group with the higher MA always does significantly better irrespective of whether the group is normal or retarded.

When age groups are compared the results are straightforward, the older retarded group gave significantly more correct responses than the younger retarded, and the older normal group gave significantly more correct responses than the younger normals.

We now turn to an analysis of the total number of responses produced during two minutes free recall on the intentional learning task. For this measure the total responses of the subjects are presented in Table 4. For the intentional task there was a significant difference in total responses between groups.

Table 5 shows the t-tests individual comparisons for the significant F-ratio obtained for total responses on the intentional task.

Table 3

The t-Test for Individual Comparisons on the Groups that Differed Significantly on the Overall F-Test for Correct Responses

| | Active Incidental | | Passive Incidental | | Misdirected Doll Furniture | |
|---|---|---|---|---|---|---|
| | t | p | t | p | t | p |
| M.A. Control young normals vs. young retarded | 5.40 | .001 | 3.26 | .01 | .75 | N.S. |
| M.A. Control old normals vs. old retarded | 4.59 | .001 | 4.08 | .001 | .94 | N.S. |
| C.A. Control young retarded vs. old normals | 8.10 | .001 | 6.12 | .001 | 3.39 | .01 |
| Developmentally young normals vs old normals | 2.70 | .01 | 2.86 | .01 | 2.61 | .02 |
| Developmentally young retarded vs old retarded | 3.51 | .001 | 2.04 | .05 | 2.45 | .02 |

Table 4

The Means and F-Ratio for the Total Responses on the Intentional Doll Furniture Task

| Young Normals | Young Retarded | Old Normals | Old Retarded | F-Ratio |
|---|---|---|---|---|
| 7.6 | 11.3 | 9.1 | 9.3 | F = 5.23<br>p = .01 level |

Table 5

The t-Tests Comparing Total Responses on the Significant Intentional Learning Task

| | t | p |
|---|---|---|
| MA Control<br>young normals vs. young retarded | 8.04 | .001 |
| MA Control<br>old normals vs. old retarded | .43 | N.S. |
| CA Control<br>young retarded vs. old normals | 4.78 | .001 |
| Developmentally<br>young normals vs. old normals | 3.26 | .01 |
| Developmentally<br>young retarded vs. old retarded | 4.34 | .001 |

From Table 5 we can see that for intentional learning in the young group the retardates gave significantly more total responses then their CA match and than their MA match. This did not hold for the older group, MA controlled, where no significant difference was found between normals and retardates. With respect to chronological age, in both the retarded and the normal groups, the younger subjects made more total responses than the older subjects.

Table 6 shows the analysis of the correct responses subtracted from total responses (incorrect responses) for the intentional condition in which a free recall procedure was used.

Table 6

The Means and F-Ratio for the Incorrect Responses on the Measure where Free Recall Was Used

| Measure | Young Normals | Young Retarded | Old Normals | Old Retarded | F-Ratio |
|---|---|---|---|---|---|
| Intentional Learning | .93 | 4.53 | 1.26 | 2.13 | 5.07 Sign. at .01 level |

From Table 6 we can see that for the intentional learning measure there was an over-all significant difference between the groups with respect to errors. Table 7 presents the t-ratios of individual comparisons on this measure.

Table 7 shows that for the intentional task the young retardates gave significantly more incorrect responses than their normal controls when matched on both MA and CA. The young retarded S's also gave more incorrect responses than the old retarded S's. This was not true for the young normals vs. the old normals. From these results we can say that for incorrect responses the young retardeds consistently gave more incorrect responses than both their MA and CA controls on the intentional task; this, in effect, represents a type of intentional learning deficit for the younger retardates.

Table 7

The t-Tests for Individual Comparisons on the Significant F-Ratio for Incorrect Responses

| Intentional Task | t | p |
|---|---|---|
| MA Control<br>young normals vs. young retarded | 3.53 | .01 |
| MA Control<br>old normals vs. old retarded | .85 | N.S. |
| CA Control<br>young retarded vs. old normals | 3.20 | .01 |
| Developmentally<br>young retarded vs. old retarded | 2.35 | .05 |
| Developmentally<br>young normals vs. old normals | .32 | N.S. |

# CHAPTER IV

## DISCUSSION

The four major hypotheses of this study were conclusively supported. For the two incidental tasks where consistent responding over time was tested (active and passive) clearly revealed an incidental learning deficit in the retarded group when the retardates were compared with both their MA and their CA controls, indicating a Low-IQ deficit. This incidental learning deficit appears to be present over a wide age range (approximately five to twenty years).

The misdirected incidental (doll furniture) task did not indicate a Low-IQ deficit. It is this task where the use of a CA control produced some interesting results. This task was very similar to the one Hetherington and Banta (1960) used and the results of the present research are essentially the same as they obtained. (In fact, for our older group which is comparable to their older group, even the mean raw scores are very similar.) Their results were interpreted as indicating no incidental learning deficit for retardates. However, when a CA control group is added, as in this study, we find an overall significant F-ratio directly attributable to a Low-MA-Low-IQ deficit.

It appears that Hetherington and Banta's study was fine, as far as it went, but if a CA control group had been added they probably would have found an incidental learning deficit even for the task they used.

It seems that two factors are operating to produce our findings. The first factor is the S's ability to maintain responding over the fifteen second interval of the task. In all our tasks (with one exception to be discussed below) the S had to be responding at the end of the fifteen second period in order to know the answer to the criterion question. It was this consistent responding which the retarded S could not maintain, and thus they could not answer the criterion questions. The second factor is the amount of response which the task requires S to make. In our passive incidental task, for instance, the S is not required to make any response at all during the entire procedure. On the misdirected incidental learning task (doll furniture) the S had to respond with some answer (a color response) to each sub-part of the overall task. The passive incidental task revealed a retardate's Low-IQ deficit, while the first misdirected incidental learning ("easier") task revealed a less severe Low-IQ-Low-MA deficit. It seems obvious that any future research on incidental learning with the retarded must be planned to take into account the amount of responding inherent in the task and the consistency of responding necessary to successfully complete the

task.

The second misdirected incidental learning measure, the color of the manipulated objects in the games (active task) yielded no significant differences between groups. This particular fact seems to say something about the nature of the incidental learning deficit. Since the colored object was present during the entire fifteen seconds of the task S did not have to maintain a sequence of responding in order to respond to color. Presumably, the retarded S only had to respond to the color once anytime during each sub-task to learn the correct answer and get as good a score as the normal subject. Thus, in keeping with the theoretical position of the present study, the incidental learning deficit on the same task does not show up when maintenance of responding is irrelevant but does show up when it is relevant.

In this study no significant differences were found on the intentional learning task for number of correct responses. This repeats the findings of Johnson and Blake (1960), Hetherington and Banta (1962) and Goldstein and Kass (1961). It appears fairly certain that on a variety of tasks retardates and normals when matched on MA show no significant differences on intentional learning.

However, when the intentional task results are analyzed for total responses the younger and older retardates give significantly more total responses than their MA and CA controls. This means that they gave as many correct

responses as the normals, who responded less, but made more incorrect responses. Thus the retardates, especially the young retardates, could not inhibit responding, which decreased their accuracy. This fits in with a "peanut brittle" model of response retrieval for the mentally retarded (Denny, 1964). That is, the retardates have all the correct responses available to them but they are "stuck together" (i.e., undifferentiated) which results in an overresponding and lack of accuracy. This finding also fits the notion of an "inhibition deficit" in the mentally retarded--a deficit which is quite well substantiated (Denny, 1964).

Since our procedure allowed for a short period of time (thirty to forty-five minutes) to lapse between presentation of stimuli and the criterion questions this opens up the possibility for an alternate interpretation of the results for the active and passive tasks. The explanation would state that the deficit is a retention deficit rather than a learning deficit. This seems unlikely since several investigators (Johnson and Blake, 1960; Ellis, Pryer and Barnett, 1960; and Wischner, Braun and Patton, 1960) found little or no evidence for a retention deficit in retardates.

To minimize the operation of a retention deficit the stimulus situation for each sub-task of both the active and passive tasks was reinstated prior to asking the criterion question. Also the fact that incidental color learning during the active task yielded no significant differences

between the retarded group and their normal controls is a strong argument against such an interpretation, particularly since interfering color responses to the doll furniture intervened between learning and test. However, since the misdirected doll furniture task, which had an immediate retention test, did not reveal a low IQ deficit the possibility of a retention deficit cannot be lightly discarded.

Since on the two more difficult incidental tasks our retardates indicate a learning deficit, any educational program aimed at teaching retardates should plan on incorporating a good deal of directed, specifically detailed instruction. It should be assumed that they will learn little in the ordinary course of events without explicit direction. The more complex the task, the more directed should be the teaching procedure. With some very simple tasks retarded children demonstrate some potential for incidental learning. Some suggestions for future research might be to draw more accurately the finer limits of the time period over which retardates might be able to maintain consistent responding, the effect of various amounts of responding required by the task, etc. to pinpoint the retardates incidental learning deficit. The retarded child can learn, but he is not a "self-starter" that is, he needs to be directed and encouraged in every step of the learning process (Denny, 1964).

Since this study also indicates that younger normal children are poorer incidental learners than older normal

children, more directed teaching methods should prove more effective in imparting complex and abstract ideas to these children. As they grow older more reliance can be placed on the child "picking up" information in informal situations.

# CHAPTER V

## SUMMARY

This study 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. Sixty subjects, fifteen in each of four groups were tested on four incidental learning tasks and one intentional learning task. The groups were chosen so that the younger normal and retarded were matched on MA, the older normal and retarded were matched on MA, and the old normals and young retarded formed a CA match. The results were analyzed by means of analysis of variance, with specific t-test comparisons.

Specifically, four major hypotheses were tested. Hypothesis I postulated an incidental learning deficit for the retardates of both age groups (MA controlled) on the active incidental task. This task involved S playing a game and then answering questions about what transpired. Hypothesis II postulated an incidental learning deficit for the retardeds on the more difficult passive incidental task. This task involved S watching the E draw some designs, and answering questions about what transpired. The results

confirmed these hypotheses. Hypothesis III postulated a retarded's deficit for the simpler misdirected color task. This task consisted of the S naming objects of doll furniture and later being asked what color the objects were. The overall F-ratio was significant, but the t-test comparisons revealed that this was due only to the retardates poorer learning on the CA match. When matched on MA there were no significant differences between the retardeds and the normals on incidental learning, for both the younger and older groups. Hypothesis IV postulated no significant differences in intentional learning between these groups. The hypothesis was confirmed.

The results were discussed pointing out that the retarded S's presumably lack the ability to consistently respond; and this accounted for their poorer ability to learn incidentally. It was pointed out that the retardates <u>can</u> learn quite well as evidenced by the intentional learning task but that they tend to overrespond and consequently are less accurate than the normal subjects. This was particularly true for the younger retardates. Such data support a "peanut brittle" model of mental retardation, that is, the retardates have the correct responses available, but they are stuck together in an undifferentiated manner. The result is overresponding and poor accuracy by the retardates.

The younger S's in both the retarded and normal groups were consistently significantly poorer than the older S's in both groups. This indicates that the ability to learn incidentally increases with age, even in retarded subjects.

The implications of this research for education and some implications for future research were also discussed.

## REFERENCES


Benoit, E.P. Relevance of Hebb's theory of the organization of behavior to educational research on the mentally retarded. Amer. J. Ment. Defic., 1957, 61, 497.

Brown, G.H. Factors influencing incidental learning. J. of exp. Psychol., 1954, 47, 163-169.

Denny, M.R. Learning and Performance in Stevens, H. (Ed) Mental Retardation, A Research Review. Univ. of Chicago, 1964 (In Press).

Denny, M.R. & Adelman, H. Elicitation theory: I. An analysis of two typical learning situations. Psych. Rev., 1955, 62, 209.

_____. Elicitation theory: II. The formal theory and its application to instrumental escape and avoidance conditioning. Paper, Michigan State University, 1956.

Edwards, A.L. Experimental Design in Psychological Research. New York, Rinehart and Co., 1950.

Eisman, Bernice S. Paired associate learning, generalization and retention as a function of intelligence. Amer. J. ment. defic., 1958, 63, 481-489.

Ellis, N.R. & Pryer, M.W. Primary versus secondary reinforcement in simple discrimination learning of mental defectives. Psychol. Rep., 1958, 4, 67.

Ellis, N.R., Pryer, M.W., & Barnett, C.D. Motor learning and retention in normals and defectives. Percept. mot. Skills, 1960, 10, 83-91.

Ellis, N.R., Pryer, R.S., Distefano, M.K., & Pryer, M.W. Learning in mentally defective, normal and superior subjects. Amer. J. ment. Defic., 1960, 64, 725.

English, N. & English, S. A Dictionary of Psychological and Psychoanalytic Terms. Longrass, New York, 1958.

Gleitman, H. & Kamsin, R. Proactive and retroactive inhilution in intentional and incidental learning. Psychol. Rep., 1957, 3, 155-160.

Goldstein, H. & Kass, C. Incidental learning of educable mentally retarded and gifted children. Amer. J. ment. Defic., 1961.

Gordon, S., O'Connor, N., & Tizard, J. Some effects of incentives on the performance of imbeciles. Brit. J. Psychol., 1954, 45, 277.

Hebb, D.O. The Organization of Behavior. New York, Wiley, 1949.

Hetherington, E. & Banta, T. Incidental and intentional learning in normal and retarded children. J. Comp. Physicl. Psych., 1962, 55, 402.

House, Betty J. & Zeaman, D. A comparison of discrimination learning in normal and mentally defective children. Child Developm., 1958, 29, 411.

Jenkins, J.G. Instruction as a factor in incidental learning. Amer. J. Psych., 1933, 45, 471-477.

Johnson, G.D. & Blake, Kathryn A. Learning Performance of Retarded and Normal Children. Syracuse University Press, 1960.

McGeoch, J.A. The Psychology of Human Learning. New York, Longmans Green, 1942.

McNemer, Q. Psychological Statistics. New York, J. Wiley & Sons, 1955.

McPherson, M.W. Learning and Mental Deficiency in Rothstein, J. (Ed.) Mental Retardation. New York, Holt, Rinehart & Winston, 1961.

Neimark, E. & Satizman, I.J. Intentional and incidental learning with different rates of stimulus presentation. Amer. J. Psych., 1953, 66, 618-621.

Osgood, C.E. Method and Theory in Experimental Psychology. New York, Oxford University Press, 1953.

Plenderleith, Mavis. Discrimination learning and discrimination reversal learning in normal and feebleminded children. J. genet. Psychol., 1956, 88, 107.

Postman, L. & Senders, V.L. Incidental learning and the generality of set. J. of exp. Pschol., 1946, 38, 153-165.

Robinson, D.D. A comparison of intentional versus incidental learning in normals as compared to mental retardates when both are matches on M.A. and C.A. Unpublished M.A. thesis, Michigan State University, 1963.

Saltzman, I.J. & Atkinson, R.L. Comparisons of incidental and intentional learning after different numbers of stimulus presentations. Amer. J. Psych., 1954, 67, 521-524.

Sarason, S. Psychological Problems in Mental Deficiency. New York, Harper Brothers, 1953.

Spitz, R. Hospitalism: An inquiry into the genesis of psychiatric conditions in early childhood. The Psychoanalytic Study of the Child, 1945, 1.

Stolurow, L. Requirements for research on learning in mental deficiency, in Approaches to Research in Mental Retardation. Woods Schools conference, Philadelphia, 1959.

Walker, H. & Lev, S. Statistical Inference. New York, Holt, 1959.

Wischner, G., Braun, H., & Patton, R. Acquisition and long-term retention of an object-quality learning set by retarded children. J. comp. Psychol., 1962, 55, 518.

Woodrow, H. Practice and transference in normal and feeble-minded children. Part I: Practice. J. educ. Psychol., 1917, 8, 85.

Zeaman, D. Discrimination learning in retardates. Training Sch. Bull., 1959, 56, 62-67.

Zeaman, D., House, Betty J., & Orlando, R. Use of special training in visual discrimination learning with imbeciles. Amer. J. ment. Defic., 1958, 63, 453.

Zigler, E.F., Hodgden, L., & Stevenson, H.W. The effect of support on the performance of normal and feebleminded children. J. Pers., 1958, 26, 106.

# Appendix A

## Analysis of Variance Table for Correct Responses for the Five Measures Showing Degrees of Freedom, Sources of Variations, Mean Squares and F-Ratios

### Active Incidental

| Sources of Var. | Sum of Sq. | df | M.S. | F |
|---|---|---|---|---|
| Between | 71.8 | 3 | 23.93 | 22.49 |
| Within | 58.5 | 56 | 1.04 | Sign. at .001 level |
| Total | 103.3 | 59 | | |

### Passive Incidental

| Sources of Var. | Sum of Sq. | df | M.S. | F |
|---|---|---|---|---|
| Between | 90.3 | 3 | 30.1 | 16.60 |
| Within | 104.1 | 56 | 1.8 | Sign. at .001 level |
| Total | 194.4 | 59 | | |

### Misdirected Doll Furniture

| Sources of Var. | Sum of Sq. | df | M.S. | F |
|---|---|---|---|---|
| Between | 37.2 | 3 | 12.4 | 5.90 |
| Within | 147.8 | 56 | 2.1 | Sign. at .01 level |
| Total | 185.0 | 59 | | |

Misdirected Task Oriented Color Incidental

| Sources of Var. | Sum of Sq. | df | M.S. | F |
|---|---|---|---|---|
| Between | 8.00 | 3 | 2.66 | 1.84 |
| Within | 80.90 | 56 | 1.44 | Not Sign. |
| Total | 88.90 | 59 | | |

Intentional

| Sources of Var. | Sum of Sq. | df | M.S. | F |
|---|---|---|---|---|
| Between | 3.7 | 3 | 1.23 | 1.43 |
| Within | 47.0 | 56 | .86 | Not Sign. |
| Total | 50.7 | 59 | | |

Appendix B

Analysis of Variance for the Total Responses Showing Degrees of Freedom, Sources of Variation, Mean Squares and F-Ratios

Incidental Doll Furniture

| Sources of Var. | Sum of Sq. | df | M.S. | F |
|---|---|---|---|---|
| Between | 7.27 | 3 | 2.42 | 1.52 |
| Within | 89.13 | 56 | 1.59 | Not Sign. |
| Total | 96.40 | 59 | | |

Intentional Condition

| Sources of Var. | Sum of Sq. | df | M.S. | F |
|---|---|---|---|---|
| Between | 105.73 | 3 | 35.24 | 5.23 |
| Within | 377.60 | 56 | 6.74 | Sign. at .01 level |
| Total | 483.33 | 59 | | |

# Appendix C

## Sex, Chronological Age, IQ and Type of IQ Test for The Retarded Groups

| Older Group | | | | | Younger Group | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Sex | CA in Months | IQ | Type IQ Test | | Sex | CA in Months | IQ | Type IQ Test |
| (1) | F | 208 | 47 | WAIS | (11) | M | 150 | 49 | WISC |
| (2) | F | 248 | 52 | WAIS | (2) | M | 154 | 47 | WISC |
| (3) | F | 252 | 55 | WISC | (3) | M | 147 | 51 | S-B-R |
| (10) | F | 222 | 56 | WAIS | (4) | M | 133 | 37 | S-B-R |
| (5) | F | 250 | 42 | WISC | (12) | M | 120 | 49 | WISC |
| (11) | F | 240 | 47 | WAIS | (6) | M | 142 | 58 | WISC |
| (7) | F | 222 | 59 | WAIS | (7) | M | 119 | 54 | S-B-R |
| (8) | F | 210 | 57 | WAIS | (8) | M | 120 | 57 | WISC |
| (9) | F | 256 | 42 | WAIS | (10) | M | 142 | 56 | WISC |
| (4) | M | 240 | 53 | WISC | (9) | F | 116 | 41 | WISC |
| (6) | M | 228 | 58 | WAIS | (5) | F | 124 | 60 | WISC |
| (12) | M | 224 | 50 | WAIS | (13) | F | 130 | 54 | S-B-R |
| (13) | M | 228 | 48 | WAIS | (14) | F | 129 | 53 | S-B-R |
| (14) | M | 219 | 55 | WISC | (15) | F | 133 | 49 | WISC |
| (15) | M | 231 | 51 | WAIS | (1) | F | 152 | 51 | WISC |

(Note: WISC = Wechsler Intelligence Scale for children,
S-B-L = Stanford-Binet, Form L,
S-B-Rs = Revised Stanford-Binet,
WAIS = Wechsler Adult Intelligence Scale,
K-A = Kuhlman-Anderson, Form K.
Numbers in ( ) represent subject order for data in Appendix E.

# Appendix D

## Sex, Chronological Age, IQ and Type of IQ Test for the Normal Groups

| Older Group | | | | | Younger Group | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Sex | CA in Months | IQ | Type IQ Test | | Sex | CA in Months | IQ | Type IQ Test |
| (1) | M | 108 | 107 | WAIS | (1) | F | 61 | 94 | S-B-R |
| (2) | M | 141 | 109 | WAIS | (3) | F | 76 | 99 | S-B-L |
| (6) | M | 114 | 96 | WAIS | (4) | F | 62 | 96 | S-B-L |
| (7) | M | 128 | 92 | S-B-R | (7) | F | 80 | 104 | S-B-R |
| (8) | M | 138 | 103 | WAIS | (8) | F | 56 | 106 | WISC |
| (13) | M | 114 | 98 | K-A | (10) | F | 65 | 95 | WISC |
| (15) | M | 125 | 102 | WAIS | (11) | F | 75 | 107 | S-B-R |
| (3) | F | 138 | 101 | WAIS | (14) | F | 80 | 108 | S-B-R |
| (4) | F | 135 | 106 | S-B-R | (15) | F | 79 | 94 | S-B-L |
| (5) | F | 125 | 103 | WISC | (2) | M | 91 | 97 | S-B-L |
| (9) | F | 140 | 105 | K-A | (5) | M | 81 | 99 | K-A |
| (10) | F | 107 | 104 | WAIS | (6) | M | 65 | 101 | S-B-R |
| (11) | F | 117 | 95 | S-B-R | (9) | M | 61 | 110 | S-B-R |
| (12) | F | 118 | 101 | WAIS | (12) | M | 83 | 106 | S-B-R |
| (14) | F | 144 | 103 | WAIS | (13) | M | 80 | 116 | WISC |

# Appendix E

## Raw Scores for Correct Responses for the Four Groups Over the Five Tasks

| | Young Normal | Young Retarded | Old Normal | Old Retarded |
|---|---|---|---|---|
| Active Incidental Task | 5 | 0 | 6 | 5 |
| | 4 | 5 | 6 | 3 |
| | 5 | 3 | 5 | 3 |
| | 3 | 1 | 6 | 6 |
| | 4 | 1 | 5 | 4 |
| | 6 | 1 | 6 | 3 |
| | 6 | 1 | 5 | 2 |
| | 6 | 3 | 6 | 5 |
| | 4 | 2 | 6 | 5 |
| | 4 | 5 | 6 | 2 |
| | 4 | 4 | 6 | 3 |
| | 4 | 5 | 4 | 4 |
| | 5 | 3 | 6 | 5 |
| | 6 | 3 | 5 | 4 |
| | 3 | 2 | 6 | 4 |
| | Mean = 4.6 | Mean = 2.6 | Mean = 5.6 | Mean = 3.9 |
| Passive Incidental Task | 4 | 0 | 6 | 2 |
| | 4 | 4 | 4 | 3 |
| | 3 | 0 | 5 | 2 |
| | 2 | 1 | 3 | 5 |
| | 5 | 1 | 6 | 5 |
| | 3 | 1 | 5 | 1 |
| | 7 | 1 | 4 | 5 |
| | 3 | 2 | 6 | 2 |
| | 4 | 1 | 7 | 5 |
| | 4 | 4 | 2 | 0 |
| | 3 | 1 | 5 | 3 |
| | 4 | 3 | 5 | 3 |
| | 3 | 1 | 6 | 3 |
| | 2 | 2 | 5 | 1 |
| | 2 | 1 | 5 | 3 |
| | Mean = 3.5 | Mean = 1.5 | Mean = 4.9 | Mean = 2.9 |

(Note: S's retain the same order over each task.)

| | Young Normal | Young Retarded | Old Normal | Old Retarded |
|---|---|---|---|---|
| Misdirected Doll Furniture | 3 | 5 | 8 | 4 |
| | 4 | 6 | 4 | 3 |
| | 2 | 0 | 6 | 5 |
| | 2 | 4 | 7 | 6 |
| | 6 | 1 | 7 | 0 |
| | 1 | 0 | 6 | 4 |
| | 6 | 4 | 4 | 3 |
| | 2 | 3 | 5 | 6 |
| | 3 | 4 | 4 | 4 |
| | 4 | 3 | 4 | 6 |
| | 4 | 4 | 4 | 6 |
| | 4 | 3 | 6 | 5 |
| | 2 | 3 | 5 | 5 |
| | 4 | 4 | 4 | 5 |
| | Mean = 3.5 | Mean = 3.1 | Mean = 4.9 | Mean = 4.4 |
| Misdirected Color | 5 | 5 | 4 | 3 |
| | 5 | 6 | 6 | 5 |
| | 6 | 3 | 4 | 4 |
| | 6 | 2 | 4 | 4 |
| | 5 | 6 | 5 | 6 |
| | 6 | 2 | 6 | 3 |
| | 3 | 3 | 5 | 5 |
| | 5 | 6 | 5 | 5 |
| | 4 | 3 | 6 | 5 |
| | 5 | 3 | 4 | 2 |
| | 4 | 5 | 4 | 5 |
| | 6 | 3 | 6 | 5 |
| | 6 | 4 | 6 | 5 |
| | 5 | 5 | 5 | 3 |
| | 2 | 4 | 3 | 4 |
| | Mean = 4.9 | Mean = 4.0 | Mean = 4.9 | Mean = 4.3 |

| | Young Normal | Young Retarded | Old Normal | Old Retarded |
|---|---|---|---|---|
| Intentional Task | 4 | 7 | 8 | 8 |
| | 6 | 5 | 7 | 6 |
| | 7 | 8 | 8 | 7 |
| | 6 | 8 | 8 | 7 |
| | 8 | 6 | 8 | 7 |
| | 7 | 6 | 8 | 7 |
| | 7 | 7 | 8 | 7 |
| | 7 | 8 | 8 | 7 |
| | 8 | 8 | 8 | 8 |
| | 5 | 6 | 7 | 7 |
| | 8 | 8 | 8 | 7 |
| | 8 | 8 | 8 | 8 |
| | 8 | 7 | 6 | 8 |
| | 6 | 7 | 7 | 7 |
| | 8 | 8 | 8 | 8 |
| | Mean = 6.9 | Mean = 7.1 | Mean = 7.6 | Mean = 7.2 |

# Appendix F

## Raw Scores for Total Responses Over the Four Groups on the Two Tasks Applicable

| | Young Normal | Young Retarded | Old Normal | Old Retarded |
|---|---|---|---|---|
| Incidental Doll Furniture | (2) 5 | (9) 3 | (1) 8 | (14) 6 |
| | (15) 7 | (5) 5 | (14) 5 | (1) 5 |
| | (11) 5 | (11) 4 | (2) 6 | (11) 6 |
| | (10) 4 | (10) 5 | (12) 4 | (5) 7 |
| | (9) 4 | (12) 5 | (10) 4 | (4) 5 |
| | (12) 4 | (6) 8 | (15) 5 | (6) 0 |
| | (14) 5 | (4) 0 | (9) 5 | (9) 7 |
| | (1) 4 | (13) 8 | (8) 4 | (2) 3 |
| | (4) 3 | (7) 9 | (4) 6 | (10) 4 |
| | (13) 4 | (3) 6 | (5) 7 | (12) 6 |
| | (5) 6 | (2) 6 | (6) 7 | (13) 5 |
| | (6) 1 | (8) 5 | (13) 6 | (3) 4 |
| | (7) 8 | (14) 4 | (3) 2 | (8) 3 |
| | (3) 2 | (1) 5 | (7) 6 | (7) 4 |
| | (8) 5 | (15) 4 | (11) 5 | (15) 5 |
| | Mean = 4.5 | Mean = 5.1 | Mean = 5.3 | Mean = 4.6 |
| Intentional Doll Furniture | (1) 4 | (3) 8 | (1) 8 | (3) 9 |
| | (2) 8 | (5) 6 | (2) 7 | (15) 12 |
| | (3) 9 | (4) 18 | (3) 13 | (9) 13 |
| | (4) 7 | (8) 12 | (4) 8 | (4) 9 |
| | (5) 8 | (9) 13 | (5) 8 | (5) 14 |
| | (6) 11 | (7) 23 | (6) 9 | (11) 10 |
| | (14) 6 | (6) 6 | (7) 9 | (7) 7 |
| | (8) 7 | (10) 9 | (8) 10 | (2) 7 |
| | (9) 8 | (11) 19 | (9) 10 | (6) 11 |
| | (10) 5 | (12) 12 | (10) 8 | (12) 8 |
| | (11) 10 | (2) 6 | (11) 8 | (10) 7 |
| | (12) 8 | (1) 7 | (12) 8 | (8) 8 |
| | (13) 8 | (13) 10 | (13) 8 | (11) 7 |
| | (7) 6 | (14) 11 | (14) 7 | (14) 8 |
| | (15) 9 | (15) 10 | (15) 8 | (13) 9 |
| | Mean = 7.6 | Mean = 11.3 | Mean = 9.1 | Mean = 9.3 |