A STUDY OF STIMULUS GENERALIZATION AS FOUND IN MENTAL RETARDATES

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THESIS

Presented to the Graduate Council of the
North Texas State University in Partial
Fulfillment of the Requirements

For the Degree of

MASTER OF SCIENCE

By

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Denton, Texas

August, 1966

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CHAPTER I

INTRODUCTION

In contemporary psychology few major topics appear to attract more attention than stimulus generalization, and the number of studies reported on this subject have been increasing year by year. Few areas present such a boundless field to the investigator; however, stimulus generalization is a complex concept which has been defined and employed many ways.

The quantity and quality of studies concerned with stimulus generalization in the mentally retarded are limited and the studies concerning stimulus generalization and the institutionalized mental defective are especially conspicious by their absence from the literature.

Review of Literature

Stimulus generalization can be said to have occurred when a response, previously trained to be elicited by stimulus O, can also be elicited by test stimuli similar to O. A first illustration of the principle of generalization is Pavlov's classical conditioning experiments in which a bell was presented to a dog and shortly followed by the presentation of food powder. After a number of such conditioning trials it was found that presentation of the bell alone elicits a salivary response. In addition, however, it was found that other sounds similar to the bell also elicited the salivary response; for example, if the original conditioned stimulus has been a sound of 1000 cycles per second, it will be found that other tone frequencies elicit the response to the extent that they are like the original sound. A sound of 950 cycles per second will elicit a vigorous response, a sound of 850 a less vigorous response, a sound of 800 still less, and so on. The same will hold for sound of greater frequency than the original conditioned stimulus--the greater the difference between the sound and the original conditioned stimulus, the weaker the tendency to respond. Generalization can take place along any effective stimulus diminsion: size, shape, color, sound frequency, loudness, smell, and taste.

An everyday situation was discribed by Staats and Staats (17) in which generalization is the common experience of speaking or waving to someone only to discover that this person is not the friend we had expected. The person we have "mistaken" for our friend will turn out to be someone who is in some way similar to the friend.

A number of investigators have found that stimulus generalization phenomenon, used in analysis of infrahuman discrimination learning and human verbal learning, can also be invoked to explain phenomena observed in more global human behavior. For example, Hull (7) has utilized stimulus generalization in explaining intercultural differences in childhood behavior. Margaret (9) and Shoben (16) have discussed the role of stimulus generalization in the area of psychotherapy. Miller (13), Miller and Krailing (14), Miller and Murray (15), and Brush, et al. (4) have also applied the construct in the field of abnormal psychology in their work on displacement.

Another study demonstrating stimulus generalization is that of Watson and Royner (18), in which a child's fear response was conditioned to a rat. The experiment demonstrated that the child's fear response generalized to other furry objects, Santa Claus mask, fur coat, and even cotton.

Grice and Saltz (5) found that generalization gradients differed for tests of larger and smaller circles with normal subjects. They suggest that the more a circle is similar in size to the conditioned one the greater the chance for generalization.

Anrep (1) repeated several of Pavlov's experiments and found that the amount of salivation in dog subjects decreased with distance of test stimulus from conditioned stimulus. In these experiments a tactile stimuli was used in different locations on the dog's body.

These experiments indicate that behavior generalizes and because of this, organisms do not have to relearn behavior in a new situation. If a child is to make progress, he cannot spend too much time learning to respond to every slightly different situation. A child will not have to learn a response with each new approaching situation, because behavior is acquired through reinforcement in similar situations. This ability of different stimuli to evoke a conditioned response is known as stimulus generalization.

Kimble (9, p. 328) suggests that "..basic facts of stimulus and response generalization are not limited to conditioned reactions, but are true of unconditional reflexes and of complex voluntary behavior. Every response is elicitable, not just by one stimulus, but by a class of similar stimuli." This indicates that a stimulus which has come through training, to elicit a particular response may, under some circumstances, elicit a related response without special training.

Pertinent Studies

Mednick (10) investigated the distortions in the gradient of stimulus generalization related to cortical brain damage and schizophrenia and found that damage to the cortex of the dominant hemisphere results in considerably more diminution of the elevation of the gradient of stimulus generalization (GSG) than damage to the cortex of the nondominant hemisphere.

In a different vein, Mednick and Lehtinen (11) measured frequency and latency of generalization gradients for "normal" children between the ages of seven and twelve years. They report that fairly regular decreasing gradients of frequency of response were found for all age ranges. While younger children demonstrate regular increasing generalization gradients of latency, the older children's latency gradients were irregular. Results seem to indicate that the younger child will generalize more than the older child.

A dissertation by Barnett (3) in which he used 60 institutionalized retardates and 60 high school juniors as subjects suggests that significantly greater amount of stimulus generalization following a high number of original training trials will occur than following a low number of such trials. Retardates were found not to respond as frequently as normal subjects.

In a similar study Arnhoff (2) used fifty-four aged subjects and 60 young subjects on a visual-spatial task of stimulus generalization. Response latency was found to be longer for the older subjects, consistent with previous findings. Significant differences in generalization were found between the two groups, with less generalization in the old group.

The hypothesis that brain damaged children suffer reduced stimulus generalization responsiveness was tested and supported in a study by Mednick and Wild (12). It seems likely that this finding may explain the behavior of the brain damaged child which has been described as "concrete." Mednick and Wild (12, p. 527) describe concrete behavior as "...a situation in which a child who has been trained to complete a task is no longer able to perform the task when his position is altered." Clearly, this could also be explained as an instance of failure of stimulus generalization.

Statement of the Problem

For purposes of the present study, the population of the world can be divided into two vast categories, the mentally retarded and those not mentally retarded. The major area of research has been in the non-retarded group. Those studies involving retardation have been few, and mostly combined with normal subjects. There are many definitions of mental retardation, and no single definition is universally accepted. However, the American Association of Mental Deficiency offers:

> Mental retardation refers to sub-average general intellectual functioning which originated during the developmental period, and is associated with an impairment in adaptive behavior, i.e., maturation, learning, and social adjustment (6, p. 837).

Additional statistics provided by the American Association of Mental Deficiency (6, pp. 838-839) indicate:

1. Nationally, about three to five percent of the population is retarded.

2. There are 126,000 retardates born each year:

   a. At the rate of 345 per day

   b. 2,431 per week

   c. 10,500 per month.

   d. There will be an additional 1,000,000 by 1970.

3. During World War II 700,000 draftees were rejected because they were mentally retarded.

4. Mental retardation is a serious problem to one out of every twelve United States citizens.

5. Mental retardation as compared to other diseases:

a. Nineteen times more defectives than diabetics

b. Twenty-five times more defectives than those with muscular dystrophy

c. 600 times more defectives than those with infantile paralysis.

6. In the State of Texas, there are about 300,000 defectives today:

a. Nineteen born each day

b. 135 born each week

c. 583 born each month.

7. Except for deafness, mental retardation is the single most prevalent major disorder in Texas.

The need to better understand the effects of stimulus generalization on the general behavior of the total population is of major importance, and the need to better understand these effects on defectives is increasing each day.

Previous studies on retardates with stimulus generalization phenomena have not been concerned with the presence of different degrees of retardation. The primary objective of this experiment was to ascertain the degree of difference in stimulus generalization between brain injured and non-brain injured retardates.

Statement of the Hypothesis

In view of the foregoing findings the following hypotheses were formulated:

1. All subjects combined will demonstrate significant stimulus generalization for all lamps involved.

2. Brain damaged retardates will demonstrate significantly less stimulus generalization than non-brain damaged retardates.

3. It is predicted that older retardates will demonstrate significantly less stimulus generalization than younger retardates.

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CHAPTER II

METHOD

Subjects

A total of 48 subjects were employed in the experiment. The subjects were selected in such a way that (1) they were evenly divided with regard to sex-- 24 males and 24 females; (2) half were brain damaged and half were familial; half were "old" (chronological ages ranged from 18.11 years to 25.1 years with a mean of 21.3 years) and half were young (chronological ages ranged from 9.2 years to 13.2 years with a mean of 10.9); (3) all subjects were matched on mental age (mental ages ranged from 55 months to 82 months with a mean of 68 months). Table I describes the 48 subjects with regard to mental age (M.A.), chronological age (C.A.), sex, and etiology.

The data represented in Table I show that young brain-damaged and young familial subjects were closely matched. The mean chronological age for young brain-damaged subjects was 11.0 years with a range of 9.2 years to 13.1 years. The mean chronological age for young familial subjects was 10.9 years with a range of 9.2 years to 13.2 years. The mean mental age for the young brain-damaged subjects was 67 months. The young familial subjects had a mean mental age of 70 months.

TABLE I

MENTAL AND CHRONOLOGICAL AGES, SEX AND ETIOLOGY FOR ALL SUBJECTS

	Brain Damaged								Familial							
	Young				Old				Young				Old			
	Male N 6		Female N 6		Male N 6		Female N 6		Male N 6		Female N 6		Male N 6		Female N 6	
	C.A.	M.A.	C.A.	M.A.	C.A.	M.A.	C.A.	M.A.	C.A.	M.A.	C.A.	M.A.	C.A.	M.A.	C.A.	M.A.
an	11.0	67	11.1	70	21.5	68	21.4	68	11.0	71	10.8	70	20.7	69	21.6	69
nge	9.2 to 13.1	56 to 80	9.2 to 13.1	59 to 81	19.3 to 24.4	57 to 82	18.11 to 25.1	58 to 81	9.11 to 12.11	59 to 82	9.2 to 13.2	61 to 82	18.10 to 23.8	59 to 81	18.1 to 25.0	55 to 82

Note--C.A. is given in years and months
M.A. is given in months only

The matching for the older groups was also very successful. The mean chronological age for old brain-damaged subjects was 21.4 years with a range of 18.11 years to 25.1 years. The mean chronological age for older familial subjects was 21.7 years with a range of 18.1 years to 25.0 years. The older brain-damaged subjects had a mean mental age of 68 months with a range of 57 months to 82 months. Subjects in the older familial group had a mean mental age of 69 months with a range of 55 months to 82 months.

The subjects were matched on Stanford-Binet mental age, chronological age, sex and etiology. The matching for brain-injured subjects and familial subjects at Lamp I, for example, was as follows: a brain injured male was paired with a familial male on the basis of matched mental age and chronological age. This resulted in a young familial male (A) being paired with a young brain injured male (A'), both having similar chronological ages and mental ages. This pair of subjects received scores at each lamp position and the mean difference between the score for both groups were used in separate t-tests for related groups at each lamp position. Each subject received a letter such as A or A' and retained this number for all matching purposes. The Appendix shows the matching used for brain injured subjects and familial subjects.

The subjects were then paired for the purpose of testing the factor of age. All subjects continued to have the same letter of identification for matching purposes. The young and old groups were then paired in such a way that a young brain injured male was paired with an older brain injured male matched also on mental age. The mean difference was obtained for this same pair and like pairs for all lamps involved. The Appendix presents the pairing for young and old subjects.

The young subjects combined had a chronological age range from 9.2 years to 13.2 years with a mean of 10.9. The mental age for the young subjects ranged from 56 months to 82 months with a mean of 69 months. The older group of subjects had a combined chronological age range from 18.1 years to 25.0 years with a mean of 21.3 years. The mental age for this group ranged from 55 months to 82 months with a mean of 68 months. Table II describes the mental and chronological ages for the young subjects combined and old subjects combined.

TABLE II

MENTAL AND CHRONOLOGICAL AGES
YOUNG AND OLD SUBJECTS

Group	Number	Mean M.A. in Months	Range in Months	Mean C.A. Years	Range in Years and Months
Young	24	69	56 to 82	10.9	9.2 to 13.2
Old	24	68	55 to 82	21.3	18.1 to 25.1

The brain injured subjects combined had a chronological age range from 9.2 years to 25.1 years with a mean of 15.9 years. The mental age for the brain injured group ranged from 56 months to 82 months with a mean of 67.5 months. The familial subjects combined had a chronological age range from 9.2 years to 25.0 years with a mean of 15.8 years. The mental age for this group ranged from 55 months to 82 months with a mean of 69 months. Table III presents the mental and chronological ages for brain injured subjects combined and familial subjects combined.

TABLE III

MENTAL AND CHRONOLOGICAL AGES FOR BRAIN DAMAGED AND FAMILIAL SUBJECTS

Group	Number	Mean M.A. in Months	Range in Months	Mean C.A. Years	Range in Years and Months
Familial	24	69	55 to 82	15.8	9.2 to 15.0
Brain Damaged	24	67.5	56 to 82	15.9	9.2 to 25.1

Experimental Design

An analysis of variance, treatment x subjects, was applied to determine the significance of the mean differences between the stimulus generalization scores for all subjects at all lamps. A related _t_-test was applied at each lamp to find the difference between the familial and brain-damage retardates. Significant differences between young and old retardates were also tested by *t*-test for matched groups.

Task and Procedure

The apparatus was adapted from one devised by Brown, Bilodeau, and Baron (1) to study stimulus generalization in normal subjects. It consists of a plywood panel six feet by two feet, painted flat black and mounted on its long edge on a table. Eleven frosted lamps (115 volts, 7.5 watts) were uniformly spaced on the panel nine degrees apart, in a curved horizontal row. The lamps were designated by numbers I through XI, with Lamp I being on the left of the subject, Lamp XI on the right of the subject, and Lamp VI being the center lamp. The panel was curved so that all were equidistant from the subject's eyes when subject was seated directly in front of, and three and one-half feet away from Lamp VI. A red, jeweled pilot lamp was located two inches above Lamp VI, and served as both a fixation point and a ready signal. A reaction key was placed on a chair on the preferred side of the subject and he was allowed to move it into a comfortable position. This leeway in procedure was necessary, since some of the patients with cerebral damage would have difficulty handling a fixed reaction key. A silent selector switch, by means of which the experimenter could turn on any of the eleven lamps, was placed behind the stimulus board.

The stimulus board effectively hid the experimenter and the equipment. A 115-volt, 7.5-watt lamp behind the stimulus board lit whenever the reaction key entered the on position. Response frequency was noted on specially prepared sheets.

Each subject was tested individually, but all subjects received the same instructions. After being comfortably seated, the subject was told, "Hold the reaction key down until the center lamp is lighted. Release the key as soon as possible if you think the lamp lit is the center one. You are not to release the key if any lamp other than the center lamp is lit. Sometimes people do release the key for a different lamp but do not worry about it. If you do, just go on to the next trial."

Two criteria were decided upon to determine whether the subject was capable of performing the task. First, the experimenter went through the instructions with the subject as many times as was necessary for him to be able to repeat them correctly. Somewhat more explanation usually proved necessary for the brain damaged child than for the non-brain damaged child. Secondly, after the instructions, the subject received two demonstration-test trials. If the subject responded inappropriately, he was discarded.

Ten consecutive training trials with the center lamp (10-15 seconds intertrial intervals) were then given. The training trials were followed without warning by a test seried furing which six of the peripheral lamps (Lamps I, III, V, VII, IX, XI) were presented twice each, interspersed with 17 "booster" trials with the center lamp in a counter-balanced order. The total number of trials in the test series was 29, 17 with the center lamp and 12 with the peripheral lamps. Zero, one, two, or three lamp booster trials intervened between successive test trials with the peripheral lamps. Six different orders were used for the test trials, each order beginning with a different peripheral lamp.

As Brown, Bilodeau, and Baron (1) state, "It was assumed that the initial series of trials would build up a strong tendency to react to the center light and that this tendency would generalize or spread to adjacent lights in proportion to their spatial nearness to the center light."

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CHAPTER III

RESULTS AND DISCUSSION

Results

In general, the experiment proceeded smoothly without occurrences of experimentally disturbing incidents. As previously stated in Chapter II, there were two criteria to determine whether the subject was capable of performing the task. Three brain-damaged retardates failed to meet the pre-test criteria, and they were replaced with a suitable match. After the subjects successfully passed the pre-test criteria, no difficulty was observed in the actual test of stimulus generalization.

To determine the validity of the hypotheses each subject was given a score of zero, one, or two, at each lamp position, with Lamp VI having a constant score of two for all subjects, since this was the point of original conditioning.

All Subjects Combined

It was hypothesized that all subjects combined possessed significant amounts of stimulus generalization at all lamp positions. To measure the significance of the difference among stimulus generalization means for all subjects and treatment x subjects, analysis of variance was applied as illustrated by McNemar (2). Table IV presents the means and standard deviations of all subjects at each lamp position.

TABLE IV

MEAN NUMBER OF RESPONSES FOR ALL SUBJECTS AT EACH TEST LAMP

Statistic	I	III	V	VI	VII	IX	XI
N	48	48	48	48	48	48	48
Mean	.63	.57	1.43	2.0	1.47	1.08	.65
SD	.60	.55	.64	. .	.61	.70	.63

Presented in Table V are the summary results of the analysis of variance. The F ratio for lamps was computed by dividing the mean squares for lamps by the lamps x subjects mean square.

TABLE V

SUMMARY OF ANALYSIS OF VARIANCE TREATMENT X SUBJECTS

Source.	Sum of Squares	df	Means	F
Subjects(S)	48.468	47	1.031	. . .
Lamps (L)	38.614	5	7.722	28.494
Lamps x Subjects(LS)	63.885	235	.271	. . .
Total	150.968	287	. . .	. . .

An F ratio of 28.494, with degrees of freedom of 5: 235 occurred. An F of 28.494 is significant at a level of confidence less than p= .001. This F indicated that significant difference among the various treatment means probably existed. A mean performance curve is presented in Figure 1 for all subjects at each lamp. The results closely resembled a "typical text book curve," so to speak, that is, the highest mean occurred at the point of original conditioning (Lamp VI) and the response means decreased progressively at test points more removed from Lamp VI.

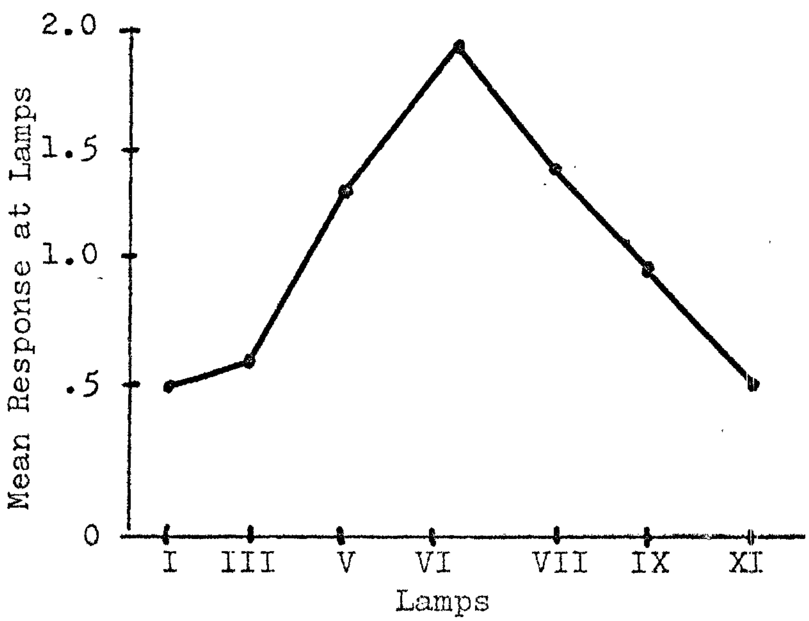

Fig. 1--Performance curve for all subjects at each lamp.

Since the F ratio of the analysis variance was significant, related t-tests of the differences between all possible pairs of means were computed by using the interaction mean square as a common error variance estimate. The critical level of significance adopted was p= .05. The formula employed is given as follows:

$$t = \frac{M_1 - M_2}{\sqrt{\frac{2\ ms_{AS}}{s}}}, \quad df = (a-1)\ (s-1)$$

Where:

M = mean for a given lamp
ms_{AS} = lamps x subjects mean square
s = number of subjects
a = number of lamps

Table VI presents the differences between means for all possible pairs of lamp positions for all subjects combined.

TABLE VI

DIFFERENCES BETWEEN MEANS FOR ALL POSSIBLE PAIRS LAMP POSITIONS

	LAMPS III	V	VI	VII	IX	XI
I	.40 *	.80 *	1.37 *	.84 *	.35 *	.20 *
III		.76 *	1.93 *	.80 *	.31 *	.20 *
V			.57 *	.04	.35 *	.78 *
VI				.53 *	.92 *	1.35 *
VII					.39 *	.82 *
IX						.43 *

Note--Coefficient of risk of p= .05 level used for tests of significance. A mean difference of .074 or greater was significant at the 5 percent level.

*p < .05

All possible differences between means were significant at the p= .05 level with the exception of the difference obtained between Lamps V and VII. The difference between the means of Lamps V and VII failed to meet the critical mean difference of .074 needed to be significant at p= .05 level.

Brain-Damaged Versus Familial Subjects

It was of interest to determine the significance of stimulus generalization response for brain-damaged versus familial groups. The hypothesis here was that brain damaged subjects possessed less stimulus generalization than familial subjects. A t-test for related measures was applied to determine the significance between these two groups at each lamp position. Presented in Table VII are the means and standard deviations of the responses for brain-damaged versus familial groups at each lamp.

TABLE VII

MEAN NUMBER OF RESPONSES AT EACH LAMP FOR BRAIN-DAMAGED AND FAMILIAL GROUPS

Group	Statistic	I	III	V	VI	VII	IX	XI
Familial	N	24	24	24	24	24	24	24
	Mean	.75	.83	1.66	2.0	1.71	1.33	.80
	SD	.60	.56	.55	. .	.45	.62	.64
Brain-Damaged	N	24	24	24	24	24	24	24
	Mean	.50	.50	1.20	2.0	1.25	.83	.50
	SD	.58	.50	.64	. .	.66	.69	.58

Figure 2 presents the mean performance curves for the two groups represented in Table VII. The familial group showed a higher degree of stimulus generalization response at all lamp positions. All subjects received a constant score of two at Lamp VI, which was the point of original conditioning.

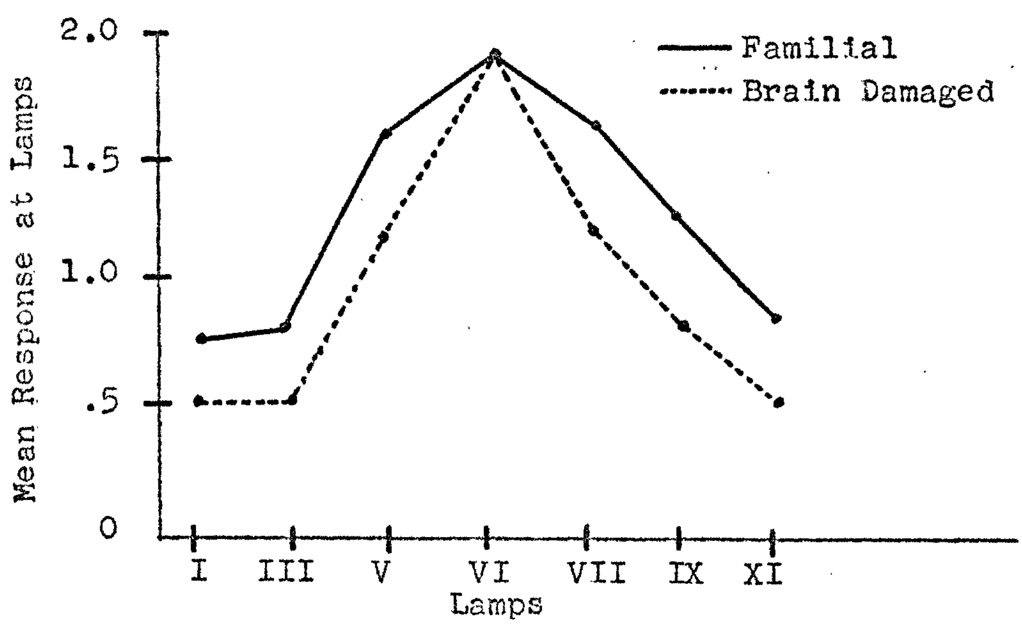

Fig. 2--Performance curves for familial and brain-damaged groups.

The results of t-tests applied for significance between brain-damaged and familial groups at each lamp are presented in Table VIII. The familial group scored a significantly higher degree of stimulus generalization at all lamps, with the exception of Lamps I, and XI.

TABLE VIII

t-RATIOS FOR BRAIN-DAMAGED VERSUS FAMILIAL RETARDATES

Lamps	Number of Matched Pairs	Mean Difference	SD of Different Scores	t
I	24	.63	.60	1.67
III	24	.67	.55	2.32*
V	24	1.44	.64	2.70**
VI	24	2	. .	. .
VII	24	1.48	.61	2.54**
IX	24	1.08	.70	2.30*
XI	24	.65	.63	1.67

Note--Coefficient of risk of $p = .05$ used for all t-tests

*$p < .05$

**$p < .01$

Young Versus Old Subjects

A t-test for matched groups was also applied for each lamp position to determine the significance of age on spread of stimulus generalization. It was hypothesized that older subjects possessed less stimulus generalization responsiveness than younger subjects. Table IX presents the means and standard deviations of responses for the young and old retardates regardless of etiology.

TABLE IX

MEAN NUMBER OF RESPONSES AT EACH LAMP FOR YOUNG AND OLD RETARDATES

Group	Statistic	I	III	V	VI	VII	IX	XI
Young	N*	24	24	24	24	24	24	24
	Mean	.70	.66	1.50	2.0	1.58	1.08	.75
	SD	.68	.62	.58	. .	.49	.64	.66
Old	N*	24	24	24	24	24	24	24
	Mean	.54	.66	1.38	2.0	1.50	1.08	.54
	SD	.50	.47	.70	. .	.70	.76	.58

*N--Refers to the number of observations

Figure 3 presents a performance curve for the data shown in Table IX. As may be anticipated from Figure 3, there was no significant difference between young and old retardate

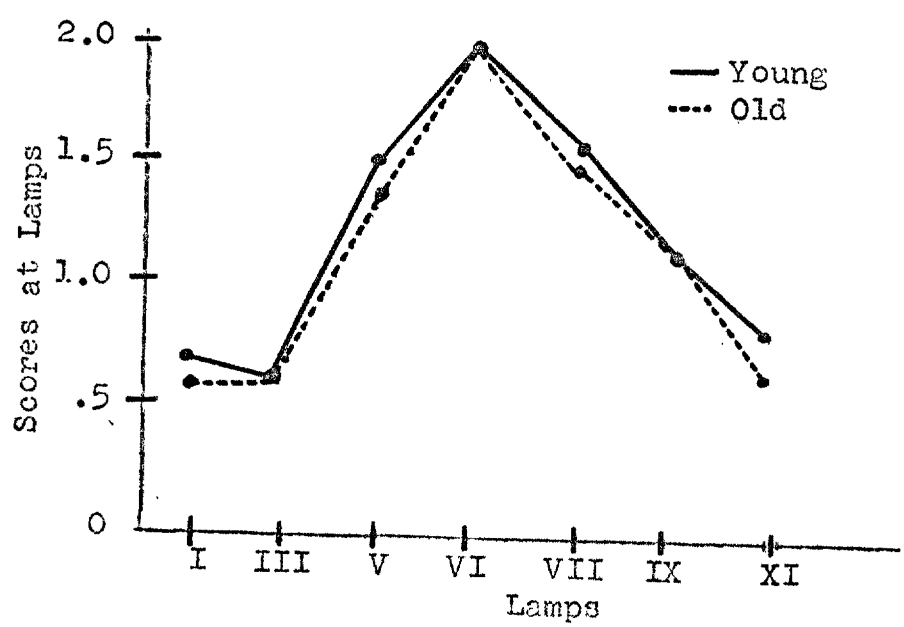

Fig. 3--Performance curve for young and old retardates for all lamps.

scores at any one of the lamp positions. This inference was verified by computation of the t-tests which are shown in Table X. This could probably be accounted for because of the closeness of mental ages. In Table X the results of related t-tests for young versus old retardates at each lamp are presented.

TABLE X

t-RATIOS FOR YOUNG VERSUS OLD RETARDATES

Lamps	Number (paired)	Mean	SD	*t*
I	24	.63	.60	1.28
III	24	.67	.55	. .
V	24	1.44	.64	.90
VI	24	2	. .	. .
VII	24	1.48	.61	1.15
IX	24	1.08	.70	. .
XI	24	.65	.63	1.09

Discussion

Three legitimate concerns have been expressed regarding the present findings. The first is a concern about the significant degree of stimulus generalization for all subjects combined for all lamps. Table IX indicated that the subjects combined demonstrated a significant degree of stimulus generalization with an F significant at the $p = .001$ level. When the difference between mean combinations were computed, all were found to be significant at the five percent level with the one exception, the difference found between Lamp V and VII. This is evidence to support the general studies concerning stimulus generalization. The everyday situation described by Staats and Staats (5) in which a person is "mistaken" for a friend is related to such findings. The fact that people have been conditioned to a lamp or a friend does not eliminate them from responding to several other lamps and people which possess elements similar to the one originally conditioned to.

Because the findings support the hypothesis that all subjects will demonstrate a significant degree of stimulus generalization from the original conditioning point, the second concern deals with finding out which group within the total subjects demonstrates the most stimulus generalization.

As previously stated in Chapter I, the major hypothesis is concerned with whether non-brain damaged or brain damaged retardates possess more stimulus generalization ability. The hypothesis that brain damaged retardates possessed less stimulus generalization was supported by the results. Table XII indicated that non-brain damaged subjects significantly displayed more stimulus generalization than brain-damaged subjects for Lamps III, V, VII, and IX. The two exceptions were Lamps I and XI, the extreme ones on each side of the original conditioning point. These findings agreed with the results found by Mednick, (3) in a study in which he investigated the distortions in the gradient of stimulus generalization. He found that brain-damaged individuals showed significantly more diminution of the elevation of the gradient of stimulus generalization than schizophrenia indicicuals.

Further support of the present findings is found in the study by Barnett (1), in which 60 institutionalized retardates were found not to respond as frequently as 60 normal subjects. It seems likely that this finding may further support the concept of behavior of the brain-damaged child, which has been described as concrete.

The third concern deals with the factor of age. Table XIV indicated that no significant t difference was found for young subjects when compared with older subjects at each lamp position. Since the t values for young and old retardates were not significant, it was concluded that the null hypothesis was retained.

The findings concerning age for the present study do not agree with the results obtained by Mednick and Lehtinen (4). They measured frequency of response for children between the ages of seven and twelve years and found that the younger child will generalize more than the older child. The difference between the present and the previous study is probably due to the different types of populations involved. The present study was concerned with different groups of retardates, while the previous one was dealing with only normal subjects.

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CHAPTER IV

SUMMARY

The present study was developed to investigate the concept of stimulus generalization in mental retardates. The primary objectives were (1) To determine the degree of stimulus generalization for all subjects combined at all lamps. (2) To ascertain the degree to which brain injured retardates differed from familial retardates in regard to stimulus generalization. (3) To ascertain the degree to which age differences affected stimulus generalization.

It was hypothesized that brain-damaged retardates would demonstrate significantly less stimulus generalization than familial retardates. It was predicted that older retardates would demonstrate significantly less stimulus generalization than younger retardates. It was further hypothesized that all subjects combined would demonstrate significant stimulus generalization for all lamps involved. Hypotheses I and III were confirmed, while hypothesis II concerning the age factor was not supported by the results of this study.

The task, eleven lamps on a curved board, was adapted from Brown, Bilodeau, and Baron (1). All subjects were conditioned to a center lamp for ten trials and then given peripheral lamp mixed with reinforcement to the conditioned lamp, to determine the degree of stimulus generalization working. Two groups of retardates were chosen from the population of Denton State School, Denton, Texas, on the basis of Stanford-Binet mental age, sex, age and etiology. The subjects were selected in such a way that (1) they were evenly divided with regard to sex--24 males and 24 females; (2) half were brain damaged and half were familial; half were "old" with mean chronological age of 21.3 years and half were "young" with a mean chronological age of 10.9 years; (3) all subjects were matched on mental age with a mean of 68 months. The main factors separating these groups were etiology and chronological age, with half of the subjects being 10.6 years older, than the other half.

The results of the present study concerning the factor of age did not agree with the findings of one of the previous studies referred to in the review of literature. However, support for the hypothesis that brain damaged retardates possessed less stimulus generalization than non-brain damaged retardates was consistent with the indicated trend of previous studies.

Conclusions

From the results obtained in this study, the following conclusions were reached:

1. All retardates combined demonstrated a significant degree of stimulus generalization to all lamps.

2. Brain injured retardates possess a significantly less degree of stimulus generalization than do non-brain injured retardates. This statement holds true regardless of chronological and mental ages.

3. The spread of stimulus generalization was not significantly affected by the age of the retardates. This conclusion did not support an earlier statement by Mednick and Wild (2) in the review of literature. However, the two following factors may have affected the difference in these two comparisons: (1) Mental ages for the subjects in the present study were lower with regard to their chronological ages than the normal subjects used in the previous study. The subjects in the present study were also matched on mental ages. (2) The present study was concerned with retardates, as compared to the previous study, which obtained its results on normal children only. No previous study has been concerned with the age factor for retardates only.

As was previous stated, the hypothesis that brain-damaged subjects possess less stimulus generalization was supported by the results. It seems likely that this finding may help to further the explanation of the behavior of the brain damaged child, which was described earlier in Chapter I as concrete. This was the situation in which a child, trained at a certain table to complete a task, will no longer be able to perform the task if his position is altered.

This way of thinking of the problems of these children has certain advantages. For one thing, we can look at the teaching materials for these children in a differential manner. If we want the child to respond with the same response to two different stimulus situations, we should eliminate all inessential differences in the stimuli, since these will hamper generalization. In addition, we have more experimental literature in stimulus generalization on which we can draw for suggestions or manners to augment stimulus generalization responsiveness. In view of these factors and the procedure followed, the present study seems to have presented a more adequate literature than previous studies for the comparison of retardates for stimulus generalization responsiveness.

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APPENDIX

TABLE XI

DISORDER, SEX, CHRONOLOGICAL AND MENTAL AGES OF THE SUBJECTS ARRANGED ACCORDING TO ANALYSIS OF t TEST SCHEME

(For familial versus brain damaged retardates)

FAMILIAL

Sub	Sex	C.A. Yrs. & Months	M.A. in Months	I	III	Lamps V	VII	IX	XI
A	M	9.11	69	0	0	1	1	1	1
B	M	10.01	59	1	1	2	2	2	2
C	M	10.09	75	2	2	2	2	1	0
D	M	11.02	82	1	1	2	1	2	1
E	M	10.05	62	0	0	2	2	1	0
F	M	12.01	65	1	1	2	2	2	1
G	F	9.02	61	2	1	2	2	2	1
H	F	9.04	64	0	1	1	1	1	1
I	F	10.01	68	1	2	2	2	2	0
J	F	10.03	77	0	0	2	2	1	0
K	F	12.03	72	1	1	2	2	1	2
L	F	13.02	82	1	1	2	2	1	1
M	M	19.01	59	1	1	2	2	1	1
N	M	20.00	61	0	0	1	1	2	0
O	M	22.01	67	1	1	2	1	1	1
P	M	21.02	70	0	1	1	2	0	2
Q	M	18.10	77	1	1	2	2	2	0
R	M	23.08	81	0	0	0	2	1	1
S	F	25.00	55	1	1	2	2	1	0
T	F	21.03	61	0	0	1	1	2	1
U	F	19.04	64	1	1	2	2	2	1
V	F	18.10	74	1	1	1	1	0	0
W	F	22.01	78	1	1	2	2	2	1
X	F	24.01	82	1	1	2	2	1	1

TABLE XI--Continued

BRAIN DAMAGED

Sub	Sex	C.A. Yrs. & Months	M.A. in Months	I	III	Lamps V	VII	IX	XI
A'	M	9.02	65	0	0	1	1	1	0
B'	M	9.08	68	1	0	1	1	1	1
C'	M	10.05	74	1	1	2	2	2	2
D'	M	10.09	80	0	0	2	1	0	0
E'	M	12.09	62	1	1	1	2	1	1
F'	M	13.01	56	0	0	1	1	0	0
G'	F	9.02	63	1	0	1	2	1	1
H'	F	9.10	59	0	0	1	1	1	0
I'	F	10.06	67	1	1	0	2	0	1
J'	F	11.08	76	0	1	1	2	1	0
K'	F	12.02	73	2	1	2	2	0	1
L'	F	13.01	81	0	0	1	1	1	1
M'	M	23.01	57	0	0	1	1	1	1
N'	M	24.04	59	0	0	1	1	0	0
O'	M	19.03	66	1	1	2	2	2	1
P'	M	21.01	68	0	1	0	0	1	0
Q'	M	19.02	74	1	0	2	0	0	0
R'	M	22.01	82	1	1	2	2	2	1
S'	F	20.03	58	0	1	2	1	0	0
T'	F	19.09	68	1	0	1	2	1	0
U'	F	18.11	68	0	1	0	1	1	0
V'	F	21.03	71	1	1	1	2	0	0
W'	F	25.01	74	0	0	1	0	1	0
X'	F	23.04	81	0	1	2	1	2	1

TABLE XII

DISORDER, SEX, CHRONOLOGICAL AND MENTAL AGES OF THE SUBJECTS ARRANGED ACCORDING TO ANALYSIS OF t-TEST SCHEME FOR YOUNG VERSUS OLD RETARDATES

YOUNG RETARDATES

	Sub	Sex	C.A. Yrs. & Months	M.A. in Months	Lamps I	III	V	VII	IX	XI
Familial	A	M	9.11	69	0	0	1	1	1	1
	B	M	10.01	59	1	1	2	2	2	2
	C	M	10.09	75	2	2	2	2	1	0
	D	M	11.02	82	1	1	2	1	2	0
	E	M	10.05	62	0	0	2	2	1	0
	F	M	12.01	65	1	1	2	2	2	1
Familial	G	F	9.02	61	2	1	2	2	2	1
	H	F	9.04	64	0	1	1	1	1	1
	I	F	10.01	68	1	2	2	2	2	0
	J	F	10.03	77	0	0	2	2	1	0
	K	F	12.03	72	1	1	2	2	1	2
	L	F	13.02	82	1	1	2	2	1	1
Brain Damaged	A'	M	9.02	65	0	0	1	1	1	0
	B'	M	9.08	66	1	0	1	1	1	1
	C'	M	10.05	74	1	1	2	2	2	2
	D'	M	10.09	80	0	0	2	1	0	0
	E'	M	12.09	62	1	1	1	2	1	1
	F'	M	13.01	56	0	0	1	1	0	0
Brain Damaged	G'	F	9.02	63	1	0	1	2	1	1
	H'	F	9.10	59	0	0	1	1	1	0
	I'	F	10.08	67	1	1	0	2	0	1
	J'	F	11.08	76	0	1	1	2	1	0
	K'	F	12.02	73	2	1	2	1	0	1
	L'	F	13.01	81	0	0	1	1	1	1

TABLE XII--Continued

OLDER RETARDATES

Sub	Sex	C.A. Yrs. & Months	M.A. in Months	Lamps I	III	V	VII	IX	XI
P	M	21.02	70	0	1	1	2	0	2
M	M	19.01	59	1	1	2	2	1	1
Q	M	18.10	77	1	1	2	2	2	0
R	M	23.08	81	0	0	0	2	1	1
N	M	20.00	61	0	0	1	1	2	0
O	M	22.01	67	1	1	2	1	1	1
S	F	25.00	55	1	1	2	2	1	0
T	F	21.03	61	0	0	1	1	2	1
U	F	19.04	64	1	1	2	2	2	1
W	F	22.01	78	1	1	2	2	2	1
V	F	18.10	74	1	1	1	1	0	0
X	F	24.01	82	1	1	2	2	1	1
O'	M	19.03	66	1	1	2	2	2	1
P'	M	21.01	68	0	1	0	0	1	0
Q'	M	19.02	74	1	0	2	0	0	0
R'	M	22.01	82	1	1	2	2	2	1
N'	M	24.04	59	0	0	1	1	0	0
M'	M	23.01	57	0	0	1	1	1	1
T'	F	19.09	68	1	0	1	2	1	0
S'	F	20.03	58	0	1	2	1	0	0
U'	F	18.11	68	0	1	0	1	1	0
W'	F	25.01	74	0	0	1	0	1	0
V'	F	21.03	71	1	1	1	2	0	0
X'	F	23.04	81	0	1	2	1	2	1

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