A COMPARISON OF INTENTIONAL VERSUS INCIDENTAL LEARNING IN MENTAL RETARDATES AS COMPARED TO NORMALS WHEN MATCHED BOTH ON M. A. AND C. A.

Thesis for the Degree of M. A.
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David D. Robinson

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By

David D. Robinson

AN ABSTRACT OF A THESIS

Submitted to
Michigan State University
in partial fulfillment of the requirements
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MASTER OF ARTS

Department of Psychology

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This study attempted to examine intentional and incidental learning in mental retardates. Four questions were posed. The first investigated the question of whether the retardates were as well able to learn as the normals. The second involved a comparison of performance on a perceptual task between retardates, normals when matched on M.A. and normals when matched on C.A. The third involved a comparison of performance of normals and retardates on a verbal task and the fourth question asked whether or not the retarded subjects would forget more over time than the normals.

A group of twenty male and twenty female retardates, a group of twenty male and twenty female normals of equivalent M.A. and a group of the same number of male and female normals of the same C.A. were randomly selected from training schools and children's homes. The subjects were assigned to either the incidental or the intentional learning condition with one restriction--that there were twenty males and twenty females under each condition.

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A simple perceptual recognition test and a verbal recall test were individually administered to each subject twice with a fifteen minute time interval separating the first and second presentation. A four-way analysis of variance was used to analyze the three response measures.

No differences between normals and retardates with respect to learning conditions were found. The retardates and normals when matched on M.A. were found to perform less well than the normals when matched on C.A. on one perceptual task. Both groups of normal subjects performed better than the retardates on the verbal task. The retardates forgot no more than the normals over time. An interaction between groups, learning condition and time was significant on two of the three response measures and neared significance on the third. A four-way interaction between groups, learning condition, sex and time was nearly significant on one measure of response.

APPROVED:

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Major Professor

Date: _____

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INTRODUCTION

A survey of the literature indicates that very few extensive studies of the learning process in mentally retarded children exist. In fact, Sloan and Berg (30) found that prior to 1957 only 23 papers had been published on this subject.

Recent research has shown that the learning capabilities of aments exceed prevailing notions. Clarke and Hermelin (9) found that institutionalized subjects were capable of rather complex motor skills such as the wiring of television tubes and that they could begin a day's work, maintain steady production and clean the shop at the end of the day without supervision. Annett (2) concluded that, even though the mentally retarded are slow to learn motor skills and begin at a lower initial level of skill than normals, they progress to a high level of efficiency with training and many perform on a level equal to normals.

The implications of such studies are clear. If the mentally retarded are capable of a much higher level of performance than was previously thought possible, training programs might be geared to their actual capabilities resulting in real improvement in performance, an increase in the retardate's self-esteem and a hitherto untapped source of revenue for the institution.

Several investigators have failed to find significant differences in learning ability when defectives and normals are matched on M.A. (8, 13, 27, 33), while others have found marked differences (4, 16, 24, 32). Goldstein and Kass (18) investigated incidental learning, comparing mental retardates with gifted children, and concluded that the retardates performed quantitatively and qualitatively as well on the gross features of the task as the gifted children of the same M.A. As the tasks became increasingly more complex, the retarded children responded more frequently than the gifted children, but with much less accuracy. Denny (11) has found that the mentally retarded are well able to learn under intentional conditions, but that they have difficulty learning incidentally. According to Denny, this inability may be partly responsible for their educational and social retardation.

In past research defectives have been compared with normals of the same M.A., but rarely with normals of the same C.A. The present study has utilized two control groups in an attempt to better identify the retardates' deficit. The purpose of this study was to compare incidental and intentional learning in mentally retarded subjects when matched with normals on C.A. Four questions are asked:

In all groups, there will be a performance difference between the intentional and incidental conditions, but will the difference be greatest in the mentally retarded group? Hebb theorizes that learning efficiency increases with chronological age and several investigators (1, 13, 14, 27, 33)

have found results supporting this notion. Other investigators (6, 10, 16, 24, 26, 30, 32) have noted that retardates experience special difficulty on verbal tasks. Two questions are raised: Will the normals perform better than the retardates on a perceptual task? If not, will there be a difference between these groups on a task of verbal learning? A fourth question to be investigated is, Will the retardates forget more than the normals over time because of a lack of ability for symbolization?

METHOD

Subjects

Each of the three groups consisted of forty subjects, each of whom were randomly assigned to the incidental or the intentional learning condition with the restriction that there were ten females and ten males under each condition in each group. Badit (3), Goldfarb (17), Sarason (28) and Spitz (31) have found institutionalization to be detrimental to the capacity for abstract thinking, and in order to eliminate institutionalization as a confounding variable, all subjects, both retarded and normal, were randomly selected from rosters of those who had been institutionalized for a period of at least six months. No subject had observable motor defects nor a history of seizures and none had been diagnosed as psychotic. However, in the group of older normals (C.A. match) there was a preponderance of character disorders.

Retarded group.--This group consisted of educable retardates from the State Home and Training School, Lapeer, Michigan. They ranged in age from 13 to 18 years with a mean age of 16.1 and their Stanford-Binet I.Q.'s ranged from 60 to 80 with a mean of 68.3. The subjects selected had been diagnosed by the medical staff as having mental deficiency due to a familial or idiopathic etiology.

Normals (C.A. match).--This group consisted of twenty inmates of the Boy's Vocational School, Lansing, Michigan,

ten inmates of the Girl's Training School, Adrian, Michigan, and ten female inmates of the Oakland County Children's Home, Pontiac, Michigan. These subjects ranged between thirteen and eighteen years of age with a mean age of 15.9 years. Their mean WISC or WAIS I.Q. score was 101.8 with a range from 90 to 126. All subjects in this group were confined by court order for such offenses as car theft, assault, breaking and entering or for sexual delinquency.

Normals (M.A. match).--This group consisted of 8 males and 2 females from St. Vincent's Home, Lansing, Michigan, 12 males from St. Francis' Home, Detroit, Michigan, and 18 females from Guardian Angel Home in Detroit. Their mean age was 10.7 and ranged from 8.0 to 14.0 years. Their mean WISC, Stanford-Binet or California Test of Mental Maturity I.Q. was 100.8 ranging from 90 to 119. In this group there were no subjects who presented problems of a behavioral or psychological nature.

A Kruskal-Wallis test (29) indicates that there are no significant age differences between the sexes, learning conditions, or groups when comparing retardates and normals when matched on C.A.; Table 1 shows the mean ages for the retarded subjects and for the normals when matched on C.A. Studentized tests (34) indicate that there are no significant differences in I.Q. between the incidental and intentional learning subjects; no significant differences in I.Q. between the two groups of normals, regardless of sex; and no significant differences in I.Q. among retardates across learning conditions.

Table 1.--The mean age of retardates and normals when matched on C.A.

	Retardates		Normals (C.A. Match)	
	Intentional	Incidental	Intentional	Incidental
Males	15.4	16.7	16.1	15.9
Females	16.0	16.3	15.4	16.0

Table 2 shows the means and pooled estimates of the variances of the I.Q.'s for each group by learning condition.*

Table 2.--The means and pooled estimates of the variances of the I.Q.'s for each group by learning condition.

	Retardates	Normals (C.A. Match)	Normals (M.A. Match)
Intentional	$\bar{X}$ = 67.95	$\bar{X}$ = 102.45	$\bar{X}$ = 102.45
Incidental	$\bar{X}$ = 68.65	$\bar{X}$ = 101.20	$\bar{X}$ = 99.5
	Pooled s^2 = 29.1	Pooled s^2 = 62.03	Pooled s^2 = 42.46

Experimental Task

The experimental task involved the recognition of a series of stimuli immediately after its initial presentation and again following a 15 minute rest period. The stimuli were 4-inch by 5-inch full length photographs of college women standing in front of a plaster wall. Four photographs were mounted on each of six 9½-inch by 11½-inch white folders. There were, then, 24 different photographs. On each

*Appendix A reflects the chronological ages of the retardates and normals (C.A. match) and Appendix B lists I.Q.'s of all subjects.

photograph was a strip of paper approximately 3-inches by 3/8-inch, on which a name, the verb "is" and a descriptive adjective was typed in capital letters, such as "MARY IS SWEET" or "JUDY IS PRETTY." A second set of the same photographs without the printed strips was mounted on six other folders which were used as recognition stimuli. The photographs in the second series were randomly assigned to the folders to eliminate the "one picture per folder" response cue.

Procedure

Each subject was seen individually and the following instructions were read from a card:

Incidental condition

> Here are some cards with girls' pictures on them. Each girl has a name and something about her on her picture. I'd like you to pick out the girl you like best on each card and read what it says on her picture, or if you have trouble with the words, I'll read it to you.

Intentional condition

> Here are some cards with girls' pictures on them. Each girl has a name and something about her on her picture. I'd like you to pick out the girl you like best on each card and read what it says on her picture, or if you have trouble with the words, I'll read it to you. Look at each card and remember the girls you choose. Remember their names and something about them. Later on I'm going to ask you to find them again and tell me their names and something about them.

After the subject made his choice, the experimenter handed

him the second set of cards, the recognition stimuli, and said:

> Here is another set of the same pictures but these are arranged differently; they're all mixed up. I'd like you to pick out the girls you just chose--the ones you liked best--and tell me their names and something about them. Sometimes you may not find a girl you chose or you may find more than one on one card. Okay? See if you can find them.

A non-correction procedure was used throughout. Ellis and Pryer (15), Zigler, Hodgen and Stephenson (35) and Gordon, O'Connor and Tizard (19) report that encouragement is a sufficient incentive in learning problems with mental retardates, and it is a well-established fact that normals are also influenced by social rewards. In the present study verbal reinforcement such as "good," "okay" and "uh-huh" was given regardless of the correctness of the response in order to maintain a fairly high rate of response.

The selection of the preferred stimuli (test 1) and the presentation of the recognition series took approximately eight minutes, regardless of group or learning condition. After the recognition series was presented, the subject was requested to wait in another room for fifteen minutes while the next subject was seen by the experimenter. After the fifteen minute rest period, the recognition series was presented again (test 2). The subjects' behavior during the fifteen minute interval was limited to conversation with other subjects who were waiting to see the experimenter a

second time. Rehearsal was not controlled for. Naive subjects were prevented from communicating with those familiar with the experimental task.

RESULTS

A four-way analysis of variance comparing groups, learning conditions, sex and one replication (tests 1 and 2) was used (12). Three response measures were selected for analysis: number of correct responses, number of incorrect responses and number of correct verbal responses (Appendices C, D, and E). A correct response was defined as the recognition of a previously selected stimulus and an incorrect response was defined as either the rejection of a selected stimulus or the acceptance of a stimulus not previously chosen. The criterion for a verbal response was the recall of the name or descriptive adjective associated with a correctly recognized stimulus. Table 3 on page 11 is a summary of the three measures analyzed. The raw score means and sums of squares are shown in Appendices F, G, and H.

Subjects under the intentional learning condition performed better than those under the incidental condition on all three response measures (corrects $p < .025$, incorrects $p < .005$, verbals $p < .005$). These results, shown in Table 4, page 12, are consistent with the conclusions of others who have investigated the importance of appropriate and inappropriate learning sets in learning (5, 7, 20, 25).

The lack of a significant groups x learning condition interaction indicates that, comparatively speaking, the retardates were as able to learn incidentally as the normals.

Table 3.--A comparison of the correct responses with the incorrect responses and the verbal responses showing sources of variation and significant F-ratios.

Source	Corrects F-Ratio	Incorrects F-ratio	Verbal F-ratio
Between			
Group (G)	2.73*	3.65**	4.7***
Learning Condition (L)	6.2 ***	11.05****	10.5****
Sex (S)	n.s.	n.s.	n.s.
Within			
Times (T)	n.s.	n.s.	16.1****
Int: T x L	n.s.	3.46*	n.s.
Int: T x L x S	3.72*	4.46**	6.2***
Int: G x L x S x T	2.80*	n.s.	n.s.

*(.10 < p < .05)
**(.05 < p < .025)
***(.025 < p < .01)
****(.005 < p < .001)

Table 4.--The mean number of correct, incorrect and verbal responses per subject by learning condition across groups, tests, and sex.

	Intentional	Incidental	P
Corrects	5.4	2.9	$.025 < p < .01$
Incorrects	3.9	5.1	$.005 < p < .001$
Verbal	2.9	1.8	$.005 < p < .001$

There was a significant main effect ($.05 < p < .025$) between the three groups on the response measure of incorrects and a nearly significant main effect ($.10 < p < .05$) on the corrects. Analysis of both measures indicated that the older normals (C.A. match) performed significantly better than those matched on M.A. with the retardates and better than the retardates. The younger normals (M.A. match) differed non-significantly from the retarded subjects, as shown in Table 5.

Table 5.--The number of correct and incorrect responses for each group.

	Retardates	Normals (M.A. Match)	Normals (C.A. Match)
Corrects	240	248	280
Incorrects	398	388	312

These findings are in agreement with Hebb (21) who theorizes that learning efficiency increases with chronological age. Benoit (4) discussed Hebb's theory and concluded that learning efficiency is not a simple function of measured intelligence,

thus supporting Hebb. Others (1, 14, 13, 27, 33) have reported similar results.

An analysis of the verbal responses indicated a significant main effect between groups ($.025 < p \leq .01$). The performance difference of the normal groups was non-significant and both normal groups performed significantly better than the retardates on this response measure. These findings are consistent with those of Berkson (6), Cruickshank (10) and others (26, 16, 24, 30, 32). Table 6 indicates the number of verbal responses for each group.

Table 6.--The number of verbal responses for each group.

Retardates	Normals (M.A. Match)	Normals (C.A. Match)
137	182	230

A non-significant time x group interaction showed that the retardates forgot no more over time than did the normals. Examination of the corrects and incorrects reveals no significant performance difference between test 1 and test 2, but significantly more verbal responses were produced during test 1 ($.005 < p < .001$).

There was a nearly significant ($.10 < p < .05$) time x learning condition interaction on the measure of incorrect responses (see Table 7, page 14) which became more pronounced when the sexes were examined separately. The time x learning condition x sex interaction tended to be significant ($.10 < p < .05$) on the corrects, reached the .05 level on the

Table 7.--The number of verbal responses in each learning condition by time and the differences between them.

	Intentional	Incidental	Difference
Test 1	226	312	86
Test 2	252	309	57
Difference	26	3	

incorrects and the .025 level on the verbal measure. Considering the corrects and incorrects, the females were better intentional learners on test 1 than the males and the males were better incidental learners on test 1 than the females (see Table 8, page 15). The sex differences between learning conditions on test 2 were non-significant on the corrects and incorrects. Analysis of the verbal measure indicated that the females far surpassed the males on the intentional test 1 and on the incidental condition test 2 but that the sex differences between incidental test 1 and intentional test 2 were non-significant.

A trend appearing on the correct response measure was the group x learning condition x sex x time interaction ($.10 < p < .05$) in which there was a sizeable intentional-incidental difference among female defectives on test 1. In Table 9 on page 16, where the mean intentional-incidental difference in number of correct responses on test 1 was 6.7, that difference among female retardates was 17, nearly double that of the next largest difference. Only on this four-way interaction was there an indication of a deficit

Table 8.--The scores of the male and female subjects by learning condition by time on the three response measures. Numerical values are representative of the total number of responses in each category.

	Intentional		Incidental	
	Test 1	Test 2	Test 1	Test 2
Corrects				
Males	103	100	99	93
Females	110	101	78	87
Differences	7	1	21	6
Incorrects				
Males	118	123	144	151
Females	108	129	168	158
Differences	10	6	24	7
Verbal				
Males	88	75	58	33
Females	107	77	66	66
Differences	19	2	8	33

Table 9.--The number of correct responses by group, by learning condition by sex by time. The largest difference in the table, the learning condition difference among female retardates on Test 1, is underlined.

	Normals (M.A. Match)		Normals (C.A. Match)		Retardates	
	Int.	Inc.	Int.	Inc.	Int.	Inc.
Males						
Test 1	32	30	36	40	35	29
Test 2	35	27	35	37	30	29
Females						
Test 1	36	27	37	32	37	20
Test 2	34	28	32	33	35	26

in incidental learning among retarded subjects and the difference in this case is dependent upon sex and time.

DISCUSSION

Several conclusions can be drawn from the results of this study. One, that under conditions of perceptual recognition and verbal recall, learning is more efficient under intentional conditions than under incidental. Two, that older normals perform better than younger normals and retardates on perceptual tasks. Thirdly, on verbal tasks both younger and older normals perform better than retardates. When tested for recognition immediately after presentation of visual stimuli, females appear to be better intentional learners than males, although males are superior on incidental tasks. The female retardates performed poorly under the incidental condition on test 1 but the hypothesis that the retardates are not as able to learn incidentally as the normals is not supported. The retardates forgot no more over time than the normals.

Since the comparison of groups and the time x learning condition x sex interaction on the analysis of the number of incorrect responses are significant, it was expected that the same comparisons would be significant in the analysis of the correct responses. However, the comparison of groups and the above mentioned interaction on that analysis fail to reach significance. It is likely that the restricted range of possible correct scores (zero to six) was responsible

for the failure of this measure to reach significance and that differences do, in fact, exist.

Contrary to expectation, the retardates were as able to learn incidentally as the normals. This finding does not support the conclusions of Denny (11), of House (27) and of House, Orlando and Zeaman (23). In the above studies no special attention was paid to any particular stimuli under the incidental condition but in the present study the subjects under that condition were instructed to select the girls they liked best. Special attention, therefore, was drawn to the appropriate stimuli and the experimental task may have been made simpler than those in the studies cited above. Goldstein and Kass (18) reported that on incidental learning tasks, retarded children perform as well quantitatively and qualitatively as gifted children of the same M.A. and that they perform less well than the normals only when the incidental learning tasks increase in complexity. In the present study the failure to find greater differences between learning conditions among retarded subjects than among normals may have been due to the simplicity of the experimental tasks.

The fact that the retarded subjects forgot no more than the normals from test 1 to test 2 is interesting but may need qualifying by the following factors: (1) the simplicity of the tasks, (2) the short retention interval, (3) the opportunity for rehearsal though this should work in favor of the normals, (4) the possibility that the retardates were

more highly motivated than the normals as a result of their being experimental subjects.

The significant time x learning condition x sex interaction for the incorrect responses and nearly significant interaction for the correct responses may reflect a fairly common phenomenon in our culture: on perceptual tasks females are better intentional learners than males, but males outdo females on incidental learning. On the verbal response measure, however, the females demonstrated their superiority by performing better than the males in every case.

SUMMARY

This study attempted to examine intentional and incidental learning in mental retardates. Four questions were asked: In all three groups subjects in the intentional learning condition should perform at a significantly higher level than those under the incidental condition, but would the difference between intentional and incidental conditions be greatest for the retarded subjects? The second question asked whether on a perceptual task the retardates would perform as well as the normals when matched on M.A. but less well than those when matched on C.A. The third asked whether the retarded subjects would perform less well than either of the normals on a verbal task. The fourth asked if the amount of forgetting over time would be greater for retardates than for normals.

A group of twenty males and twenty female retardates, a group of twenty male and twenty female normals of equivalent M.A. and a group of the same number of male and female normals of the same C.A. were randomly selected from training schools and children's homes. All subjects had been institutionalized for a minimum of six months and none had observable physical defect or psychosis. The subjects were randomly assigned to either the incidental or intentional learning condition with the restriction that there were ten females and ten males under each condition.

A simple perceptual recognition test and a verbal recall test were individually administered to each subject twice with a fifteen minute time interval separating the first and second presentation.

A four-way analysis of variance was used to analyze the three response measures. A non-significant groups x learning condition interaction on all three response measures showed that under the incidental condition the retardates were as able to learn the experimental task as the normals. The second question was answered by the significant F-ratio on the incorrects, and a nearly significant F-ratio on the corrects, indicating that the normals when matched on C.A. performed better than the retardates or the normals when matched on M.A. Both groups of normals performed better than the retardates, thus answering the third question. The retardates were found to forget no more over time than the normals.

The time x learning conditions x sex interaction also neared significance on the corrects and was highly significant on the incorrects and the measure of verbal responses. The group x learning condition x sex x time interaction was nearly significant.

This study found no evidence that retardates are less able to utilize incidental learning than normals, but the task may not have been of sufficient complexity to detect such a difference if it exists. These findings would tend to indicate that training programs for the educable mentally

retarded should be set up in such a way that minimal emphasis be placed on verbal tasks and that an emphasis on perceptual tasks will lead to optimal learning. The results of this study also indicate that females and males learn differently under different learning conditions and perhaps the greatest benefits could be accrued by separating the sexes in learning situations. Further indicated is the proposition that retardates, once having learned a stimulus-response pattern, will forget no faster than normals over a short term.

APPENDICES

APPENDIX A

THE CHRONOLOGICAL AGES OF NORMALS (C.A. MATCH) AND RETARDATES BY SEX AND BY LEARNING CONDITION

Normals (C.A. Match)				Retardates			
INT	FREQ	INC	FREQ	INT	FREQ	INC	FREQ
			Males				
13		13		13		13	1
14	2	14	2	14	4	14	
15		15	1	15	2	15	1
16	3	16	4	16	2	16	3
17	5	17	3	17		17	4
18		18		18	2	18	1
			Females				
13	1	13		13		13	1
14	2	14		14	2	14	2
15	1	15	3	15	2	15	
16	4	16	5	16	1	16	1
17	2	17	1	17	4	17	2
18		18	1	18	1	18	4

APPENDIX B

SUBJECTS' I.Q.'S BY GROUP AND BY LEARNING CONDITION

Retardates			Normals (C.A. Match)			Normals (M.A. Match)		
IQ	FREQ		IQ	FREQ		IQ	FREQ	
	INT	INC		INT	INC		INT	INC
60	5		90	1	1	90	1	1
61		2	91	1	1	91		
62		1	92		1	92	1	2
63		1	93			93		
64		2	94	1	1	94	1	1
65			95	1	1	95		1
66	2	1	96	2	2	96	1	1
67	3	1	97		1	97	1	1
68		1	98	1		98	1	3
69	1	1	99		1	99	1	
70	2	5	100	1	1	100	2	3
71	2		101		1	101		1
72	2	2	102	4		102	1	2
73			103		1	103	2	
74			104	1		104	1	
75			105	2		105	2	1
76			106	1	3	106		1
77	1	1	107			107	1	
78	1	1	108			108	1	
79		1	109		2	109	1	
80	1		110		2	110	1	1
			111	1		111		
			112	2		112		
			113			113		
			114		1	114		
			115			115		1
			116			116		
			117			117		
			118			118		
			119			119	1	
			120					
			121					
			122					
			123					
			124					
			125					
			126	1				

APPENDIX C

ANALYSIS OF VARIANCE TABLE FOR THE CORRECT RESPONSES SHOWING DEGREES OF FREEDOM, SOURCES OF VARIATION, MEAN SQUARES AND F-RATIOS WHICH WERE SIGNIFICANT OR APPROACHED SIGNIFICANCE.

Source	DF	SS	MS	F
Between:				
Group (G)	2	12.0	6.0	2.73*
Learning Condition (L)	1	13.6	13.6	6.2 ***
Sex (S)	1	1.5	1.5	n.s.
Int: G x L	2	8.5	4.3	n.s.
Int: G x S	2	1.3	.6	n.s.
Int: L x S	1	5.1	5.1	n.s.
Int: G x L x S	2	1.2	.6	n.s.
Between SS	108	241.5	2.2	
Total Between SS	119	284.7		
Within:				
Times (T)	1	.4	.4	n.s.
Int: T x G	2	.4	.2	n.s.
Int: T x L	1	1.0	1.0	n.s.
Int: T x S	1	.3	.3	n.s.
Int: T x G x L	2	1.4	.7	n.s.
Int: T x G x S	2	.6	.3	n.s.
Int: T x L x S	1	1.6	1.6	3.72*
Int: G x L x S x T	2	1.3	1.2	2.80*
Int: Within SS Pooled	108	46.5	.43	
Total Within SS	120	53.5		
Total	239	338.2		

*($.10 < p < .05$)
**($.025 < p < .01$)

APPENDIX D

ANALYSIS OF VARIANCE TABLE FOR THE INCORRECT RESPONSES SHOWING DEGREES OF FREEDOM, SOURCES OF VARIATION, MEAN SQUARES AND F-RATIOS WHICH WERE SIGNIFICANT OR APPROACHED SIGNIFICANCE.

Source	DF	SS	MS	F
Between:				
Group (G)	2	56.1	28.1	3.65**
Learning Condition (L)	1	85.2	85.2	11.05***
Sex (S)	1	3.0	3.0	n.s.
INT: G x L	2	9.1	4.6	n.s.
Int: G x S	2	11.9	5.96	n.s.
Int: L x S	1	5.1	5.1	n.s.
Int: G x L x S	2	12.3	6.2	n.s.
Between SS	108	827.3	7.7	
Total Between SS	119	1010.0		
Within:				
Times (T)	1	2.2	2.2	n.s.
Int: T x G	2	3.3	1.6	n.s.
Int: T x L	1	3.5	3.5	3.46*
Int: T x S	1	.1	.1	n.s.
Int: T x G x L	2	1.3	.65	n.s.
Int: T x G x S	2	.1	.05	n.s.
Int: T x L x S	1	4.5	4.5	4.46**
Int: G x L x S x T	2	.1	.5	n.s.
Int: Within SS Pooled	108	109.4	1.01	
Total Within SS	120	124.5		
Total	239	1134.5		

*(.10< p< .05)
**(.05< p< .025)
***(.005< p< .001)

APPENDIX E

ANALYSIS OF VARIANCE TABLE FOR THE VERBAL RESPONSE MEASURE SHOWING DEGREES OF FREEDOM, SOURCES OF VARIATION, MEAN SQUARES AND SIGNIFICANT F-RATIOS

Source	DF	SS	MS	F
Between:				
Group (G)	2	57.3	28.7	4.7***
Learning Condition (L)	1	64.1	64.1	10.5****
Sex (S)	1	16.1	16.1	n.s.
Int: G x L	2	22.3	11.2	n.s.
Int: G x S	2	2.4	1.2	n.s.
Int: L x S	1	1.6	1.6	n.s.
Int: G x L x S	2	.8	.4	n.s.
Between SS	108	654.7	6.1	
Total Between SS	119	819.3		
Within:				
Times (T)	1	19.3	19.3	16.1****
Int: T x G	2	1.1	.6	n.s.
Int: T x L	1	1.3	1.3	n.s.
Int: T x S	1	.2	.2	n.s.
Int: T x G x S	2	1.8	.9	n.s.
Int: T x G x L	2	5.4	2.7	n.s.
Int: T x L x S	1	7.4	7.4	6.2***
Int: G x L x S x T	2	1.6	.8	n.s.
Int: Within SS Pooled	108	124.9	1.2	
Total Within SS	120	163.0		
Total	239	982.3		

***($.025 < p < .01$)
****($.005 < p \leq .001$)

APPENDIX F

RAW SCORE SUMS AND SUMS OF SQUARES FOR THE CORRECT RESPONSES BY GROUP, LEARNING CONDITIONS, SEX, AND REPLICATION. N = 10 IN EACH CELL.

	Normals (M.A. Match)				Normals (C.A. Match)				Retardates			
	INT		INC		INT		INC		INT		INC	
	EX	EX^2	EX	EX^2	EX	EX^2	EX	EX^2	EX	EX^2	EX	EX^2
Females												
Test 1	36	136	26	80	37	143	32	108	37	165	20	50
Test 2	34	120	28	90	32	126	33	115	35	149	26	78
Males												
Test 1	32	116	30	100	36	136	40	168	35	135	29	97
Test 2	35	133	27	79	35	137	37	145	30	108	29	101

APPENDIX G

RAW SCORE SUMS AND SUMS OF SQUARES FOR THE INCORRECT RESPONSES BY GROUP, LEARNING CONDITION, SEX, AND REPLICATION. N = 10 IN EACH CELL.

	Normals (M.A. Match)				Normals (C. A. Match)				Retardates			
	INT		INC		INT		INC		INT		INC	
	ΣX	ΣX^2	ΣX	ΣX^2	ΣX	ΣX^2	ΣX	ΣX^2	ΣX	ΣX^2	ΣX	ΣX^2
					Females							
Test 1	38	188	53	307	34	154	45	231	36	188	70	562
Test 2	44	206	51	293	43	245	46	226	42	234	61	401
					Males							
Test 1	46	262	54	312	29	91	38	188	43	249	52	310
Test 2	45	247	57	349	34	146	43	213	44	226	51	339

APPENDIX H

RAW SCORE SUMS AND SUMS OF SQUARES FOR THE VERBAL RESPONSES BY GROUP, LEARNING CONDITION, SEX, AND REPLICATION. N = 10 IN EACH CELL.

	Normals (M.A. Match)				Normals (C.A. Match)				Retardates			
	INT		INC		INT		INC		INT		INC	
	ΣX	ΣX^2	ΣX	ΣX^2	ΣX	ΣX^2	ΣX	ΣX^2	ΣX	ΣX^2	ΣX	ΣX^2
Females												
Test 1	38	182	19	61	37	173	31	107	32	142	16	52
Test 2	31	145	19	61	29	121	28	126	17	83	19	81
Males												
Test 1	39	189	16	36	30	108	32	132	19	89	10	26
Test 2	31	139	10	42	28	104	15	57	16	64	8	16

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