THE EFFECTS OF RECENCY AND VARIED AMOUNTS OF AUDITORY HABITUATION ON THE NOVEL STIMULUS SELECTION BEHAVIOR OF LOWER AND MIDDLE CLASS KINDERGARTEN CHILDREN

by

Paul Jerry Vicinanza

A Dissertation Submitted to
the Faculty of the Graduate School at
the University of North Carolina at Greensboro
in Partial Fulfillment
of the Requirements for the Degree
Doctor of Philosophy

Greensboro
May, 1969

Approved by

[signature]

APPROVAL SHEET

This dissertation has been approved by the following committee of the Faculty of the Graduate School at the University of North Carolina at Greensboro, Greensboro, North Carolina.

Dissertation Director

Oral Examination Committee Members

April 16, 1969

Date of Examination

ABSTRACT

VICINANZA, PAUL JERRY. The Effects of Recency and Varied Amounts of Auditory Habituation on the Novel Stimulus Selection Behavior of Lower and Middle Class Kindergarten Children. (1969). Directed by: Dr. Richard Klemer and Dr. Boyd McCandless pp. 40

The purpose of this study was to determine the effects of varied amounts of delay and auditory habituation on the novel stimulus selection behavior of lower and middle class kindergarten children. Three levels of auditory habituation and three amounts of delay between habituation and testing were employed as independent variables. Subjects were lower-class or middle-class kindergarten children who were habituated to either 1, 3 or 5 minutes of auditory stimuli and were tested either immediately after the preliminary (habituation) session or 3 or 6 days after habituation.

Seventy-two middle-class children were randomly selected from two church-related kindergartens in Greensboro, North Carolina. Seventy-two lower-class children were also randomly selected from Greensboro Head Start centers. Eight middle-class and eight lower-class subjects, with an equal number of boys and girls in each class sampling, were randomly assigned to each of the nine experimental conditions.

Subjects were habituated to auditory stimuli for the amount of time designated by their sample placement and were tested for a 90 second interval after their assigned delay period. During the 90 second testing sessions subjects were allowed to press two rubber bulbs - one causing the presentation of the familiar auditory stimuli and the second causing the presentation of novel visual stimuli. Subjects' responses for both stimuli were recorded. A visual preference (VP)

score was tabulated for each subject by dividing the number of visual responses by the total number of responses. The VP score was used as the dependent variable. A 2 x 3 x 3 factorial analysis of variance, with trend analysis was used to analyze data.

Five major conclusions from statistically significant results were drawn from the experiment: (a) Increases in the amount of auditory habituation cause linearly related increases in preference for visual stimuli; (b) the longer the delay between habituation and testing, the less Ss prefer visual stimuli; (c) the effect of the interaction of habituation and delay is greatest under conditions of longer habituation and shorter delay, with no specifically related function, Ss' mean VP scores increased as habituation increased and delay decreased; (d) social class of subjects differentially interacts with the amount of delay between habituation and testing and can best be expressed as a linear function; (e) social class of Ss differentially interacts with the effect of habituation and can best be expressed in the form of a modified inverted U.

ACKNOWLEDGEMENTS

This dissertation is by no means my work alone. Very many persons have contributed to its conclusion.

I am particularly indebted to the chairmen of my committee, Dr. Richard H. Klemer and Dr. Boyd R. McCandless for their knowledgeable guidance, and to the members of my committee, Dr. Helen Canaday, Dr. Bert A. Goldman, Dr. Frances Dunham and Dr. Clara Ridder for their interest and helpful suggestions.

To all my friends who have taken an interest in this research and who have aided in its completion, I express my thanks. Dr. William L. Burnett and Dr. Doris H. Lauten are two such friends who have taken a personal interest in the completion of this research.

To various members of the faculty of this University I owe my thanks for their help. In particular I am very greatful to Dr. Kendon Smith and Dr. Earnest A. Lumsden for their aid in methodology and equipment.

Gratitude must also be expressed to the persons who have contributed to the composition of this dissertation, to Lois and Dell Oaks for typing and drafting and to Lou Matherly for final typing and duplication.

To all the children who were subjects I owe my thanks.

Finally I am indebted to my wife, Ann, for her understanding, patience and tolerance over the years.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

CHAPTER I

INTRODUCTION

Much of what a child learns is a result of his curiosity - that is, of his exploration of, and response to, environmental stimuli. Just why a child is curious and what arouses his curiosity is, however, an intriguing question. Until recent years there had been a tendency to place human investigatory behavior within a drive-reduction context. This conceptual frame-work "assumed, as the proposition that 'all behavior is motivated' implies that the organism would be inactive unless driven by either inner or outer stimuli" (Hunt, 1960, p. 491). Hunt offered a rationale for taking the area of curiosity out of a drive-reduction theory context, where it had been relegated to a secondary-drive status. As a secondary drive, investigatory behavior was usually thought of as either being in the service of some primary drive (i. e. hunger, thirst, sex), or being a learned habit once associated with some primary drive. Evidence reviewed by Hunt led him to the conclusion that "spontaneous behavior" such as curiosity could no longer adequately fit into formal drive theory.

The evidence (Berlyne, 1960; Montgomery, 1953; Harlow, 1953, 1950) suggests that while some internal need or drive may be present for the onset of investigatory behavior, external stimulus sets contribute more significantly in eliciting this type of behavior, especially in the human organism.

Glanzer (1958), in a review of theoretical and empirical findings related to the general area of curiosity, proposed the concept of stimulus satiation to explain an organism's need for variation in stimulus experience. Specifically, Glanzer postulated:

> When an organism observes a stimulus, a quantity of stimulus satiation is built up. This quantity reduces the responsiveness of the organism to the stimulus. The longer the stimulus is present, the greater the amount of stimulus satiation built up. In the absence of the stimulus, this quantity dissipates (1958, p. 304).

The present study was designed to investigate Glanzer's (1958) hypothesis about the effects of varied amounts of stimulus satiation, and the dissipation of the effect of stimulus satiation as a function of time or absence of the stimulus on the perceptual investigatory behavior of kindergarten children.

Various research workers, using non-human subjects in experimental settings, have demonstrated the organism's propensity for novel stimulus selection behavior. While "some theorists reasoned that activity of this kind was always in the service of hunger, thirst, sex, or some other organic need," empirical data conflict with this type of theoretical interpretation (White, 1959, p. 289). Montgomery (1953) found that organic-need satiated rats in a Y-maze avoided the short arm and selected the arm that led to a maze that they could explore. Kivy, Earl, and Walker (1956), and Dember (1956) found that need-satiated rats previously exposed to a T-maze choice point, but prevented from entering either arm of the maze, later selected the arm that had some stimulus property change. Experiments in latent learning (Buxton, 1940; Thistlethwaite, 1951) demonstrated that a need-satiated rat placed in a complex maze will explore the maze. At a later time, when placed in the maze again, these rats made fewer mistakes and had faster times to a goal box than rats not previously allowed to explore the maze. For a review of latent learning material see Hilgard and Marquis (1961, pp. 226-237).

Other research employing rats (Berlyne, 1955) and monkeys as subjects (Montgomery and Monkman, 1955; Harlow, H. F., Harlow, M. K. and Meyer, 1950) disclosed convincing evidence for the occurrence of exploratory behavior even where such behavior was not immediately related to "primary drive reduction" (i.e., hunger, thirst, sex). The fact that Harlow's (1950) monkeys would spend hours trying to put together a puzzle for no apparent reason other than curiosity, as well as other data from animal research, has led to several theoretical reconsiderations of the nature of primary drives and motivation. Hunt (1960), White (1959), Glanzer (1958), Fiske and Maddi (1961) and Berlyne (1960) have all provided theoretical treatments of these data. Additionally, each of these authors reviews the empirical data concerned with or relating to the topic of curiosity.

That humans desire (and need?) variation in environmental stimulation seems evident. However, research in this area has been scarce. Maddi states:

> We have overlooked exploratory behavior as a basic feature of infant and child behavior. Although many observations of investigatory behavior are available, surprisingly few systematic investigations have been done. While the observations do suggest the importance of such variables as novelty and complexity, it is not yet possible to state the precise role that these and other variables play in the elicitation and continuation of investigatory responses (1961, p. 259).

Berlyne (1960) postulated that novel stimulus selection behavior is affected by a number of factors. His research showed that such things as degree of novelty, recency of habituation, and complexity of stimulus affect variations in novel stimulus selection behavior. However, most of his support came from experiments with adult human subjects and infrahuman subjects, and from descriptive studies of children. The few experiments that have been done involving children have yielded conflicting results when compared to similar studies with adult subjects (Berlyne, 1960, pp. 160-162).

Mendel (1965) worked with children age three to five years, and found that they preferred arrays of toys 25 to 75 per cent of which were novel. Subjects in the experimental sample were allowed to play with an array of eight toys placed on a table for eight minutes (habituation or stimulus satiation session). After the eight minutes of play each subject was exposed to five additional arrays of eight toys which were 0, 25, 50, 75 and 100 per cent novel. Experimental subjects chose arrays of 25, 50 and 75 per cent novelty significantly more often than subjects who did not receive the habituation session. There were no statistically significant differences between control and experimental subjects' selection of the 0 and 100 per cent novel arrays.

Burnett (1967) studied the effect on the "perceptual investigatory responses" of kindergarten children of varied types of habituation (auditory, visual and audio-visual) and amounts of delay (five minutes and five days between habituation and testing). His findings indicated that preference for visual stimuli was a function of the type of habituation and the interaction of habituation and delay. He also found that subjects' "recovery from habituation" (see Welker, 1961) was a function of time during testing as well as the delay interval between habituation and testing sessions. Subjects in Burnett's two delay treatments did not differ from each other. He concluded that his subjects' investigatory responses were not affected by the different delay treatments. While the main effect of delay was not sufficient, the interaction of delay and habituation was, indicating that delay was effective only when the type of habituation was considered. The present study was designed partly as an extension of Burnett's (1967) experiment.

Statement of the Problem

As stated previously, this study was designed to investigate Glanzer's (1958) hypotheses about the effects of varied amounts of stimulus satiation (habituation) and the dissipation of the effect of stimulus satiation as a function of time. More specifically, the experimenter sought to determine the effects of varied amounts of auditory habituation on the novel (visual) stimulus selection behavior of lower and middle class kindergarten children, as well as to investigate the effects of recency of exposure to auditory stimuli on such children's stimulus selection behavior.

The inclusion of a social class variable was prompted by a study in progress (Gray and Klaus) that suggests that lower class children respond more to auditory cues than to visual cues. Lesser, Fifer, and Clark (1965) studied class and ethnic differences in mental abilities. They found that "differences in social-class placement do produce significant differences in the absolute level of each mental ability" (p. 82). McCandless (1967) reported that among the "psychosocially deprived" the problem was not that there were insufficient stimuli, but rather that there were "overwhelming but undifferentiated stimuli: too many people in too little space" (p. 161).

Maddi (1961) proposed that each person has a different need for variation, and that much of the variation seeking of adults is most likely based on the need for variation as well as the actual experience in variation during childhood. He postulated that "the more variable of two early environments produces an adult organism that is perceptually and behaviorally more alert, flexible and able to cope with change" (p. 247). Fiske and Maddi (1961) also presented a "conceptual framework" of need for variation based on the notions of activation, arousal, and intensity. They reviewed the theory and research of Hebb (1955), Duffy (1957), and Malmo (1958; 1959), and concluded that effectiveness of performance as related to level of activation had a functional relationship in the form of an inverted U. Both low and high activation levels usually led to poorer performance, while moderate levels of activation usually led to "maximally effective performance" (Fiske and Maddi, 1961, p. 31). Combining the findings reported by Fiske and Maddi (1961) and those reported by McCandless (1967), it seems that the psychosocially deprived child who suffers from "overwhelming but undifferentiated stimuli" (McCandless, 1967, p. 161) may also be continually exposed to high activation producing stimulus situations, and must therefore "tune-out" these stimuli in order to maintain functional balance. Since childhood may be a continual process of tuning out many of the available stimuli, later needs for stimulus variation may also be minimal. Terrell (1959) "has suggested that engaging in learning for the sheer enjoyment derived from the activities of learning itself is more characteristic of middle-class than lower-class children" (p. 705).

Hypotheses

The two hypotheses listed below were drawn directly from Glanzer's (1958) postulation:

I. Increases in amount of auditory habituation cause linear increases in preference for visual stimuli.

II. Increases in amount of delay between auditory habituation and testing sessions cause linear decreases in preference for visual stimuli.

Additionally, it is predicted that:

III. The interaction effect of habituation and delay is significant. It is expected that the effect of habituation is maximal as habituation increases and delay decreases.

Prediction of social class difference effects is difficult, since there is little pertinent information or theory in the area. While it is expected that there are class differences in preference for visual (novel) stimuli, the direction this difference takes cannot be predicted. Hence, hypothesis IV is stated:

IV. Lower class kindergarten children differ from middle class kindergarten children in their preference for visual stimuli.

The interactions of habituation and social class and of delay and social class are not formally hypothesized although they too, are expected to be significant.

In order to test the hypotheses stated above, three independent variables (amount of habituation to auditory stimuli, amount of delay between habituation and testing, and social class level of subjects) were employed. In all cases the dependent variable was the subjects' preference for a novel visual stimulus set.

CHAPTER II

METHOD

Subjects

A model of the research design is shown in Figure 1. Eighteen experimental conditions with eight subjects (Ss) in each condition (4 boys and 4 girls) were employed. For the lower social class sample, an equal number of Negro and white Head Start children from the Greensboro Public Schools Head Start Program were randomly assigned by sex and race of subjects to each of the nine lower class experimental conditions. The middle class sample was drawn from two Greensboro church kindergarten programs. Four boys and four girls were randomly assigned to each of the nine middle class experimental conditions. Class status of Ss was determined from the occupational status of the head of household in which the child resided. In order to qualify as a lower class S, the head of the household must have had an occupation falling in one of the following groups: operative and kindred workers; private household workers; service works, except private household; laborers; or one of the above, but currently receiving public welfare. In order to qualify as a middle class S, the head of the household must have had an occupation falling in one of the following groups: Clerical and kindred workers; managers, official, and proprietors; or professional, technical, and kindred workers (Kahl, 1957). For convenience, Ss from the Head Start population were termed lower class Ss and Ss from the church kindergartens were termed middle class. Children with known

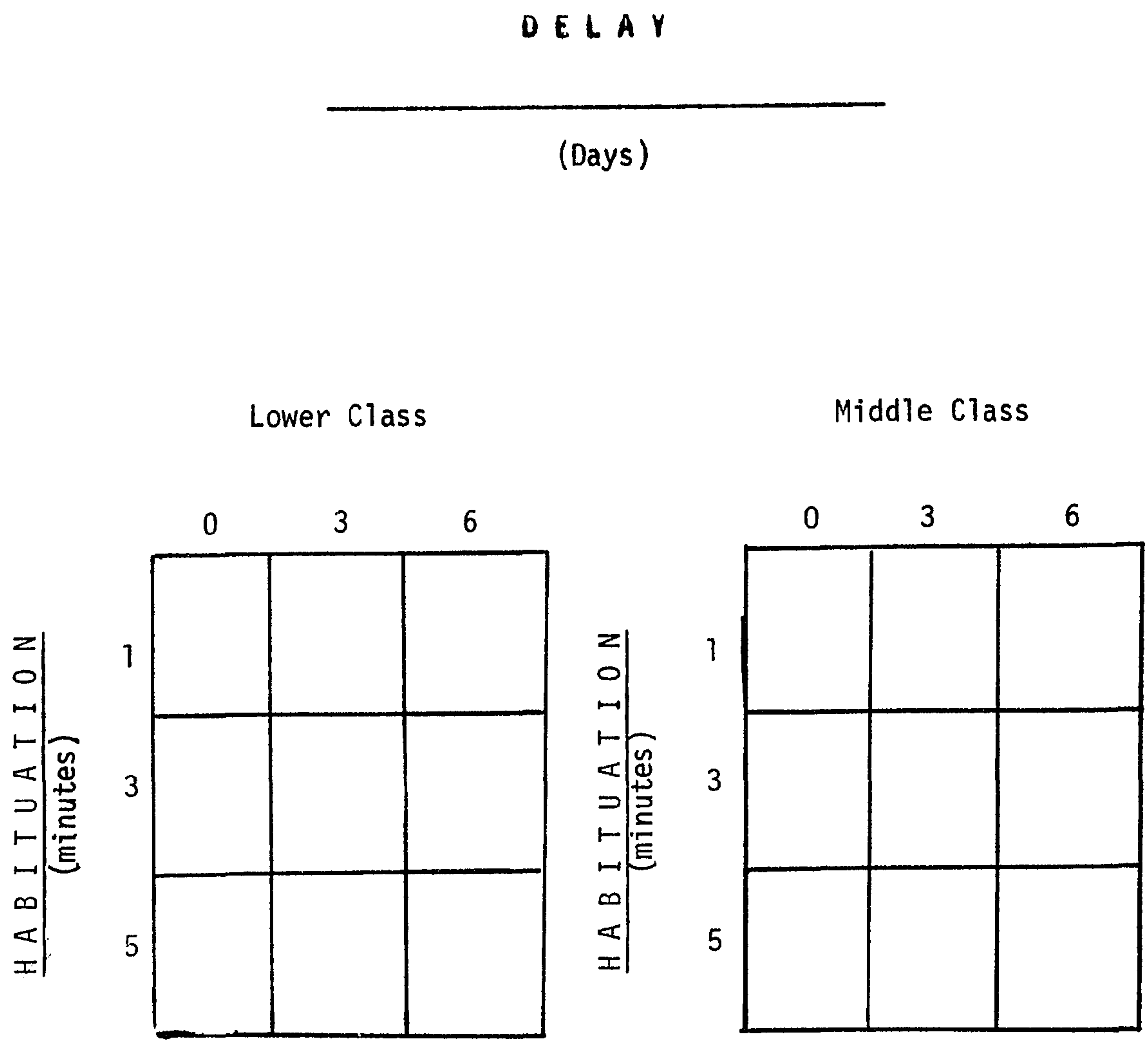


Figure 1. Experimental Design 2 x 3 x 3 Factorial Plan.

hearing or visual defects were excluded from the study.

Stimulus Materials

The auditory stimuli were 12 sound effects selected from volumes 2 and 4 of Elektra Corporations's Authentic Sound Effects. These stimuli were:

Trumpet fanfare number 2	Steam train approaches and stops
Light plane	Chicken coop
Bacon frying	Tropical birds
Sleigh with bells	Small clock ticking
Tire pump	Grandfather clock strikes 12
Pile driver	Adding machine

Each sound track was recorded on a 37.5 feet section of tape at a speed of 7.5 inches per second. The taped segments were randomized and spliced together.

Visual stimuli consisted of a random sequence of 12 different color motion picture travel films. Each of the visual stimuli contained 80 frames and was projected from a unit designed to show 16 frames per second. The following 12 sequences were selected and spliced together in random order.

(1) Mount Rushmore	(7) Bear
(2) Swimming in Pacific Ocean	(8) Old Faithful
(3) Indian	(9) Deer
(4) Beehive geyser sign	(10) Boys
(5) Street in Chicago	(11) Yosemite
(6) Indians Dancing	(12) YMCA sign

These motion picture sequences were selected from film shot by Dr. William L. Burnett in 1963 while he was on a cross-country trip. The sound effect records, now the property of the University of North Carolina at Greensboro, School of Home Economics Nursery School, were the same as used by Burnett (1967). However, the present investigator used certain sounds that were different from those employed by Burnett.

Apparatus

The apparatus used in the present study was similar to Burnett's. Figure 2 is a schematic drawing of the placement of the equipment in the experimental setting. A Clown's face was painted on a four feet by four feet plywood board and was braced by four cement blocks. The Clown's open mouth, twelve inches in diameter, was covered with sheet white drawing paper. The remainder of the Clown's face was painted in white, blue, red, and yellow. Location of the Clown's face was approximately 6.5 feet from the S during habituation and testing sessions. As shown in Figure 2, the experimental setting was enclosed by using three cardboard screens 4 1/2 feet high.

Projection of the visual stimuli (color motion pictures) to the back of the white paper in the Clown's mouth was made by a Technicolor "single concept" 8 mm projector. An Alphax tachistoscopic lens was affixed to the projector lens. The tachistoscopic lens was operated by a pneumatic bulb that, when pressed, opened the tachistoscope for a one second interval, allowing projection of the visual stimuli onto the white paper.

Auditory stimuli were played from an Autostereo model tape transcriber. An eight inch Norelco "high fidelity" enclosed speaker was used as the sound outlet. The leads from the tape deck to the speaker were routed through a photoelectric cell unit mounted on an additional tachistoscopic lens affixed to a film-strip projector. This second tachistoscopic lens was also operated by a pneumatic bulb that, when pressed, allowed light to activate the photoelectric unit and in

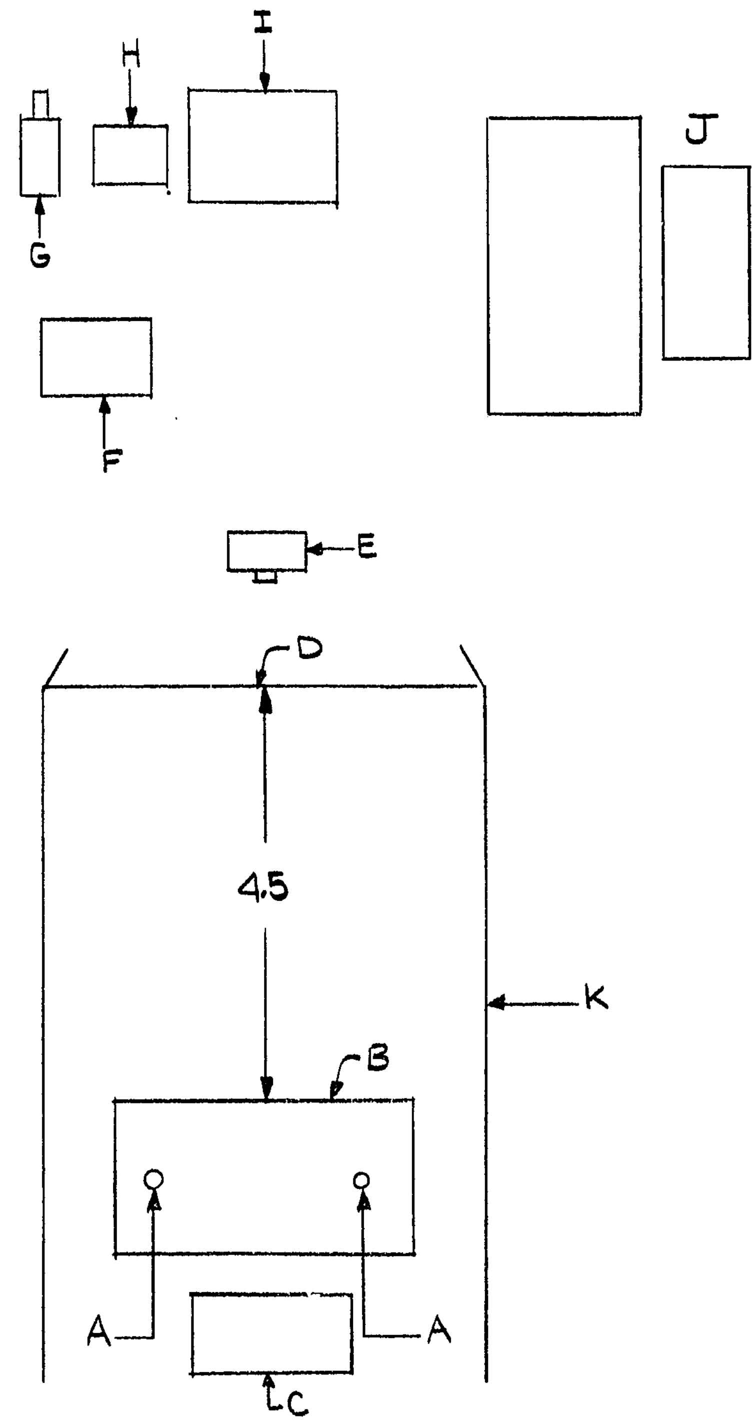


Figure 2. Experimental Cubicle. A, bulbs; B,S's table; C, S's chair; D, Clown; E, 8mm projector; F, tape transcriber; G, film-strip projector; H, potentiometer; I, speaker; J, E's table and chair; K, screen.

turn allowed sound to be transmitted to the speaker.

The two pneumatic bulbs were inserted into a small table as shown in Figure 2. When S pressed one bulb, a visual stimulus appeared in the Clown's mouth for a one second interval. When he pressed the other bulb, a one second auditory stimulus emanated from the speaker four feet behind the Clown. The bulbs were approximately three feet apart. This was done to make it difficult for Ss to press both bulbs simultaneously.

Procedure

One day prior to data collection at each school, the experimenter spent two hours showing the Clown to the children in each class. During data collection, each S was escorted by the E to the experimental room set-up at his school.

Habituation

Each S was seated at a small table in the experimental room directly in front of the Clown. The E sat to the S's left and said "__________, this is Bobo, the Clown. Say 'hi' to Bobo." Then E, using a remote control switch, activated the tape deck and said to the S, "Bobo says 'hi' to you."

Depending upon his assigned experimental condition, S received either one, three, or five minutes of auditory stimulation. This auditory stimulation is referred to as the habituation session.

Testing

After the conclusion of the habituation session, Ss in the three and six day delay conditions were escorted back to their classroom.

Subjects in the no delay condition were given the following instructions. "Now, _______, I am going to let you play with Bobo. Watch me press this rubber bulb. (E presses the manipulandum.) Can you do that? Let me see you try. (S presses the manipulandum.) Good! Now let me see you press the other bulb. (S presses the other manipulandum.) Very good! In a short while, when you press this bulb, Bobo will make some sounds for you, and when you press this bulb Bobo will show you some color pictures. (E presses each manipulandum as he is giving instructions to S.) Won't that be fun? Remember, you may press either bulb, and you may change hands if the one you are using becomes tired. Now I am going to leave the room so you can have fun with Bobo all by yourself. Wait until you hear me say "go" before you start pressing the bulbs. Do you have any questions? I'll be back in a few minutes. Have fun"![1]

E then left the experimental cubicle and sat behind the Clown. He said "go" and started his stop watch. He tabulated S's responses for auditory and visual stimuli for a period of 90 seconds, at which time he stopped the apparatus. At the conclusion of the 90 second testing period, E returned to the experimental cubicle and said, "_______, did you have fun playing with Bobo? I may invite some of your friends to see Bobo today. Let's not tell them what Bobo did while you were here, and your friends will have a real surprise when they visit! Don't tell them! Promise?" E then went back with S to his classroom.

Subjects in the two delay conditions were brought into the

---

[1]The wording in the instructions was similar to that used by Burnett (1967). The writer is indebted to Dr. Burnett for the use of his materials.

experimental room after the appropriate interval. E then said to these Ss "You remember Bobo! The other day Bobo talked to you." At that point the E gave the standard instructions to S.

Delay

Three delay conditions were used in the experiment. The "no delay" condition required Ss to respond to stimuli immediately after habituation and instructions. The three and six day delay conditions required Ss to respond to stimuli within one half hour of three and six days of time from habituation, respectively.

Analysis

A 2 x 3 x 3 factorial analysis of variance with trend analysis was employed to analyze the data. The dependent variable was the proportion of Ss' responses for visual stimuli. This proportion was termed the S's "VP" score (VP=responses for visual stimuli divided by responses for visual plus responses for auditory stimuli, or, $VP = \frac{V}{V + A}$).

Pre-test

Five Head Start and five middle class kindergarten children were tested without any habituation for preference of either of the stimulus sets used in the experiment. Analysis of variance between auditory and visual responses of these subjects showed no significant differences (F. = 1.750). Mean number of visual responses was 19.5, while the mean number of auditory responses was 19.1.

CHAPTER III

RESULTS

Mean visual preference (VP) scores for each of the 18 experimental samples are shown in Table 1.[2]

TABLE I[3]

MEAN VP SCORES FOR EACH SAMPLE
(N=144, n=8)

Delay	Habituation						Total Means
	Lower Class			Middle Class			
	1 min.	3 min.	5 min.	1 min.	3 min.	5 min.	
None	.575	.816	.956	.566	.787	.945	.775
3 days	.525	.635	.797	.528	.619	.801	.651
6 days	.511	.545	.543	.512	.538	.593	.541
Mean Totals	.538	.665	.765	.536	.648	.780	.656

[2]The raw data from which the means in Table 1 and from which all other analyses were computed are in the Appendix.

[3]In order to determine what effect, if any, race had on lower class Ss' VP scores an analysis of variance was computed between lower class, Negro Ss' VP scores ($\overline{X}$ = .656) and lower class white Ss' VP scores ($\overline{X}$ = .655). Additionally, an analysis of variance between all male Ss' VP scores ($\overline{X}$ = .653) and all female Ss' VP scores ($\overline{X}$ = .657) was computed. These analyses were not statistically significant.

Main Effects

A summary of the 2 x 3 x 3 factorial design with trend analysis is presented in Table 2. The main effect of social class (A) was not statistically significant. The main effect of habituation (B) was linearly significant beyond the .001 level of confidence. Figure 3 shows that as the amount of auditory habituation increased, there was a correlated increase in the subjects' (Ss') mean VP scores. Ss who received one minute of habituation had a mean VP of .537, while Ss who received three or five minutes of habituation had mean VP scores of .657 or .773, respectively. The delay main effect (C) was also found to be linearly significant ($p. < .001$). Figure 4 demonstrates that as delay between habituation and testing increased, the Ss' mean VP scores proportionally decreased. Ss in the no delay condition had a mean VP score of .775, while Ss in the three or six day delay conditions had mean VP scores of .651 or .541, respectively.

TABLE 2

ANALYSIS OF VARIANCE WITH TRENDS OF VP SCORES FOR Ss IN TWO SOCIAL CLASSES, THREE HABITUATION CONDITIONS AND THREE DELAY CONDITIONS

Source	SS	d.f.	MS	F
Class (A)	0	1	0	-
Habituation (B)	1.3428	2	0.6714	1678.500**
Lin. B	1.3426	1	1.3426	3356.500**
Quad. B	0.0002	1	0.0002	0.500
Delay (C)	1.3156	2	0.6578	1644.500**
Lin. C	1.3141	1	1.3141	3285.250**
Quad. C	0.0015	1	0.0015	3.750
A X B	0.0061	2	0.0030	7.500**
A X Lin. B	0.0012	1	0.0012	3.000
A X Quad. B	0.0049	1	0.0049	12.250**
A X C	0.0060	2	0.0030	7.500**
A X Lin. C	0.0059	1	0.0059	14.750**
A X Quad. C	0.0001	1	0.0001	0.250
B X C	0.4637	4	0.1067	266.750**
Lin. B X Lin. C	0.4166	1	0.4166	1041.500**
Lin. B X Quad. C	0.0157	1	0.0157	39.250**
Quad. B X Lin. C	0.0081	1	0.0081	20.250**
Quad. B X Quad. C	0.0233	1	0.0233	58.250**
A X B X C	0.0028	4	0.0007	1.750
Error	0.0558	126	0.0004	
Total	3.1928	143		

** $P. < .001$

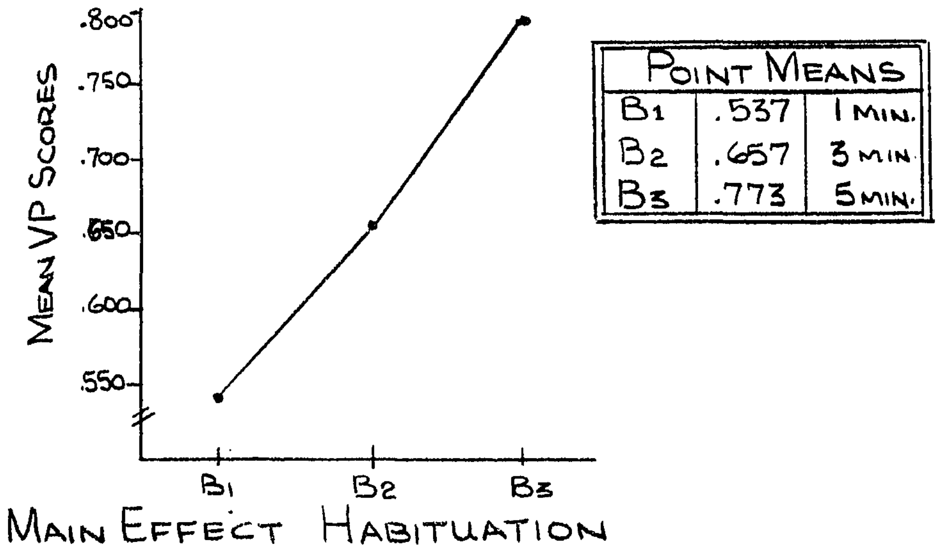


Figure 3. Main Effect of Habituation. One minute (B_1), Three minutes (B_2), Five minutes (B_3).

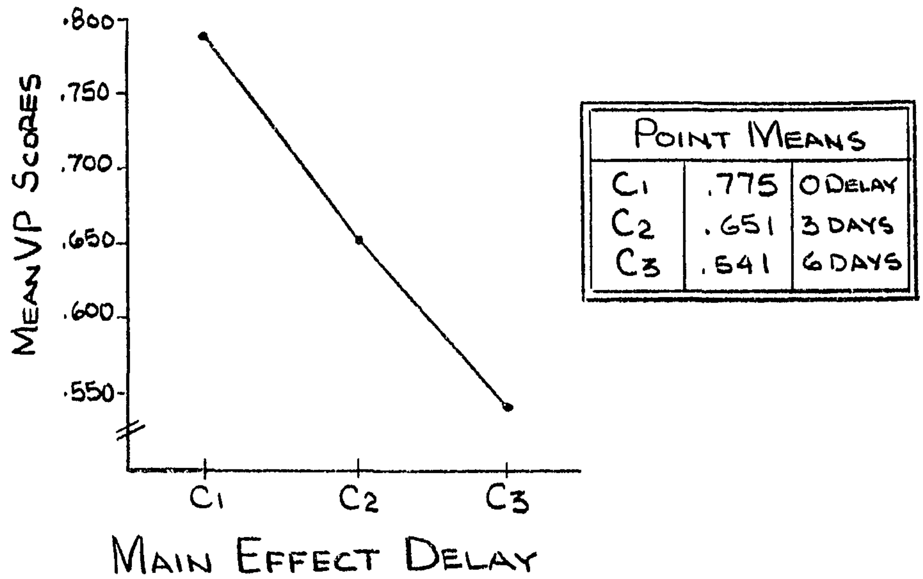
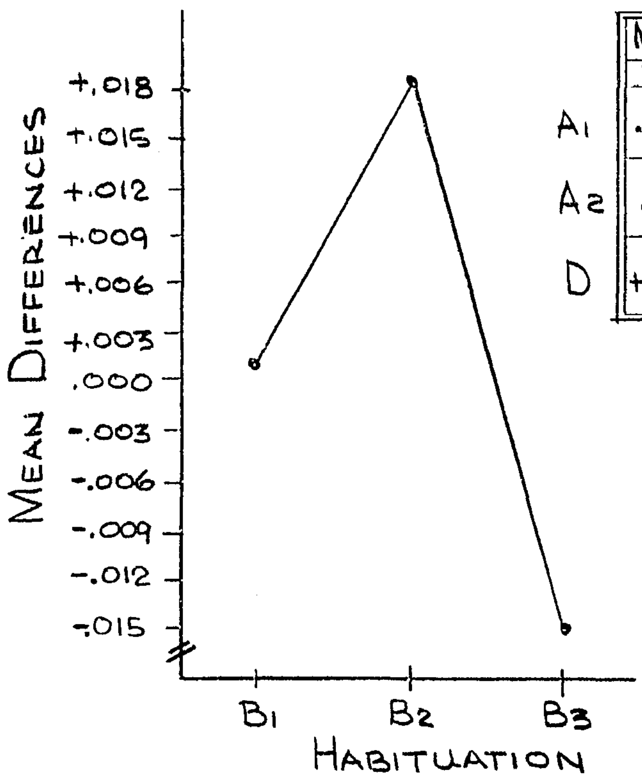


Figure 4. Main Effect of Delay. None (C_1), Three days (C_2), Six days (C_3).

Interaction Effects

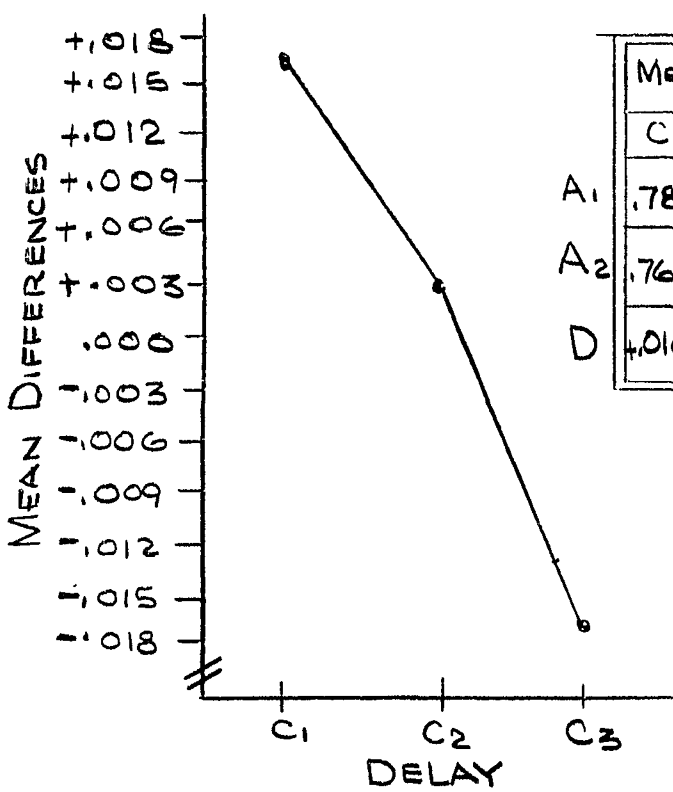
The class x habituation (A x B) interaction was significant beyond the .001 level of confidence. Trend analysis of this interaction shows that only the quadratic B portion of the interaction to be significant ($p. < .001$). In Figure 5 is shown the plot of differences between lower and middle class subjects mean VP scores as the amount of habituation increases. While there was relatively little difference between lower and middle class subjects' mean VP scores in the one minute of habituation condition, lower class subjects had higher mean VP scores than middle class subjects in the three minute habituation condition. In the five minute habituation condition middle class subjects had higher mean VP scores than did lower class subjects.



Mean Differences	B_1	B_2	B_3
A_1	.538	.665	.765
A_2	.536	.648	.780
D	+.002	+.017	-.015

Figure 5. Class x Habituation Interaction. Lower class (A_1), Middle Class (A_2). Habituation (B). Differences (D).

The class x delay (A x C) interaction was significant beyond the .01 level of confidence. Analysis of trends shows that only the A x C linear portion of the interaction to be significant ($p. < .001$). The plot of differences between lower and middle class subjects' mean VP scores as a function of delay is shown in Figure 6. In the no delay condition lower class subjects had higher mean VP scores than did middle class subjects. In the three day delay condition there was relatively little difference between lower and middle class subjects' mean VP scores, while in the six day delay condition middle class subjects had higher mean VP scores than did lower class subjects.



	Mean Differences		
	C1	C2	C3
A1	.783	.652	.533
A2	.767	.649	.548
D	+.016	+.003	-.015

Figure 6. Class x Delay Interaction. Class (A). Delay (C). Differences (D)

The habituation x delay (B x C) interaction was significant beyond the .001 level of confidence as were all the trends for the B x C interaction. However, it is noted that the linear B x linear C portion of the interaction has the greatest amount of variability, and thus the greatest contribution to the overall B x C interaction. In Figure 7a each of the three level of habituation (B) is plotted across the delay (C) factors. Differences between the three levels of B are greatest at the no delay condition (C) and diminish through treatments C_2 and C_3. By plotting each of the three levels of C across the B factor (Figure 7b) it is seen that the differences between the three levels of delay are smallest under the one minute (B_1) habituation condition and become greater as the amount of habituation is increased.

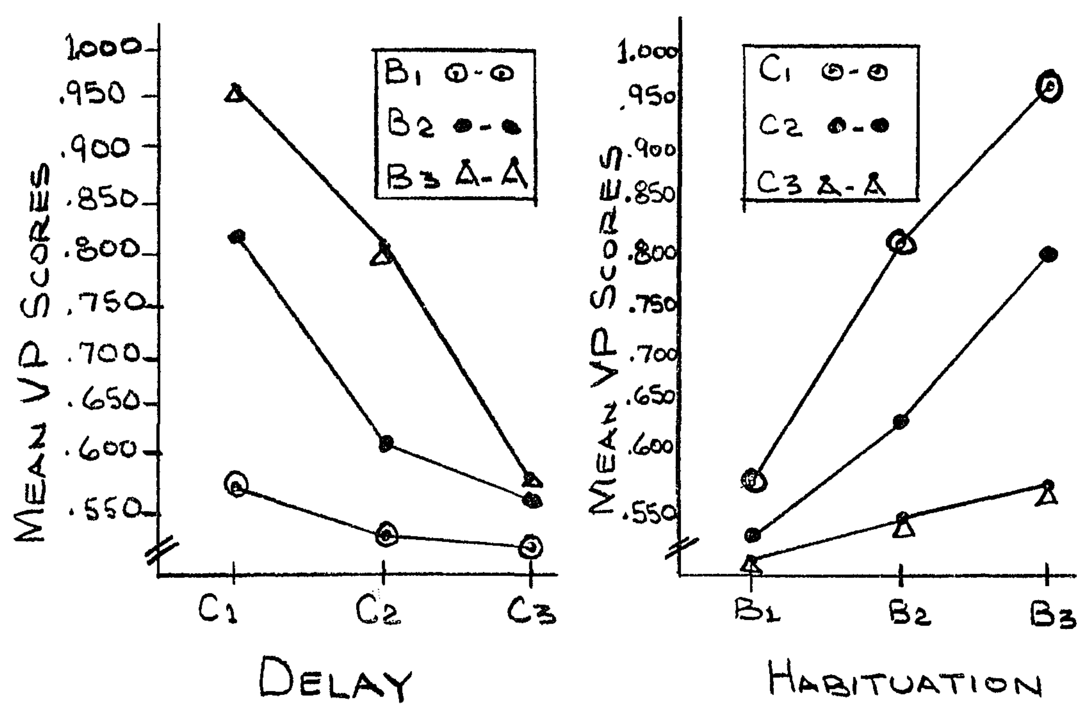


Figure 7. Left (a); Habituation (B) plotted against Delay (C). Right (b); Delay (C) plotted against Habituation (B).

CHAPTER IV

DISCUSSION AND CONCLUSIONS

Five major conclusions can be drawn from the present investigation: (a) Increases in the amount of auditory habituation cause linearly related increases in preference for visual stimuli; (b) the longer the delay between habituation and testing, the less Ss prefer visual stimuli; (c) the effect of the interaction of habituation and delay is greatest under conditions of longer habituation and shorter delay, with no specifically related function, Ss' mean VP scores increased as habituation increased and delay decreased; (d) social class of subjects differentially interacts with the amount of delay between habituation and testing and can best be expressed as a linear function; (e) social class of Ss differentially interacts with the effect of habituation and can best be expressed in the form of a modified inverted U.

Habituation

Glanzer (1958) postulated that exposure to a stimulus decreases an organism's responsiveness to that stimulus. In the present study, kindergarten children were exposed (habituated) to varying amounts of an auditory stimulus, after which they were allowed to cause either the familiar auditory stimulus and/or an unfamiliar visual stimulus to emanate from the apparatus for a brief interval. While a more direct test of Glanzer's (1958) hypothesis could have been made by using the subject's preference for the familiar stimulus, the present study used a preference score for the new or novel visual stimulus. However, it should be pointed out that the scores analyzed were ratios of visual to auditory (plus visual) responses. If the ratios were inverted to study preference for the familiar stimulus, complementary results of equal significance would be obtained. Subjects who were habituated to the auditory stimulus for longer periods of time not only preferred the visual stimulus more, but also the auditory stimulus less, than did subjects who were habituated for shorter periods of time. Within a two choice system, the effect of stimulus satiation is not only a decrease in responsiveness to the familiar stimulus, but also an increase in responsiveness to the novel stimulus. As such, Hypothesis I is supported: Increases in amount of auditory habituation caused linear increases in preference for visual stimuli.

Delay

Glanzer (1958) also postulated that in the absence of the habituated stimulus, the effect of satiation or habituation dissipates. Delay between habituation and testing, in the present study, caused a decrease in preference for the novel stimulus. Stated in converse form, delay between habituation and testing caused an increase in preference for the habituated (auditory) stimulus. This finding fits with Glanzer's hypothesis. However, it does not agree with Burnett's finding that ". . . the effect of dalay, *per se*, did not seem to influence subjects' investigatory responses significantly" (1967, p. 32). The discrepancy between the present finding and that of Burnett's can be resolved by further investigation of his data. Using only two delay conditions (5 minutes and 5 days) and three types of habituation conditions (auditory, auditory-visual, and visual), Burnett found no significant main effect of delay. He used three qualitative variables, the effect of which was to balance out preference for visual stimulus. Thus, his negative finding seems likely to be an artifact of the use of these qualitative variables. It should be noted, however, that Burnett did find a significant interaction between amount of delay and type of habituation. Data from the present study support Glanzer's hypothesis as well as the researcher's specific prediction that: Increases in the amount of delay between auditory habituation and testing sessions will cause linear decreases in preference for visual stimuli.

Other research workers (Welker, 1961; Butler, 1957) have discussed the effects of delay in terms of recovery, or a return to a normal state. Welker stated that "the degree to which recovery occurs probably depends upon the recency, duration, and frequency of previous exposures as well as upon the initial degree of novelty of the stimulus" (1961, p. 194). Recency of exposure to a given stimulus has a direct effect upon the organism's choice of stimuli at later points in time. The nearer the point of testing is to the point of first exposure, the more likely it will be that the organism will select a novel stimulus modality over a familiar stimulus modality. The effects of "duration and frequency" of habituation can be seen in the present study as the amount of habituation. Subjects who experienced only one minute of habituation showed a very low mean (VP score = .537) preference for the novel stimulus. This preference increased significantly as the amount of habituation was increased.

Habituation and Delay

Statistical analysis of the interaction of habituation and delay revealed that there were statistically significant ($p. < .001$) differences between the nine habituation-delay treatment combinations. Furthermore, all trends were found to be statistically significant (p .001) for each related degree of freedom with the linear B x linear C interaction contributing the most to the over-all B x C interaction. Both Welker (1961) and Glanzer (1958) discussed the effect that recency and amount of habituation would have upon the organism. As part of Hypothesis III in the present research, it was predicted that the effect of habituation would be maximal as habituation increased and delay decreased. Since the overall habituation x delay interaction was significant along with all trends related to that interaction, an explicit statistical test of this part of Hypothesis III was impossible. However, if the nine treatment combination for this interaction were plotted in ascending order of the dependent variable; and weights were assigned to the numerical subscript of each independent variable in such a fashion that the delay variable was assigned a negative value and the habituation variable a positive value, the nine treatment combination would have the following weighted order: -2, -1, -1, 0, 0, 0, +1, +1, +2. This is shown in Figure 8.

While the validity of such a manipulation is questionable, it supports the prediction made in Hypothesis III. If there were some more precise way to calculate each independent variable's contribution to the interaction, then this type of post hoc analysis would be unnecessary. In many respects the interaction of habituation and delay is similar to the interaction of heredity and environment. In both types of interactions, the precise contribution and effect of one part on the other cannot be stated. Just as in the heredity-environment interaction, discussion of how much habituation or delay contributes to interaction is presently unstatable and is in need of further research.

Class and Habituation

Although the main effect of social class was not found to be significant, the interaction between class and habituation was statistically significant ($p < .01$). The class x quadratic habituation interaction function was also found to be significant ($p < .001$). Differences in VP scores between Head Start subjects and middle class kindergarten subjects were minimal during the one minute habituation condition. These differences increased during the three minute habituation condition with Head Start subjects having higher VP scores than middle class subjects. However, during the five minute habituation condition, the middle class Ss had higher VP scores than the Head Start Ss, and the magnitude of the difference between them was almost the same as that between them during the three minute habituation condition.

Head Start children and middle class children are similarly affected by very short habituation and are affected differentially by moderate and long habituation. There are two possible answers as to why this is: First, these results may be the product of some type of error, either in sampling or treatment. Second, it may be that the

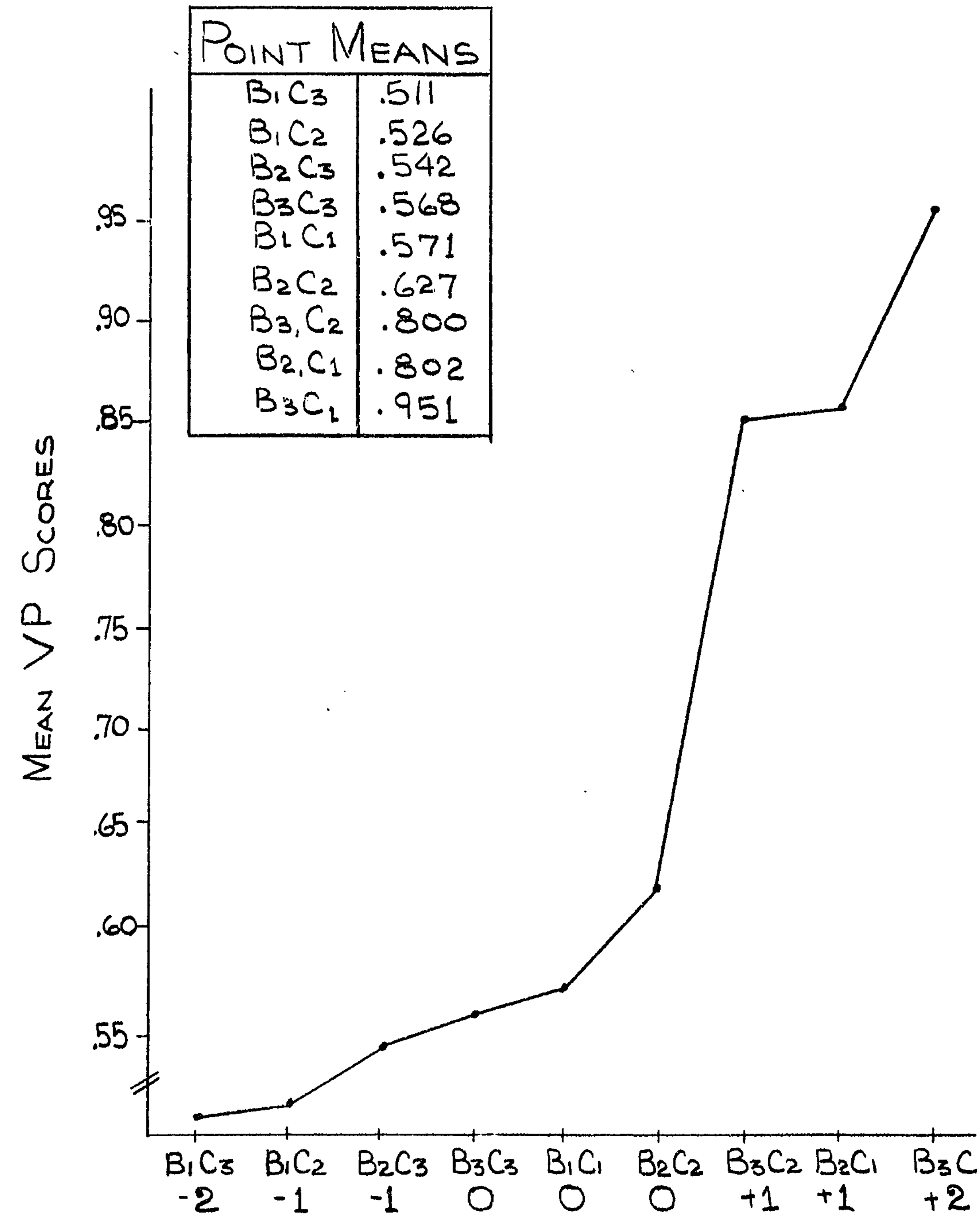


Figure 8. Mean for the Habituation (B) x Delay (C) Interaction plotted in ascending order.

Head Start child's span of attention is not as great as the middle class child's, so that longer habituation periods are more effective among middle class subjects. While the first reason, error, may be correct, it seems more likely that some facet of span of attention is responsible for the changes in differences in VP scores from three to five minutes of habituation between the two samples. If, as these data suggest, three minutes of habituation are more effective for lower class children, then it may be that the peak span of attention is reached some timer prior to five minutes for the lower class child but may not have been reached at five minutes for the middle class child. Lower class subjects may be "tuning out," as Deutsch (1967) has suggested.

Class and Delay

The significant Class x linear Delay interaction supports a "tuning out" hypothesis. Figure 6 shows that, as the amount of delay increased between habituation and testing, differences between lower and middle class Ss decreased from positive to negative. That is, lower class Ss had higher VP scores than middle class Ss in the no delay condition; at three days' delay differences were minimal; and at six days' delay middle class subjects had higher VP scores than lower class subjects. While span of attention may not be directly responsible for these differences, memory facility, which Deutsch (1967) closely relates to attention, may be the relevant variable. Concomitant with shorter attention span is shorter memory span. Lower class Ss "remember" better for short intervals of time (no delay) than do middle class subjects, while under long delay (6 days) middle class children "remember" better.

In summarizing both the Habituation x Class and the Delay x Class findings, it seems that lower class children tend to "sprint." That is, they perform better than middle class children under conditions of shorter delay and shorter habituation. Middle class children perform better than lower class children under conditions of longer delay and habituation. This conclusion, however, is not wholly supported by the findings. If this conclusion is to be fully acceptable, then the interaction of Habituation x Delay x Class should have been significant. This was not the case. Further research into this area is needed to solve the problem.

Summary and Implications

In the present study it was found that the longer Ss were habituated to an auditory stimulus set, the more they preferred a novel visual stimulus set. It was also found that the longer the delay between habituation and testing, the less Ss preferred the novel visual stimulus set. While direct implications and generalizations from an experimental study of the present type must be sharply limited and dependent upon further research, it seems that some can be advanced.

The basic generalization from these results is that, given a choice to respond to either a familiar or novel stimulus set, kindergarten children will respond to the novel stimulus set more often than to the familiar set, the initial response value of the two sets being equal. Second, delaying the opportunity to respond to either stimulus set depresses responsiveness to the novel stimulus set and thus increases responsiveness to the familiar stimulus set. The most direct implication of these generalizations is that kindergarten children desire and need variation in environmental stimulation. Within an educational context, primary emphasis is placed upon the child's ability to learn. Learning occurs as a result of a child's ability to respond to a stimulus. If a child is to continue to learn, he must be supplied with changing stimulus conditions. This establishes the need for stimulus variation.

After reviewing several studies in the area of curiosity McCandless stated:

> It is pathetic to see how schools fail to capitalize on research like the studies above. The average teacher does not introduce gimmicks; the same dusty appurtenances stay on the bulletin boards or walls for weeks and months at a time; routines are followed as invariably, dully, and without surprise as one sheep follows another, for the daily schedule never changes; the social science class is always conducted the same way; nobody is ever tricked (1967, pp. 227-228).

That humans desire and need variation in environmental stimulation not only seems evident, but also makes good common sense if education's goal is to produce learning. Continual exposure to one stimulus set, be it technique, subject matter, person, or place, is not conducive to responding and thus to learning.

Differences in social class of the subjects had an effect upon their VP scores when the amount of habituation was considered. While minimal differences existed between lower and middle class subjects' mean VP score during one minute of habituation, lower class subjects had a higher mean VP score than middle class subjects for three minutes of habituation. For five minutes of habituation, the trend was reversed, and middle class subjects had a higher mean VP score than did lower class subjects. At the same time it was found that lower class subjects showed a higher mean VP score than middle class subjects during the no delay condition, while during the six day delay condition middle class subjects obtained a higher mean VP score than lower class subjects. Span of attention and memory were discussed as possible contributors to these differences. A "tuning out" hypothesis was also advanced. One educational implication of these findings is that lower class children need more variation in environmental stimuli than do middle class children.

Lower class children are affected more by shorter stimulus sets than are middle class children. The effect of stimulus exposure is more likely to "wear off" for lower class than for middle class children during extended intervals of time.

While the entire area of investigatory behavior deserves further research, the present study points to the need for research that will allow an exact statement of the effect of the interaction of amount of habituation and delay on children's investigatory responses. Second, social class differences appear that are related to habituation and delay effects. Further research in this area may reveal new methods of motivational techniques that will enable the culturally deprived child to learn as well as the advantaged child.

REFERENCES

REFERENCES

Berlyne, D. E. Conflict, arousal, and curiosity. New York: McGraw-Hill, 1960.

Berlyne, D. E. The arousal and satiation of perceptual curiosity in rats. Journal of Comparative Physiological Psychology. 1955, 48, 238-246.

Burnett, William L., Effect of recency of habituation of varied auditory, visual and audio-visual stimuli on the perceptual investigatory responses of kindergarten children. Unpublished Doctoral Dissertation, University of North Carolina at Greensboro, 1967.

Buxton, C. E. Latent learning and the goal-gradient. Contemporary Psychological Theory. 1940, 12, No. 2.

Dember, W. N. Response by the rat to environmental change. Journal of Comparative Physiological Psychology. 1956, 49, 93-95.

Deutsch, Martin. The disadvantaged child. New York: Basic Books, 1967.

Duffy, Elizabeth. The psychological significance of the concept of "arousal" or "activation". Psychological Review, 1957, 64, 265-275.

Fiske, D. W., and Maddi, S. R. (Editors) Functions of varied experience. Homewood, Ill: Dorsey Press, 1961.

Glanzer, M. Curiosity, exploratory drive, and stimulus satiation. Psychological Bulletin, 1958, 55, 302-315.

Harlow, H. F. Mice, monkeys, men, and motives. Psychological Review, 1953, 60, 23-32.

Harlow, H. F., Harlow, M. K., and Meyer, D. R. Learning motivated by a manipulation drive. Journal of Experimental Psychology, 1950, 40, 228-234.

Hebb, D. O. Drive and the C.N.S. (conceptual nervous system), Psychological Review, 1955, 62, 243-254.

Hilgard, E. R., and Marquis, D. G. Conditioning and learning. New York: Apleton-Century-Crofts, 1961.

Hunt, J. McV. Experience and the development of motivation: Some reinterpretations. Child Development, 1960, 31, 489-504.

Kahl, J. The American class structure. New York: Rinehart, 1957.

Kivy, P. N., Earl, R. W., and Walker, E. L. Stimulus context and satiation. Journal of Comparative Physiological Psychology, 1956, 49, 90-92.

Lesser, G. S., Fifer, G., and Clark, D. H. Mental abilities of children from different social-class and cultural groups. Monographs - S.R.C.D., 1965, 30.

McCandless, B. R. Children: behavior and development. New York: Holt, Rinehart and Winston, 1967.

Maddi, S. R. Exploratory behavior and variation-seeking in man. In D. W. Fiske and D. S. Maddi (Editors) Functions of varied experience. Homewood, Ill: Dorsey Press, 1961.

Malmo, R. B. Measurement of drive: an unsolved problem in psychology. M. R. Jones (Editor) Nebraska symposium on motivation. Lincoln: University of Nebraska Press, 1958. Pp. 229-265.

Malmo, R. B. Activation: a neuropsychological dimension. Psychological Review, 1959, 66, 367-386.

Mendel, Gisela. Children's preferences for differing degrees of novelty. Child Development, 1965, 36, 453-465.

Montgomery, K. C. The effect of the hunger and thirst drives upon exploratory behavior. Journal of Comparative Physiological Psychology, 1953, 46, 315-319.

Montgomery, R. C., and Monkman, J. A. The relation between fear and exploratory behavior. Journal of Comparative Physiological Psychology, 1955, 48.

Terrell, G. Manipulatory motivation in children. Journal of Comparative Physiological Psychology, 1959, 52, 705-709.

Thistlethwaite, D. A critical review of latent learning and related experiments. Psychological Bulletin, 1951, 48, 97-129.

Welker, W. I. An analysis of exploratory and play behavior in animals. In D. W. Fiske and S. R. Maddi (Editors) Functions of varied experience. Homewood, Ill: Dorsey Press, 1961.

White, R. W. Motivation reconsidered: The concept of competence. Psychological Review, 1959, 66, 297-333.

APPENDIX

RESPONSES FOR VISUAL AND AUDITORY STIMULI FOR EACH SUBJECT BY EXPERIMENTAL CONDITIONS

Lower Class Subjects

	Visual	Auditory	Total	Visual Preference
One minute habituation no delay	26	19	45	.577
	28	18	46	.608
	24	19	43	.558
	17	15	32	.531
	20	15	35	.571
	23	16	39	.590
	21	15	36	.583
	24	17	41	.585
One minute habituation three days delay	19	18	37	.514
	22	20	42	.524
	16	15	31	.516
	21	19	40	.525
	23	20	43	.535
	21	21	42	.500
	24	20	44	.545
	22	19	41	.537
One minute habituation six days delay	20	20	40	.500
	19	18	37	.514
	23	21	44	.523
	24	22	46	.522
	16	17	33	.485
	19	17	36	.528
	17	17	34	.500
	21	20	41	.512
Three minutes habituation no delay	32	9	41	.780
	29	8	37	.784
	33	6	39	.846
	27	7	34	.794
	31	7	38	.816
	35	8	43	.814
	34	6	40	.850
	33	6	39	.846
Three minutes habituation three days delay	24	14	38	.632
	26	15	41	.634
	22	12	34	.647
	27	18	45	.600
	26	13	39	.667
	25	15	40	.625
	23	14	37	.622
	26	14	40	.650

	Visual	Auditory	Total	Visual Preference
Three minutes habituation six days delay	19	17	36	.528
	22	19	41	.537
	24	21	45	.533
	23	19	42	.548
	24	18	42	.571
	20	16	36	.556
	21	17	38	.553
	23	20	43	.535
Five minutes habituation no delay	37	2	39	.949
	39	2	41	.951
	42	1	43	.977
	35	2	37	.946
	38	0	38	1.000
	43	1	44	.977
	36	3	39	.923
	37	3	40	.925
Five minutes habituation three days delay	32	8	40	.800
	31	8	39	.795
	34	9	43	.791
	30	6	36	.833
	35	8	43	.814
	29	7	36	.806
	29	10	39	.744
	30	8	38	.789
Five minutes habituation six days delay	19	18	37	.514
	21	18	39	.538
	20	17	37	.541
	23	19	42	.548
	24	19	43	.558
	19	17	36	.528
	25	19	44	.568
	23	19	42	.548

Middle Class Subjects

One minute habituation no delay	17	15	32	.531
	18	15	33	.545
	21	16	37	.567
	19	14	33	.575
	22	15	37	.594
	19	13	32	.593
	17	14	31	.548
	22	16	38	.578

	Visual	Auditory	Total	Visual Preference
One minute habituation three days delay	18	17	35	.514
	16	15	31	.516
	21	19	40	.525
	19	17	36	.527
	21	18	39	.538
	17	15	32	.531
	21	19	40	.525
	17	14	31	.548
One minute habituation six days delay	16	15	31	.516
	19	17	36	.528
	18	18	36	.500
	16	17	33	.485
	16	16	32	.500
	18	17	35	.514
	20	18	38	.526
	19	17	36	.527
Three minutes habituation no delay	27	6	33	.818
	26	7	33	.787
	29	9	38	.763
	27	8	35	.771
	27	7	34	.794
	30	9	39	.769
	29	8	37	.783
	31	7	38	.816
Three minutes habituation three days delay	23	13	36	.639
	25	15	40	.625
	24	13	37	.649
	21	12	33	.636
	22	14	36	.611
	19	13	32	.598
	20	14	34	.588
	20	13	33	.606
Three minutes habituation six days delay	20	17	37	.540
	21	17	38	.552
	18	16	34	.529
	19	16	35	.542
	22	18	40	.550
	18	17	35	.514
	19	16	35	.542
	20	17	37	.540

	Visual	Auditory	Total	Visual Preference
Five minutes habituation no delay	34	3	37	.918
	32	3	35	.914
	36	2	38	.947
	31	1	32	.969
	34	2	36	.944
	35	0	35	1.000
	37	3	40	.925
	35	2	37	.946
Five minutes habituation three days delay	28	6	34	.823
	29	7	36	.806
	26	6	32	.813
	29	8	37	.784
	31	9	40	.775
	32	7	39	.821
	26	7	33	.788
	32	8	40	.800
Five minutes habituation six days delay	23	15	38	.605
	25	16	41	.608
	20	14	34	.588
	21	13	34	.618
	22	14	36	.611
	20	16	36	.556
	19	13	32	.594
	20	15	35	.571