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EFFECTS OF RECENCY OF HABITUATION OF VARIED AUDITORY, VISUAL, AND AUDIO-VISUAL STIMULI ON THE PERCEPTUAL INVESTIGATORY RESPONSES OF KINDERGARTEN CHILDREN

by

William Leslie Burnett

A Dissertation Submitted to
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Approved by

Naomi G. Albanese

ABSTRACT

BURNETT, WILLIAM LESLIE. Effects of Recency of Habituation of Varied Auditory, Visual, and Audio-Visual Stimuli on the Perceptual Investigatory Responses of Kindergarten Children. (1967) Directed by: Dr. Irwin V. Sperry. pp. 70.

The purpose of the experiment was to determine and compare the effects of recency of habituation of varied auditory, visual, and audio-visual stimuli on the perceptual investigatory responses of kindergarten children. Two delay intervals (5-minutes and 5-days) and three types of habituation (auditory, visual, and audio-visual) were studied. Factorial analysis of variance made it possible to analyze the independent and interactive effects of these variables on the investigatory responses of the children during 5-minutes of testing.

The population of the study consisted of 144 children drawn from three church-related kindergartens in Greensboro, North Carolina. Thirty six of these children, with an equal distribution of boys and girls, were randomly selected from each kindergarten. Within each of these groups, subjects were assigned to six experimental conditions: (1) Short delay auditory habituation (SA); (2) Short delay audio-visual habituation (SAV); (3) Short delay visual habituation (SV); (4) Long delay auditory habituation (LA); (5) Long delay audio-visual habituation (LAV); and (6) Long delay visual habituation (LV). The remaining 36 children, with an equal number of boys and girls, were assigned to a "replacement" group. Children were randomly selected from the latter group to replace experimental subjects, who, for various reasons were unable to complete the experiment.

The stimuli, varied sounds and color-pictures, were presented with a simple motor task in which pressing manipulanda (rubber bulbs) produced auditory and visual stimuli. Prior to testing sessions, subjects in the SA and

LA groups were exposed to auditory stimuli; subjects in the SAV and LAV groups were exposed to auditory and visual stimuli; and subjects in the SV and LV groups were exposed to visual stimuli. Subjects in the SA, SAV, and SV groups had a 5-minute delay interval between the preliminary (habituation) sessions and testing sessions, whereas subjects in the LA, LAV, and LV groups had a 5-day delay between preliminary and testing sessions. All sessions were conducted in a cubicle, where the children were seated at a small table in front of a clown's face made of plywood.

The number of bulb-pressing responses were recorded separately for each child during each minute of testing. These responses were designated auditory responses if they resulted in the presentation of sounds or visual responses if they resulted in the presentation of color-pictures. The original scores were transformed to visual preference scores by the following formula: $VP = \frac{V}{(V + A)}$, where VP is the visual preference score of a subject, V is the frequency of his visual responses, and A is the frequency of his auditory responses. An analysis of variance for a 2 x 3 x 5 factorial design was performed on the visual preference (VP) scores of the 18 subjects in each of the experimental groups. The results of the analysis indicated: (a) there were differences in subjects' mean VP scores resulting from varied types of habituation; (b) there were differences in subjects' mean VP scores resulting from the interaction of amount of delay and type of habituation; (c) there were differences in subjects' mean VP scores resulting from the interaction of type of habituation and minutes of testing; (d) there were differences in subjects' mean VP scores resulting from the interaction of amount of delay, type of habituation, and minutes of testing.

Additionally, single factor analyses of variance indicated that: (a) mean VP scores were greatest for subjects in the SA group, next greatest for subjects in the SAV group, and least for subjects in the SV group; (b) mean VP scores were greatest for subjects in the LA group, next greatest for subjects in the LAV group, and least for subjects in the LV group; (c) mean VP scores were greater for subjects in the SA group than for subjects in the LA group; (d) mean VP scores were greater for subjects in the LV group than for subjects in the SV group.

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 28, 1967

Date of Examination

DEDICATION

In recognition of his role as extraordinary friend and adviser, and also in appreciation for the lasting personal and professional values gained in the course of several years' association with him, this dissertation is respectfully dedicated in memory of

PROFESSOR IRWIN V. SPERRY

ACKNOWLEDGMENTS

It seems futile to attempt to express adequately the deep appreciation I feel toward all who have contributed to the accomplishment of this dissertation. A study of the experimental type here presented must always be the result of the generous cooperative efforts of a large number of people. In this instance the list of those to whom appreciation is due is too long to be included. However, I do wish to name certain persons to whom I feel especially indebted.

In particular, I am indebted to Dr. Irwin V. Sperry, Professor and Chairman of the Child and Family Development Area, School of Home Economics, and Director of the Institute for Child and Family Development, the University of North Carolina at Greensboro, whose untimely death prevented him from seeing the final outcome. He participated most generously in the planning of the study, and was ever ready with constructive criticism, encouragement and counsel. Therefore, it is with a real feeling of gratitude that I have dedicated this dissertation in memory of Dr. Sperry.

To Dr. Naomi G. Albanese, Dean of the School of Home Economics, under whose supervision this study was completed, and Dr. Mary Elizabeth Keister, Acting Chairman of the Child and Family Development Area, I wish to express my sincere appreciation for the understanding and considerate way in which they extended to me every opportunity and every means to carry on and to complete this study.

Four other individuals on my Dissertation Committee--Professors Kenneth E. Howe, Pauline E. Keeney, Vance T. Littlejohn, and Lyda Gordon Shivers--gave cheerfully and generously of their time. I express my admiration of them as well as my thanks.

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To Dr. Boyd R. McCandless, Professor of Educational Psychology, Emory University, whose red pencil culled most, if not all, of the grammatical and stylistic errors in a preliminary draft, I express not only my warmest thanks, but also, quite frankly, my envy.

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Perhaps the greatest influence upon this study was that given indirectly by Dr. Helen Canaday, Dr. Daniel F. Hobbs, Jr., Mrs. Stirling F. Rigg, and Mrs. William C. Singletary, who, through their class lectures and personal advice, have contributed immeasurably to my understanding of young children.

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Finally, to 156 wonderful children who, by their patience and friendly cooperation as experimental subjects, played so essential a role in the preparation of this dissertation, I express not only my gratitude but also my sincere wish that happiness and success will always be theirs in generous measure.

W. L. B.

May, 1967

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CHAPTER I

INTRODUCTION

A young child displays an almost insatiable interest in exploring his world and manipulating the objects in it. He continuously investigates and manipulates his toys and, in general, is extremely responsive to new sights and sounds. "With an object never observed before, he seems to be asking what will happen if he pushes it, drops it, eats it, tastes it, kicks it, smashes it, gets it wet, or throws it" (Rethlingshafer, 1963, p. 38). This apparent exploratory behavior in the young child has been interpreted by several writers as crucial because of its early ontogenetic appearance and the function it serves in helping the child to understand and maintain contact with his environment. White (1959, p. 321) writes:

> The child appears to be occupied with the agreeable task of developing an effective familiarity with his environment. This involves discovering the effects he can have on the environment and the effects the environment can have on him. To the extent that these results are preserved by learning, they build up increased competence in dealing with the environment.

Since the early 1950's, there has been an increasing interest by behavioral scientists in the systematic analysis of exploratory behavior. The rather extensive literature descriptive of studies dealing with the tendencies of human and nonhuman organisms to engage in exploratory activity has been summarized by Berlyne (1960), Butler (1965, 1960), Cantor (1963), Cofer and Appley (1964), Dember and Fowler (1958), Fiske and Maddi (1961), Lana (1960), and White (1959). A review of selected studies related to the present research will be presented in another section of this chapter. Suffice to mention, at this point, the results of all studies on exploratory behavior indicate that the responsiveness of an organism is highly dependent upon a diverse and changing external environment. It is important to mention also that severe restriction of external stimuli can markedly retard the development of an organism (Solomon, et al., 1957; Solomon, et al, 1961).

Statement of the Problem

One of the major problems in contemporary child development research is the discovery of suitable variables and hypotheses for relating a young child's early learning of environmental events to the large body of theory that exists on stimulus determinants of exploratory behavior. The problem is two-fold. First, certain attributes of external stimulation and certain stimulus selection behaviors of young children must be selected to serve, respectively, as antecedents and consequents of a learning and action equation. Then, second, hypotheses must be formed as to the relations between these two sets of variables.

These are not easy tasks. Obviously, the observable characteristics of a young child's early learning and exploratory activity, its phenomenal properties, are unique to each observer. For example, a kindergarten child tears the pages from a picture book. Reacting to his physical environment in this way may be moderately stimulating to the child. But it becomes a unique learning experience, and a much more exciting event for the child, when his action causes the kindergarten teacher to run to him, and his playmates to laugh. Casual observers will interpret the child's behavior in different ways: "independence," "disobedience," "destructiveness," "cute." Or it might be called "not having good sense."

Quite properly, it may be accounted all these things. But it is not likely that all of them are reasonable behavior consequents which should (or could) be usefully incorporated in a theory of learning or motivation. For research purposes and theory-building, this multiplicity must be reduced to an agreed-upon set of variables that will be measurable and ultimately helpful in constructing antecedent-consequent statements that permit the prediction, control, or accurate interpretation of the child's motives and his learning of environmental events. Berlyne (1954, p. 256) reflects on the problem:

> When we set out to inquire into a complex form of human motivation like curiosity, we find ourselves faced with a bewildering array of variables that may be relevant. The difficulty of knowing where to begin is, no doubt, one reason why little work in this area has been done. One indispensable aid is to have a theory to suggest relationships that are likely to repay investigation. But even then, the task may still seem baffling. There may be a vast network of factors involved, each making a comparatively slight contribution, and individual differences must be enormous. It seems therefore desirable to pass through an intermediate stage, if the project is to be practicable, namely an exploratory experiment. This would use small samples of subjects and sound the effects of several variables at once. It may well prove too insensitive to permit definitive conclusions about some of the relationships it studies. But it can save us from many a costly blind alley by confirming that certain lines of research are worth pursuing.

To the extent that a child's behavior is influenced by his responsiveness to external environmental conditions, an understanding of external stimulation and the stimulus-exploratory behavior relationship is vital to interpretation of the significance of these factors as a motivational process underlying a child's early learning. Therefore, the present research is an "exploratory experiment," designed to investigate the effects of certain external stimulus events by which a young child's investigatory behavior may be maintained, extinguished, strengthened, or weakened.

The specific purpose of the experiment is to determine and compare the effects of recency of habituation of varied auditory, visual, and audio-visual stimuli on the perceptual investigatory responses of kindergarten children.

Definitions of Terms

Before proceeding to a discussion of selected studies and certain theoretical considerations related to the present research, an attempt is made in this section to delineate and define, operationally, certain terms that are used repeatedly in this dissertation.

Exploratory Behavior. In the present study, exploratory behavior is used in the same sense as Maddi (1961, p. 254) used it, i.e., as a descriptive term referring to "any behavior that indicates interest in, or particular attention to one portion, as opposed to the rest, of the surround . . ."

Berlyne (1960) divided exploratory behavior into three categories according to the types of responses that comprise it: (a) *orienting responses*--exploratory responses consisting of changing in posture, in the orientation of sense organs, or in the state of sense organs; (b) *locomotor exploration*--exploratory responses that consist of locomotion; and (c) *investigatory responses*--exploratory responses that affect changes in external objects by manipulating them.

In the present experiment, *perceptual investigatory responses* are defined, operationally, as rubber bulb-pressing responses by subjects during testing sessions.

Habituation. There are three prominent interpretations of habituation in behavior theory and neurophysiology. They are the *exhaustive*

(Mowrer, 1960), inhibitory (Pavlov, 1927; Hernandez-Peron, 1961), and the anticipatory (Galambos, 1960). Regardless of interpretation, however, the observation that ". . .repeated or continued exposure to the same physical stimulus influences both its arousal potency and its effect on the acts which follow" (Maddi, 1961, p. 193) is well-known.

In the present study, habituation is the procedure of exposing subjects to auditory, visual, or audio-visual stimuli for 5-minutes during preliminary (habituation) sessions.

Recovery. Recovery is the return of an organism to its normal state after exposure to stimuli (English and English, 1958, p. 445). Butler (1957) found that the longer the time since previous stimulation, the greater the recovery of the initial reactivity. Welker (1961, p. 194) states:

> In the absence of stimuli to which habituation has developed (for example, during periods between successive presentations), there is some degree of recovery of the initial reactivity . . .the degree to which such 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. That is, there is a return toward the initial novelty value of the stimulus.

In the present study, recovery from habituation is operationally defined as the amount of increase or decrease in subjects' investigatory responses during testing sessions.

Additional operational definitions used in the present study are:

Experimental Stimuli. Experimental stimuli are the varied sounds and color-pictures that are presented to subjects during preliminary and testing sessions.

Novel Stimuli. Novel stimuli refer to experimental stimuli that are not presented to subjects during preliminary sessions.

Familiar Stimuli. Familiar stimuli refer to experimental stimuli that are presented to subjects during preliminary sessions.

Preliminary (Habituation) Session. A preliminary session is a 5-minute period when a subject is habituated to auditory, visual, or audio-visual stimuli.

Testing Session. A testing session is a 5-minute period when a subject responds for auditory and/or visual stimuli.

Short Delay. Short delay refers to the 5-minute interval between preliminary and testing sessions.

Long Delay. Long delay refers to the 5-day interval between preliminary and testing sessions.

Cubicle. The term cubicle refers to an "experimental room" where subjects are seated during preliminary and testing sessions.

General Theoretical Considerations

Historically, theorists in a number of areas have focused in some way or another on the motivational processes underlying exploratory behavior. Weber and Fechner (Boring, 1963) were among the first who related physical stimulus properties and psychological response properties. Dewey (1896) noted the importance of identifying the external stimulus and pointed out that the subject does not know how to respond until he knows the nature of the stimulus. Freud (Brill, 1938) indicated that the impulse for knowledge and investigation is derived from the desire to acquire external objects, and is a function of repressed sexual instincts. McDougall (1908) explained all behavior in terms of instinct theory and cited the tendency "to explore strange places and things" as one of man's "innate propensities" (McDougall, 1908, p. 97). The "orientation reaction" was a phenomenon of interest to Pavlov (1927) and he commented on it extensively. At different times he called it the "investigatory" and "what-is-it?" reaction, and in one passage describes it as follows:

> It is the reflex which brings about the immediate responses in man and animals to the slightest changes in the world around them, so that they immediately orientate their appropriate receptor organ in accordance with the perceptible quality in the agent bringing about the change, making a full investigation of it. The biological significance of this reflex is obvious. If the animal were not provided with such a reflex its life would hang at any moment by a thread. In man this reflex has been greatly developed with far reaching results, being represented in its highest form by inquisitiveness--the parent of that scientific method through which we hope one day to come to a true orientation in knowledge of the world around us (Pavlov, 1927, p. 12).

Numerous learning theorists (Berlyne, 1960; Brown, 1953; Harlow, 1953; Hull, 1951; Skinner, 1938; Tolman, 1955) have noted the importance of stimuli as activators and/or directors of exploratory behavior. Other theorists (Dollard and Miller, 1950; McClelland, Atkinson, Clark, and Lowell, 1953; Rotter, 1954) have also dealt at a general level with the relations between stimuli (cues or situations) and behavioral occurrences.

Researchers studying personality variables (Atkinson, 1958; Eriksen, 1952; Zuk, 1956) have provided evidence that stimulus properties can be ordered on the basis of their response "pull" and that response strengths (attitudes) can be assessed in relation to these ordered stimulus properties.

Thus, there is a general consensus among these writers as to the presence of a stimulus-behavioral occurrence relation. However, there is not generally clear specification of, or agreement about, the nature of this stimulus-behavioral occurrence relation.

Cognitive Structure and Exploratory Behavior

Theoretical formulations by theorists such as Bartlett (1958), Berlyne (1960), Festinger (1957), Hebb (1949), Hunt (1960), Maslow (1954), Piaget (1952), and White (1959), focus attention upon the interrelations between an individual's cognitive structure and his responsiveness to the external environment. While these formulations differ from one another both in rigor and the types of situations to which they typically are applied, they agree in emphasizing the interdependence among elements of a cognitive structure. Each conceptualization defines certain sets of relations among cognitive elements as "balanced," and each postulates that states of imbalance tend to become resolved into balanced states.

Several of these theorists have attempted to explain approach-avoidance reactions to novelty in terms of cognitive structure. Thus, Hebb (1949) postulated that certain external stimuli disrupt established neural circuits of the organism and arouse incompatible perceptual or cognitive processes. Hebb hypothesized that it was the partially strange stimuli, rather than the completely familiar or unfamiliar stimuli, which disrupt the established neural patterns and cause an organism's avoidance or approach behavior.

Piaget (1952) explained adaptation to the unfamiliar in terms of "cognitive equilibrium." He theorized that organization of schemata evolves through two distinct processes: (a) assimilation--the fitting of an environmental event to an available category or classification scheme; and (b) accommodation--the development of a new category when an environmental event does not match or fit any available scheme. Presumably, unfamiliar stimuli cause "imbalance" of these cognitive processes, and "equilibrium" does not occur until adaptation to the stimuli is achieved.

Berlyne (1960) indicated that approach-avoidance behavior is produced by "perceptual" and/or "cognitive conflict." He conceptualized conflict as a primary mechanism, with novelty, complexity, and incongruity as factors which increase it. According to Berlyne, exploratory behavior serves to increase familiarity with the environment, and as external stimuli become familiar, cognitive conflict is reduced.

Hunt (1960) reviewed the theoretical speculations of Hebb (1949) and Piaget (1952) and proposed an "incongruity-dissonance" hypothesis to explain approach or avoidance behavior in novel situations. He suggested that such actions facilitate basic information processing to maximize accurate anticipation of reality. Thus, in accordance with the speculations of Hebb (1949) and Piaget (1952), exploratory behavior would increase familiarity, reduce conflict, and allow the cognitive processes to maintain a state of equilibrium.

Berlyne's Theory

Although both Dashiell (1925) and Nissen (1930) wrote about "curiosity" drives, interest in the phenomena was minimal until Berlyne (1950) proposed that novel stimuli give rise to the motivational state of curiosity, with functioning based on two postulates: (a) when a novel stimulus falls upon an organism's receptors, there will occur drive-stimulus-producing responses called curiosity, and (b) as a curiosity-arousing stimulus continues to impinge upon an organism's receptors, curiosity will diminish. In addition, these postulates had three corollaries derived from Hull's (1943) two-factor theory of inhibition: (a) the behaviors that increase such stimulations will be reinforced; (b) after a time, exploration will cease; and (c) after a further lapse of time, there will be a second stage of exploration but less than the first spontaneous recovery. According to Berlyne's formulation, the prominent features of exploratory behavior are: (a) heightened interest in novel stimuli; (b) habituation of interest with continued exposure; and (c) recovery of responsiveness during unstimulated periods.

It should be noted that about the same time Berlyne (1950) posited the existence of a curiosity drive, Montgomery (1951) published the first of a series of experimental studies supporting the presence of what he termed an "exploratory drive." The exploratory drive, Montgomery proposed, was also aroused by novel stimulation which evoked exploratory behavior. Such behavior decreased with the time that the organism was exposed to the stimulus but recovered during the period of nonexposure.

Related Research

In this section selected studies bearing on the present experiment are reported. The writer does not intend to present a complete review of previous work, but to indicate only the more significant studies related to the present research.

Investigatory Responses in Nonhumans

Barnes and Kish (1958) reported an experiment that illustrates, quite effectively, the investigatory response in its simplest form. Mice were given access to two bars, both of which could be pressed, but only one of which caused an increase in illumination. The mice pressed this bar significantly more than the other.

The most widely known experiments on the investigatory response in monkeys are those from Harlow's laboratory. Harlow, Harlow, and Meyer (1950) provided four experimental rhesus monkeys with 12 days' experience in manipulating an assembled mechanical puzzle, the solution of which did not lead to any special incentive such as food or water. Four other monkeys had disassembled puzzles placed in their cages for the same period of time. The performance of the two groups was then compared by noting the monkeys' investigatory responses to the assembled puzzles for 5-minute periods on the next two days of the experiment. The results indicated that the experimental monkeys were significantly more efficient than their controls when measured by total number of solutions. The experimental monkeys showed a total of 31 solutions and the controls four solutions in 40 tests used. On the basis of these results the investigators postulated a "manipulation drive" to account for learning and maintenance of the performance. It was hypothesized that drives of this class represent forms of motivation which may be as primary and as important as the homeostatic drives, i.e., hunger, thirst, etc.

A second study by Harlow (1950), with a more complex puzzle, found that two monkeys worked repeatedly at disassembling the puzzle for 10 continuous hours even though they were apparently free of homeostatic need.

Butler (1957) tested rhesus monkeys in a sound-treated booth located in a room adjacent to one housing a monkey colony. A microphone and an amplifier, placed in front of the colony, were connected to a loud-speaker which was fastened to the top of the test cage. Inside the test cage were two levers fixed to opposite walls. Pressing one of the levers was followed by sounds emitted from the colony. No sound "reward" was given when the other lever was pressed. The results showed that monkeys selected the lever that provided auditory stimulation more frequently than they did the control lever. When the auditory stimuli became associated with the opposite lever, the performance of the monkeys was modified accordingly, in that investigatory responses decreased for the original lever and increased to the lever newly associated with the auditory stimuli.

Butler (1958) indicated that monkeys will consistently press a lever more frequently to hear certain sounds than they will to hear others. For example, the sound of a monkey calling to its cage-mate had a much greater incentive value than the sounds of an enraged monkey colony or the sound of a barking dog.

Investigatory Responses in Humans

It is reasonably evident to even the casual observer that healthy children, from infancy on, respond by inspecting and manipulating objects in their environment. Piaget (1952, p. 269) reported investigatory responses made by his son, Laurent, at 10 months and 11 days:

> He grasps in succession a celluloid swan, a box, and several objects, in each case stretching out his arm and letting them fall. Sometimes he stretches out his arm vertically, sometimes he holds it obliquely in front of or behind his eyes. When the object falls in a new position (for example on his pillow) he lets it fall two or three times more on the same place, as though to study the spatial relation; then he modifies the situation.

In a series of experiments conducted by Berlyne (1957), the adult subject was seated in a darkened room facing a tachistoscope. The subject could look at any particular figure as often as he liked. When he had seen enough of one stimulus, he was to say "Yes." Everytime he pressed a lever, a figure in the tachistoscope became visible for 0.14 second, and the experimenter would replace it with a new one. Each subject took part in four experiments, designed to reveal the influence of different variables on the number of investigatory responses of the subjects. The investigator identified four stimulus properties that caused the subjects to make investigatory responses: (1) incongruity, (2) complexity, (3) surprisingness, and (4) irregularity. The stimuli used in this experiment are shown in Figure 1.

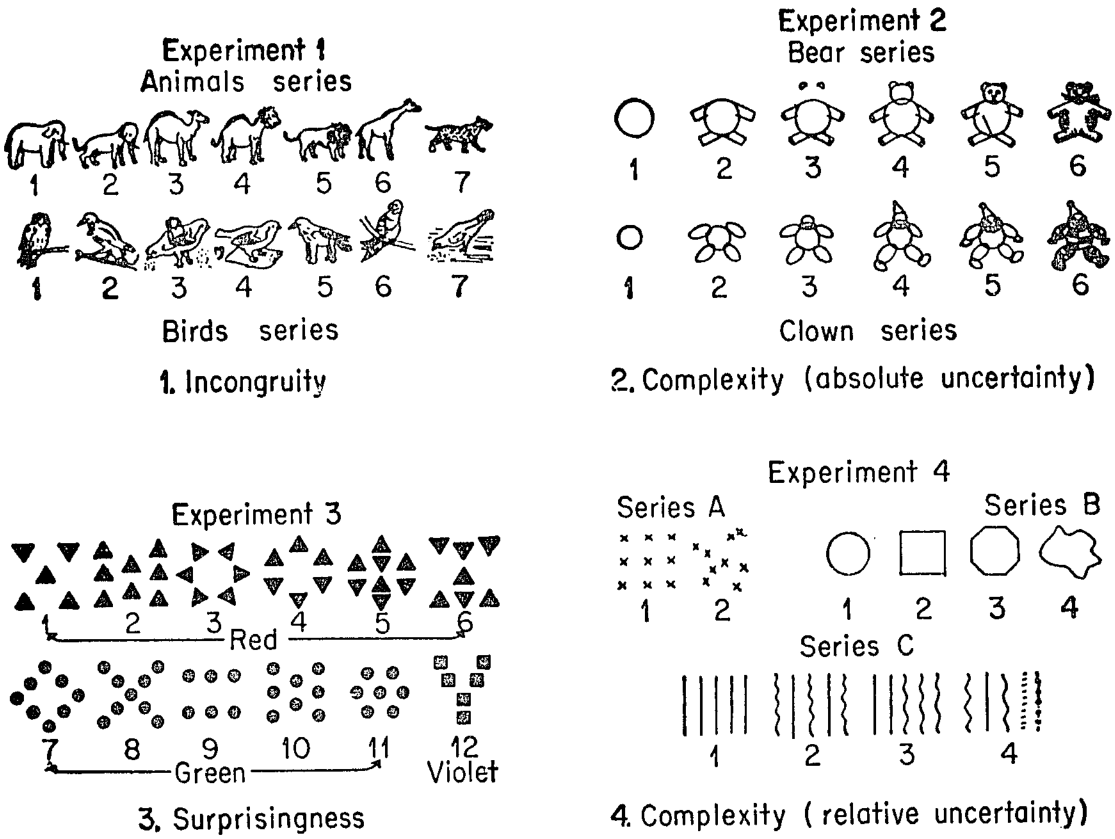


Figure 1. Berlyne's Experimental Stimuli. (From Conflict, Arousal, and Curiosity by D. E. Berlyne. Copyright, 1960. Used by permission of McGraw-Hill Book Company.)

In experiment I, it was found that such incongruous pictures as animals 2 and 4, and birds 3 and 5, were responded to by more investigatory responses than pictures of normal animals and birds. In experiment II, there was a series of six figures developing, by progressive addition of material, from a circle into a picture of a bear, and a similar series developing from a circle into a picture of a clown. The mean number of investigatory responses per stimulus increased with the increased degree of complexity, whether a series was presented in numerical order from 1 to 6, or in random order. The stimuli in experiment III contained geometric figures of colored spots. Stimuli 1 to 6 were made up of red triangles, 7 to 11 of green circles, and 12 of violet squares. Surprisingness was identified by stimuli 7 and 12, since they both differed in form and color from the preceding stimuli.

These stimuli were responded to more by investigatory responses than were stimuli 2 through 6 and 8 through 11. In experiment IV, the more irregular stimuli attracted more investigatory responses.

Burgess (Berlyne, 1957), using essentially the same stimuli with young children, did not find significant differences in the investigatory responses of the children, although their general response level was much higher. The data was not definitive because the exposure time in Burgess' study (.014 second) was shorter than that employed by Berlyne. Berlyne (1957) offered no clear explanation for the lack of effect of the stimuli on the investigatory responses of the children. However, he did conclude that the higher response level of the children was not due to the shorter exposure time alone, because four adults tested at Burgess' time interval responded at approximately the same level as the original adult group.

The results of a study by Ghent (1960) helps to resolve some of the discrepancy between the studies by Berlyne and Burgess. Ghent found that the "span of apprehension" is longer in children and they require longer exposure durations in order to differentiate stimuli.

In a study by Mendel (1965), preschool children were given a choice of playing with one of five arrays of toys, each array containing eight toys. For the experimental subjects, the five arrays differed in the number of toys that had been used during an earlier habituation play period, the percentage of novel toys being 0, 25, 50, 75, or 100. Control subjects did not play with the toys during the habituation period. The number of experimental subjects choosing each array was an increasing function of the percentage of novel toys in the array; in contrast, the control subjects demonstrated no consistent trend in their choices of the same five arrays of toys.

Cantor, Cantor and Ditrichs (1962) designed a study to investigate the relationship between stimulus complexity and observing responses in preschool children. Stimulus complexity, after Berlyne (1957), was defined as the amount of variety or diversity in a stimulus pattern. The experimenters found that children responded significantly more to high complexity stimuli than to stimuli which contained a low or medium degree of complexity.

In summary, the general conclusions that can be drawn from the theoretical considerations and research discussed thus far indicate that: (a) novel stimuli evoke more investigatory responses than familiar stimuli; (b) investigatory responses for novel stimuli decrease as a function of time in the presence of the novel stimuli; and (c) the more different novel and familiar stimuli are in their properties, the greater the effect of novelty on investigatory responses.

These conclusions, taken together, serve as a basis for deducing a general hypothesis concerning the investigatory response patterns of subjects in the present experiment. This hypothesis concerns expected patterns among visual preference scores of experimental subject-groups, with individual subjects' scores computed by the following formula:

$$\text{Visual Preference Score} = \frac{\text{Visual Responses}}{(\text{Visual Responses} + \text{Auditory Responses})}$$

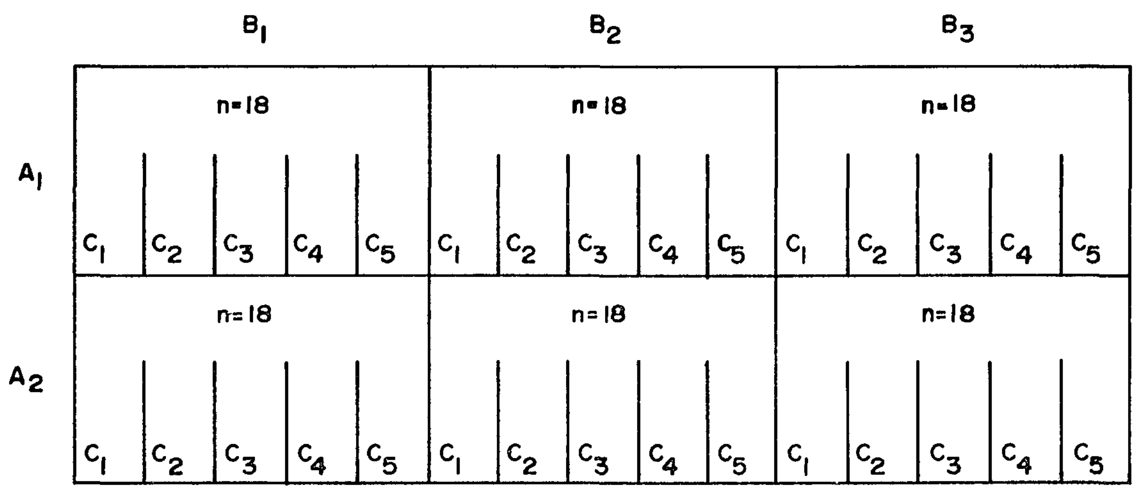
The general hypothesis is: a child's investigatory response patterns during five consecutive 1-minute periods of testing are a function of the amount and type of preliminary habituation he receives, the delay interval between his preliminary and testing sessions, and the frequency and type of stimulus exposures he makes during his testing session.

Two delay intervals and three types of habituation are to be studied in this experiment. The delay factors are 5-minutes and 5-days. The types of habituation are auditory, visual, and audio-visual. Factorial analysis of variance makes it possible to analyze the independent and interactive effects of these variables on the investigatory responses of the children during five minutes of testing. This experimental design also yields four research hypotheses which are tested in lieu of the general hypothesis stated on the preceding page.

CHAPTER II

EXPERIMENTAL DESIGN, HYPOTHESES AND METHOD

The basic design for this experiment is a 2 x 3 x 5 factorial plan with two types of delay, three types of habituation, and five consecutive 1-minute periods of testing. An analysis of variance for repeated measures on the same subjects, as described by Edwards (1960, pp. 233-246), was performed on the visual preference (VP) scores of the 18 subjects in each of the experimental conditions. As an aid to clarity, the main combinations of factors can be conceptualized as the model diagramed in Figure 2.



MODEL OF THE EXPERIMENTAL DESIGN

Figure 2

The first factor (A) is delay. The A_1 group is composed of those subjects who had only a 5-minute delay period between the preliminary session and the testing session. The A_2 group had a 5-day delay period between the habituation session and the testing session.

The second factor (B) represents the type of habituation. The B_1 group is composed of subjects who received auditory habituation, the B_2 group received audio-visual habituation, and the B_3 group consists of subjects who received visual habituation.

The third factor (C) represents the five consecutive 1-minute periods of testing: C_1, C_2, C_3, C_4, C_5.

Statement of Hypotheses

The experimental design described above permits the testing of the following major hypotheses:

I. There are differences in subjects' mean VP scores resulting from varied types of habituation.

II. There are differences in subjects' mean VP scores resulting from the interaction of amount of delay and type of habituation.

III. There are differences in subjects' mean VP scores resulting from the interaction of type of habituation and minutes of testing.

IV. There are differences in subjects' mean VP scores resulting from the interaction of amount of delay, type of habituation, and minutes of testing.

Additionally, specific directional hypotheses are proposed which predict relationships that are expected to exist among the six experimental groups. To test these minor hypotheses, single factor analyses of variance are employed. Specifically, it is predicted that:

A. Mean VP scores are greatest for subjects in the SA (short delay auditory) group, next greatest for subjects in the SAV (short delay audio-visual) group, and least for subjects in the SV (short delay visual) group.

B. Mean VP scores are greatest for subjects in the LA (long delay auditory) group, next greatest for subjects in the LAV (long delay audio-visual) group, and least for subjects in the LV (long delay visual) group.

C. Mean VP scores are greater for subjects in the SA group than for subjects in the LA group.

D. Mean VP scores are greater for subjects in the LV group than for subjects in the SV group.

Method

Subjects

The population for this study consisted of 144 children, with mean age of 5.7 years (range 5.5 to 5.11), drawn from three church-related kindergartens in Greensboro, North Carolina. This age level was chosen as a compromise between the desire to select subjects as young as possible, so as to maximize their reliance on perceptual processes, and the requisite that the child have adequate motor ability to respond effectively to the manipulanda used in the experiment.

Thirty six of these children, with an equal distribution of boys and girls, were randomly selected from each kindergarten. Within each of these groups, subjects were randomly assigned to six experimental conditions, maintaining for each condition an equal number of boys and girls. The remaining 36 children, with an equal number of boys and girls, were assigned to a "replacement" group. Children were randomly selected from this group to replace experimental subjects who, for various reasons, were unable to complete the experiment.

Twelve subjects in the experimental groups were replaced for the following reasons: (a) habituation requirements of two subjects were not satisfied due to a malfunction of the automatic apparatus used for presenting the experimental stimuli; (b) four subjects refused to accompany the experimenter to the cubicle; (c) six subjects failed to complete the experiment due to illness.

Table 1 summarizes the representation of subjects by socio-economic classification.

TABLE 1

SOCIO-ECONOMIC STATUS OF SUBJECTS' FATHERS MEASURED BY EDWARD'S OCCUPATIONAL SCALE

Classification	n	Percentage
Professional Persons	56	38.9
Proprietors, Managers, Officials	29	20.1
Clerks and Kindred Workers	37	25.7
Skilled Workers and Foremen	14	9.7
Semiskilled Workers	5	3.5
Unskilled Workers	0	.0
Deceased or Unknown	3	2.1
Total	144	100.0

Socio-economic characteristics of the population sampled were assessed by rating fathers' occupations. The scale used to measure the relative social rank of occupations was developed by Edwards (1943) at the Bureau of Census, and is the general occupational classification used in the censuses of 1940 and 1950.

The largest percentage of subjects' fathers were professionally trained workers who were engaged chiefly in intellectual pursuits, as contrasted with other service pursuits and pursuits directly related to the production, exchange, and distribution of goods. Proprietors, managers, and officials, in combination with the clerks or "white collar" workers, contain the majority of the remaining fathers. Relatively few "blue collar" workers and no unskilled workers were included in the sample.

Table 2 shows the sex, age, and intelligence characteristics of the children in each of the groups. All intelligence testing and scoring was done by the experimenter within one month of the child's participation in the experiment. The Peabody Picture Vocabularly Test, individually administered, was used for this purpose. No statistically significant differences were found within each group between means or variances for these variables. These subjects were assigned to groups without regard to other variables.

Stimuli

1. Auditory

Five random sequences of 12 different sounds were used as the auditory stimuli in the experiment. The sounds were recorded, on tape, from two *Authentic Sound Effects* records (Volumes 2 and 4).[1] Each sound in each sequence was recorded on tape for 5-seconds. The recorded sounds, arbitrarily selected by the experimenter, are as follows:

Volume 2	Volume 4
steam locomotive	bacon frying
horse walks	San Francisco cable car
milking machine	windshield wipers
cuckoo clock	pile driver
calculator	pigs
dog howling	New Year's Eve (Time's Square)

[1] Records were purchased from The Electra Corporation, 116 West 14th Street, New York City.

TABLE 2

SEX, AGE, AND INTELLIGENCE CHARACTERISTICS OF SUBJECTS IN EACH GROUP

Group	n	Sex		Mean C.A.	Mean M.A.	Mean I.Q.
		Male	Female			
Short Delay Auditory	18	9	9	5.7	6.6	105.6
Long Delay Auditory	18	9	9	5.7	6.3	107.2
Short Delay Visual	18	9	9	5.6	6.4	106.3
Long Delay Visual	18	9	9	5.7	6.5	105.8
Short Delay Audio-Visual	18	9	9	5.8	6.5	107.3
Long Delay Audio-Visual	18	9	9	5.6	6.4	106.4
Replacements	36	18	18	5.7	6.4	105.4
Total	144	72	72	5.7	6.4	106.3

2. Visual

Five random sequences of 12 different 35-millimeter color-picture slides were used as the visual stimuli in the experiment. The slides were selected arbitrarily by the experimenter from Meston's Color Slide Catalog (Vol. 3 No. 2).[1] Each slide in a sequence was changed automatically by a timing switch on a slide projector. The 35-millimeter color-picture slides selected by the experimenter are as follows:

4409B	Indian Tepee	1386A	Roping a Cow
CC-9	Vanguard Rocket	5780C	Vacation (cartoon)
156D	Happy Birthday (cartoon)	7070A	Diego Rivera Mural
865A	French Dome Train	5842B	Old Faithful
5975B	Scarlet King Snake	5956B	Camels
300A	Rolls Royce	5905A	Cactus Blooms

Apparatus

An effort was made to present the habituation treatments in a way that would create the semblance of a game and spontaneously arouse the child's interest and motivation. The apparatus shown in Figure 3 added considerable appeal to the experimental setting. The face of a clown, held upright on the floor by four cement blocks, was enameled in white, blue, red, and yellow on a 3/4 inch plywood board, measuring 4-feet by 4-feet. The clown's face had a large open mouth (8 inches in diameter) covered by a piece of 1/8 inch flashed white opal glass attached to the backside of the plywood board. The plywood board was located approximately 6½-feet from a small table and chair, where the child sat during preliminary and testing sessions. During testing sessions, two manipulanda (rubber bulbs) were mounted on the table. The clown face, table, and chair were enclosed by three cardboard screens, approximately 5-feet in height.

[1]Color-picture slides were purchased from Meston's Travels, Inc., 3601 North Piedras, El Paso, Texas.

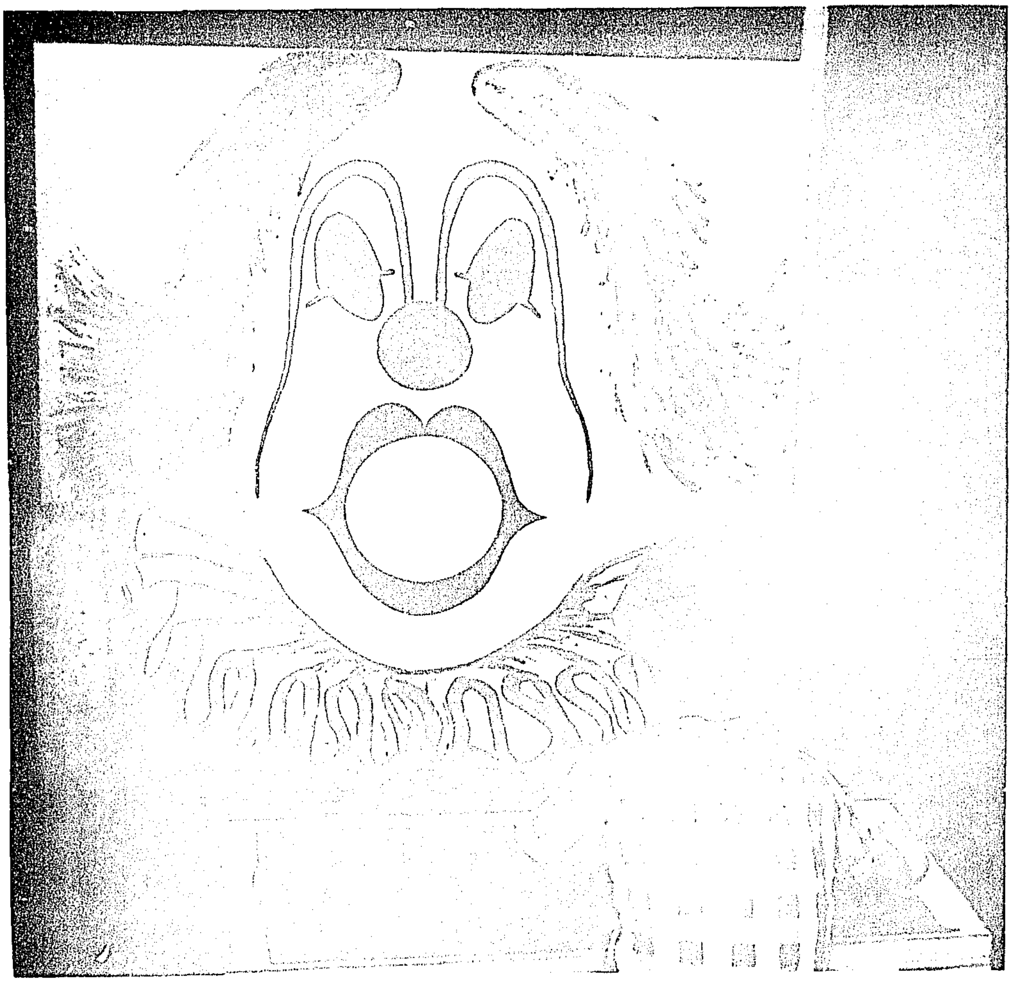


Figure 3. Photograph Showing Clown Face, Table, and Child Pressing Manipulanda.[1]

[1] ROWI-pneu rubber bulbs and tubes, distributed by Edmund Scientific Company, Barrington, New Jersey, were used as manipulanda in the experiment. This equipment operates on a pneumatic principle, so that hand pressure on the bulbs affect the release of shutters on the tachistoscopic lenses. Each bulb is 3.75 inches in diameter.

A Sawyer 700-R 35-millimeter slide projector with an automatic timing unit was used to project the visual stimuli on the back surface of the transluscent glass, so that the stimuli appeared in the clown's mouth. The slide projector produced a luminance level of approximately 200-L, measured by a Gossen Lunar-Pro Exposure Meter at the outside surface of the glass. An Alphax tachistoscopic lens was mounted on the slide projector lens, and the child could control the presentation of visual stimuli during testing sessions by pressing the appropriate manipulandum attached to the table in front of him.

A photoelectric cell attached to a tachistoscopic lens mounted on a film strip projector activated the auditory stimuli from a tape recorder. The projector served as a light-source for this operation. A 5-inch speaker, placed 4½-feet behind the clown face, transmitted the auditory stimuli to the child when he pressed the appropriate manipulandum. The speaker provided an auditory stimulus with an intensity level of approximately 80 decibels as measured 4-feet in front of the speaker by a Dawe Sound Level Meter (Type 1400-D). A potentiometer regulated the light sensitivity level of the photoelectric cell. The appearance and placement of the apparatus described above is shown in Figures 4 and 5. Additional equipment included a stopwatch measuring to the nearest .01 second.

Pilot Study

Prior to the experiment 12 children (6 boys and 6 girls), with the same age range as the population for the study, were tested in order to (a) develop procedures for administering the experimental sessions; (b) test the efficiency of the apparatus; (c) select auditory and visual stimuli of approximately equal preference value; and (d) determine the most functional period of time for the preliminary and testing sessions.

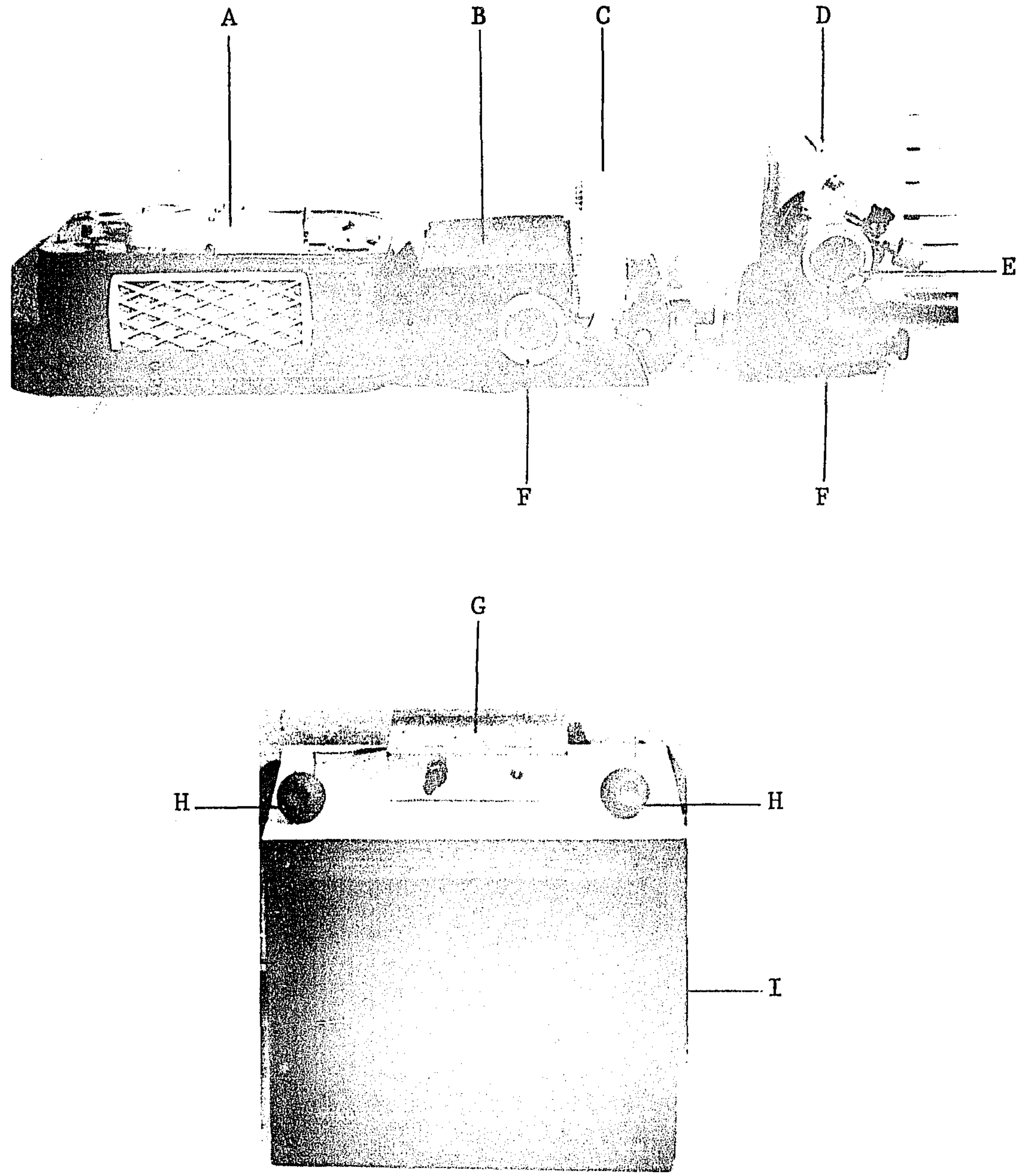


Figure 4. Photographs of Equipment Used to Present Auditory, Visual, and Audio-Visual Stimuli During Preliminary and Testing Sessions.

Upper Photograph: Tape Recorder (A); Slide Projector (B); Slide Tray (C); Film Strip Projector (D); Photo-electric Cell (E); Tachistoscopic Lenses (F).

Lower Photograph: Potentiometer (G); Manipulanda (H); Speaker (I).

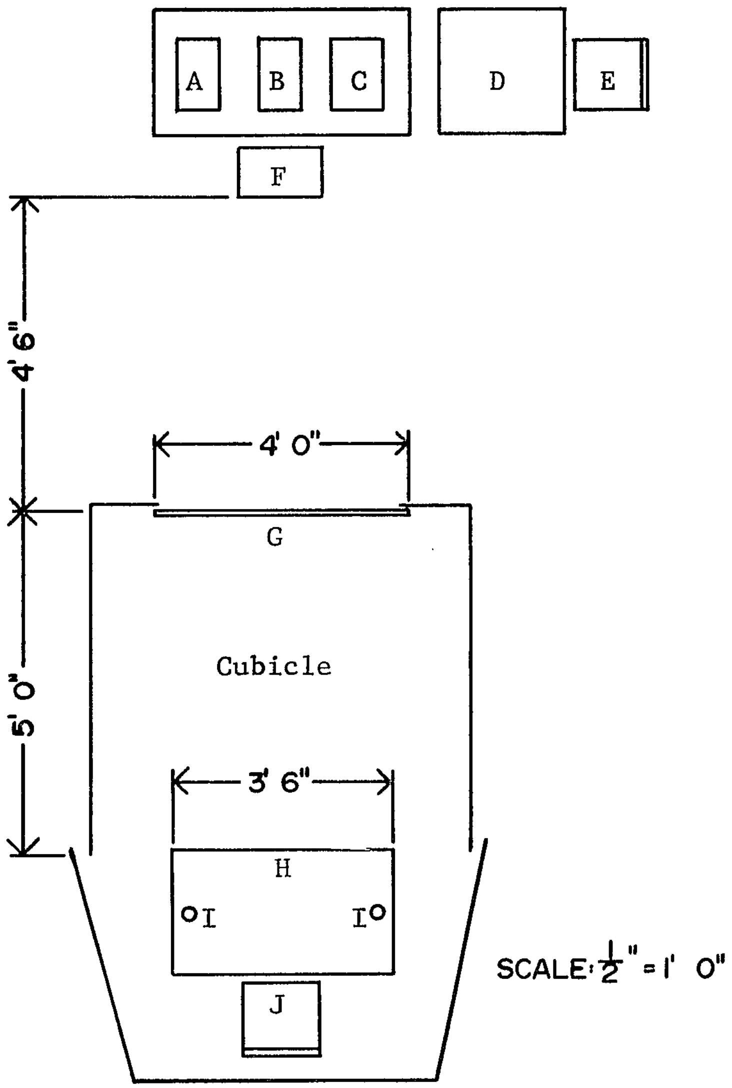


Figure 5. Diagram of the Experimental Setting, Showing Location of Tape Recorder (A); Slide Projector (B); Film Strip Projector (C); Experimenter's Table (D); Experimenter's Chair (E); Speaker (F); Clown Face (G); Child's Table (H); Manipulanda (I); Child's Chair (J).

Results of pre-testing suggested 5-minutes as an appropriate duration for the testing and preliminary sessions. This period represents the mean number of minutes at which the children spontaneously ceased to respond to the manipulanda. This group was also employed to determine if there were any statistically significant sex differences in responses for auditory and/or visual stimuli, and if there were any statistically significant stimuli preferences. In both instances, analyses of variance on raw response scores indicated that no differences existed. However, the group did demonstrate a slight preference for the visual stimuli.

Procedure

Prior to the experimental sessions, the experimenter spent a day participating in kindergarten activities and becoming acquainted with the children. Whenever it appeared necessary, additional time was spent with a child just before the habituation session in order to assure good rapport.

Preliminary (Habituation) Session. The children were escorted individually into a quiet room in which the experimenter and subject were alone. During the habituation session, the child was seated at a small table directly in front of the clown face (see Figures 3 and 5). The experimenter was seated to the child's left side. When the child was comfortably seated, the experimenter said, "X, this is Bobo, the clown. Say 'hi' to Bobo." Whether or not the child responded, the experimenter turned on a toggle switch (concealed under the table) that activated the tape recorder, projectors, photoelectric cell, and the potentiometer. Then the experimenter pressed one or both of the manipulanda mounted on the table and said, "Bobo says 'hi' to you!" Pressing the manipulanda affected the release of the tachistoscopic shutters so that stimuli were presented to the child.

For subjects assigned to the auditory habituation treatment, the experimenter pressed the manipulandum that presented varied sounds. The alternate manipulandum was pressed for subjects assigned to the visual habituation treatment, and color-pictures were presented. Both manipulanda were pressed, simultaneously, for subjects who received audio-visual habituation, and color-pictures and sounds were presented simultaneously. The presentation of stimuli was programmed so that each subject received five consecutive minutes of exposure to the experimental stimuli.

Testing Session. When the habituation treatment was concluded, subjects who were assigned to the long delay (5-day) treatment were escorted back to the kindergarten teacher. Subjects assigned to the short delay (5-minutes) treatment remained in the cubicle with the experimenter. A stopwatch was started to mark the beginning of the short delay period.

The following instructions were given by the experimenter prior to the testing sessions:[1]

"Now, X, I am going to let you play with Bobo. Watch me press this rubber bulb. (E presses a 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 few minutes, when you press this bulb (E presses manipulandum), Bobo will make some sounds for you, and when you press this bulb (E presses the other manipulandum), Bobo will show you some color-pictures. Won't that be fun? Remember, you may press either bulb,[2] and you may change hands, if the one

[1] Subjects who received short delay treatments were given the instructions immediately following termination of the preliminary session.

[2] The manipulanda mounted on the table were approximately 3-feet apart (see Figure 5). Therefore, it was very difficult for the child to press the manipulanda simultaneously.

you are using becomes tired."

"Now I am going to leave the room (cubicle) 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!" The experimenter then left the cubicle and went behind the plywood panel to wait until 5-minutes had elapsed before signaling the child to begin the motor task.

The stimuli presented during the preliminary session served as the "novel" and "familiar" stimuli during the testing session. Each stimulus (auditory and/or visual) was presented for a period of 1-second each time the child pressed a manipulandum. In order to control for hand preferences,[1] the positions of the manipulanda were alternated. For half of the subjects, with an equal distribution of boys and girls, the visual-bulb was mounted at the right-hand position. For the remaining subjects, the visual-bulb was mounted at the left-hand position.

During the testing session, the experimenter was seated at a table (see Figure 5), where he monitored the equipment and recorded the child's responses for auditory and/or visual stimuli on a data sheet (see Appendix C). A stopwatch was used to mark each minute of testing.

When the testing session was concluded, the experimenter returned to the cubicle and said, "X, did you have fun playing with Bobo? I may invite some of your friends in 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?" Then the experimenter escorted the child back to his teacher.

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[1] By the end of the second year about 85 per cent of all children are predominantly right-handed. Stability of preference, however, is not established until the age of six, at which time the percentage of left-handedness (7 per cent) roughly approximates that found in the adult population (Hildreth, 1949).

CHAPTER III

RESULTS AND DISCUSSION

The purpose of the experiment was to determine and compare the effects of recency of habituation of varied auditory, visual, and audio-visual stimuli on the perceptual investigatory responses of kindergarten children.

The number of investigatory responses, i.e., bulb-pressing responses, were recorded separately for each child during each minute of testing. These responses were designated auditory responses if they resulted in the presentation of sounds or visual responses if they resulted in the presentation of color-pictures. The original scores, which are given in Appendix A, were transformed to visual preference scores by the following formula: $VP = \frac{V}{(V+A)}$, where VP is the visual preference score of a subject, V is the frequency of his visual responses, and A is the frequency of his auditory responses. These data are presented in Appendix B.[1]

An analysis of variance for a 2 x 3 x 5 factorial design for repeated measures on the same subjects, as described by Edwards (1960, pp. 233-246), was performed on the VP scores of 18 subjects in each of six experimental groups in order to test four major hypotheses. Additionally, single factor analyses of variance were employed to test four minor hypotheses. Cochran's Test of Homogeneity of Variances (Dixon and Massey, 1957, p. 438) was computed to test the assumption of equal variances among the six experimental

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[1] It should be noted that: (a) a mean VP score of .500 (50 per cent) indicates that subjects made an equal number of auditory and visual responses; (b) a mean VP score above .500 indicates that subjects made more visual choices than auditory choices; and (c) a mean VP score below .500 indicates that subjects responded more often for visual stimuli than for auditory stimuli.

groups. The calculated value was .2790. Since the criterion value for the .05 level of confidence is .3135, the null hypothesis was accepted and the variance was considered homogeneous.

Table 3 summarizes the overall mean VP scores for subjects in the six experimental groups. Total row means may be used to compare the effects of delay, while total column means may be used to compare the effects of habituation. The six cell means include the interaction effect of delay and habituation and are referent points for testing the minor hypotheses.

TABLE 3

MEAN VISUAL PREFERENCE (VP) SCORES FOR DELAY AND HABITUATION

Delay	Habituation			Total
	Auditory	Audio-Visual	Visual	
Short	.750	.513	.259	.507
Long	.578	.506	.463	.515
Total	.664	.509	.361	.511

Main Effects of Delay and Habituation. A summary of the analysis of the 2 x 3 x 5 factorial design, showing the linear and quadratic components of the interaction with minutes sums of squares, is given in Table 4. The main effect of delay was not significant. The mean VP score for subjects under the short delay treatment was .507, while the mean VP score for subjects under the long delay treatment was .515. Consequently, the effect of delay, *per se*, did not seem to influence subjects' investigatory responses significantly.

The main effect of habituation, however, was statistically significant ($p < .01$). Subjects under auditory habituation had a mean VP score of .664,

TABLE 4

ANALYSIS OF VARIANCE OF VISUAL PREFERENCE (VP) SCORES, SHOWING THE LINEAR AND QUADRATIC COMPONENTS OF THE INTERACTIONS WITH MINUTES SUMS OF SQUARES, FOR TWO DELAY GROUPS AND THREE TYPES OF HABITUATION DURING FIVE CONSECUTIVE MINUTES OF TESTING

Component	SS	d.f.	V	F
Delay	.0093	1	.0093	1.00
Habituation	8.2952	2	4.1476	445.98**
Delay x Habituation	3.1893	2	1.5949	171.49**
Error (a)	.9470	102	.0093	
Minutes	.2582	4	.0645	7.25**
Linear	.2232	1	.2232	25.08**
Quadratic	.0266	1	.0266	2.99
Residual	.0084	2	.0042	.47
Delay x Minutes	.0394	4	.0098	1.10
Linear	.0258	1	.0258	2.90
Quadratic	.0003	1	.0003	.03
Residual	.0133	2	.0066	.74
Habituation x Minutes	5.0069	8	.6258	70.31**
Linear	4.9332	2	2.4667	277.16**
Quadratic	.0269	2	.0134	1.51
Residual	.0468	4	.0117	1.31
Delay x Habituation x Minutes	.3230	8	.0404	4.54**
Linear	.2520	2	.1260	14.16**
Quadratic	.0533	2	.0266	2.99
Residual	.0177	4	.0044	.49
Error (b)	3.6717	408	.0089	

** $p < .01$

while subjects under audio-visual and visual habituations had mean VP scores of .509 and .361, respectively. Since the *F*-ratio obtained for the main effect of habituation was significant, it can be concluded that Hypothesis I (that there are differences in subjects' mean VP scores resulting from varied types of habituation) is supported. Furthermore, it can be seen that subjects under auditory habituation showed more preference for the unfamiliar visual stimuli ($\bar{X}$ = .664) than did subjects who were familiar with both auditory and visual stimuli ($\bar{X}$ = .509), or who were familiar with only the visual stimuli ($\bar{X}$ = .361).

Interaction of Delay and Habituation. It can be seen in Table 4 that the interaction between delay and habituation was also significant ($p < .01$). Mean VP scores for this interaction are shown in Table 3, and graphically presented in Figure 6. Inspection of these data suggests that the short delay treatment depressed visual responses for subjects under auditory habituation, had minimal effect on the visual responses of subjects under audio-visual habituation, and increased the visual responses of subjects under visual habituation. It can also be seen in Figure 6 that the long delay treatment had minimal effect on subjects under audio-visual habituation, while it substantially affected visual responses of subjects under the auditory and visual habituation treatments, respectively. Considering these data, as well as the significant delay x habituation interaction, Hypotheses II (that there are differences in subjects' mean VP scores resulting from the interaction of amount of delay and type of habituation) seems tenable.

F-tests were computed to compare the performances of the six experimental groups involved in the delay x habituation interaction. Table 3 contains the relevant data for these comparisons. Critical values needed to obtain differences significant at the .05 level were calculated.

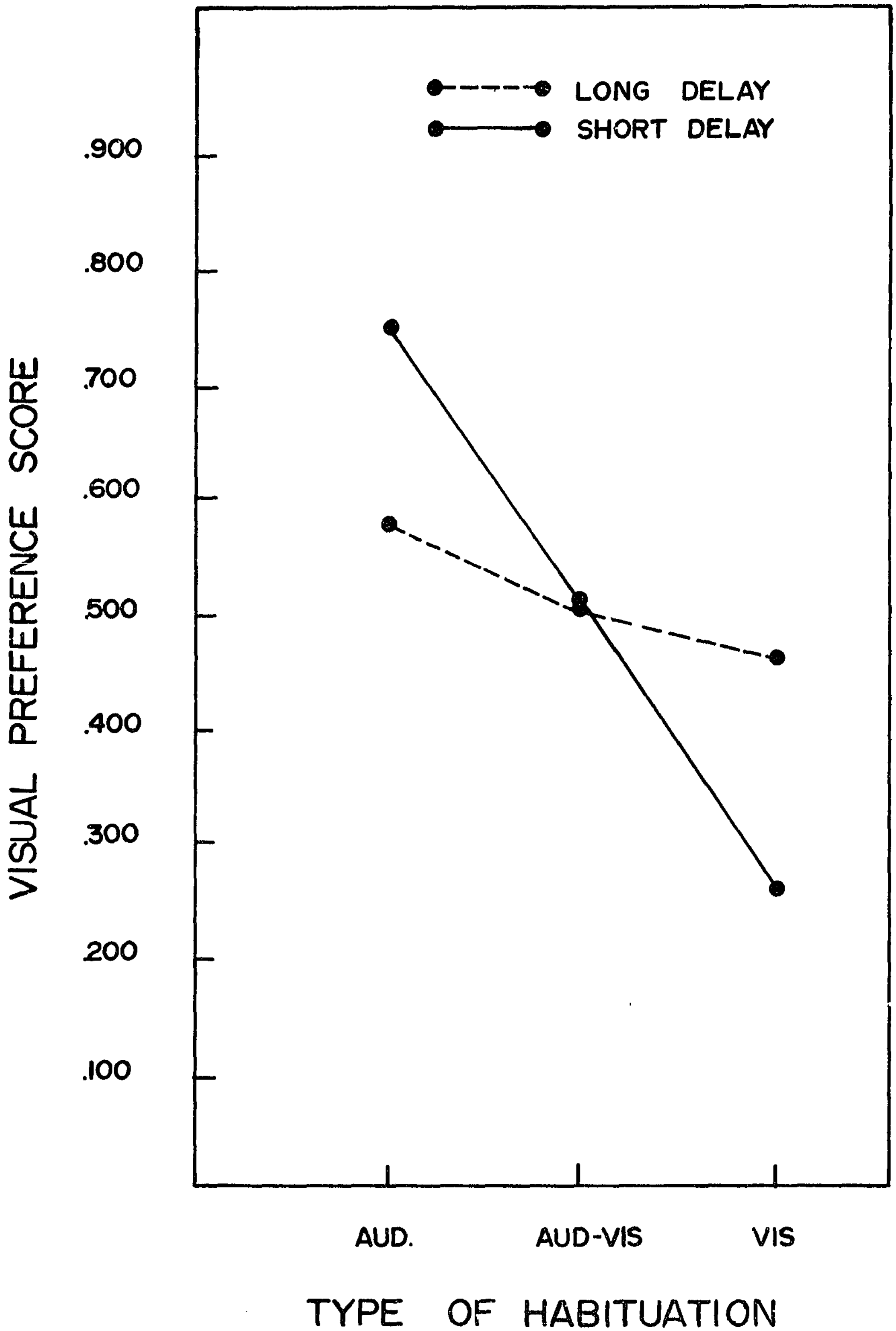

Figure 6. Mean Visual Preference (VP) Scores Plotted for Delay x Habituation Interaction.

The comparisons of groups SA (short delay auditory) vs. SAV (short delay audio-visual) and SA vs. SV (short delay visual) showed that the mean VP score of group SA ($\bar{X}$ = .750) was significantly greater than that of group SAV ($\bar{X}$ = .513) and group SV ($\bar{X}$ = .259) (df = 1,34: $\underline{F}$ = 176.72, $p < .01$; $\underline{F}$ = 1086.50, $p < .01$, respectively). The comparison of the SAV vs. SV groups was also statistically significant ($\underline{F}$ = 263.00, $p < .01$). Hypothesis A is supported: SA > SAV > SV.

The comparisons of groups LA (long delay auditory) vs. LAV (long delay audio-visual) and LA vs. LV (long delay visual) showed that the mean VP score of group LA ($\bar{X}$ = .578) was significantly greater than that of group LAV ($\bar{X}$ = .506) and group LV ($\bar{X}$ = .463) (df = 1,34: $\underline{F}$ = 36.24, $p < .01$; $\underline{F}$ = 70.09, $p < .01$, respectively). The comparison of LAV and LV groups was statistically significant ($\underline{F}$ = 173.75, $p < .01$). Hypothesis B is thus supported: LA > LAV > LV.

There were also significant differences between the SA and LA groups ($\underline{F}$ = 112.64, $p < .01$), and between the SV and LV groups ($\underline{F}$ = 274.65, $p < .01$). These results support Hypotheses C and D: SA > LA, and LV > SV.

Main Effect of Minutes. Table 4 shows that minutes of testing had a statistically significant linear trend ($p < .01$), indicating that there were differences in VP scores across the five minutes of testing. Table 5 shows that as time in testing increased, total mean VP scores also increased. This result was neither predicted nor expected. It implies that time in testing had an effect on subjects' VP scores, regardless of type of habituation or amount of delay. As such, it is possible to hypothesize that time, *per se*, accounted for some of the variability in the VP scores. This speculation, however, seems to give time a property that it theoretically should not have. If, however, the means reported in Table 5 are carefully studied, a different interpretation for these data is suggested.

TABLE 5

MEAN VISUAL PREFERENCE (VP) SCORES FOR HABITUATION AND MINUTES

Habituation	Minutes 1	2	3	4	5	Total
Auditory	.794	.714	.682	.597	.535	.664
Audio-Visual	.510	.493	.504	.510	.528	.509
Visual	.166	.273	.337	.437	.591	.361
Total	.490	.493	.507	.514	.551	.511

During the first minute, overall, subjects had a mean VP score of .490, indicating a slight preference for auditory stimuli. This may be mainly attributable to the fact that the mean VP score for subjects under visual habituation was initially very low ($\bar{X}$ = .166); and for subjects under auditory habituation, the converse (very high) was less marked ($\bar{X}$ = .794). Finally, in the last minute of testing, subjects under visual habituation preferred visual stimuli ($\bar{X}$ = .591) more than did subjects under auditory habituation ($\bar{X}$ = .535). This relatively higher preference for visual stimuli by subjects under visual habituation may be responsible for the significant linear trend. Apparently, then, the effect of visual habituation was not as strong as the effect of auditory habituation.

Post hoc speculation suggests that for these children, being as they are, at an important stage of color concept development, the visual stimuli were inherently more interesting than the auditory stimuli.[1]

[1] Children under three years of age predominantly use form in preference to color as the basis for classifying objects. Between the ages of three and six there is a gradual shift to color; but after the age of six form becomes dominant again (Brian and Goodenough, 1929; Welch, 1940).

If this speculative assumption is correct, recovery from visual habituation would be expected to be more rapid than for auditory habituation.

Interaction of Habituation and Minutes. The results summarized in Table 4 reveal a statistically significant linear trend in VP scores for the habituation x minutes interaction ($p < .01$). The means compared in this analysis are reported in Table 5 and are graphically presented in Figure 7. These means indicate that as time in testing increased, mean VP scores for subjects under auditory habituation decreased, whereas mean VP scores for subjects under visual habituation increased. Subjects who were habituated to audio-visual stimuli demonstrated a slight preference for visual stimuli, except during the second minute of testing. These data support Hypothesis III, that there are differences in subjects' mean VP scores resulting from the interaction of type of habituation and minutes of testing.

Again, post hoc speculation suggests that the minute-by-minute decline in responses for novel (visual) stimuli by subjects under auditory habituation may be attributable to the high frequency of their visual choices during the first two minutes of testing. The obverse would be true for subjects under visual habituation. In other words, if repetitive exposures for novel stimuli early in the testing session made the subsequent appearance of familiar stimuli a "surprising" event, it could be speculated that a heightened "orientation reaction" (Berlyne, 1960, p. 80) accompanying the surprise made the response for the familiar stimuli more effective.

That stimuli which initially are effective activators of investigatory responses lose such effectiveness with repeated presentation is a phenomenon which has been demonstrated in studies employing a variety of types of subjects (Berlyne, 1960; Glanzer, 1958; Lipsitt, 1963; Welker, 1961).

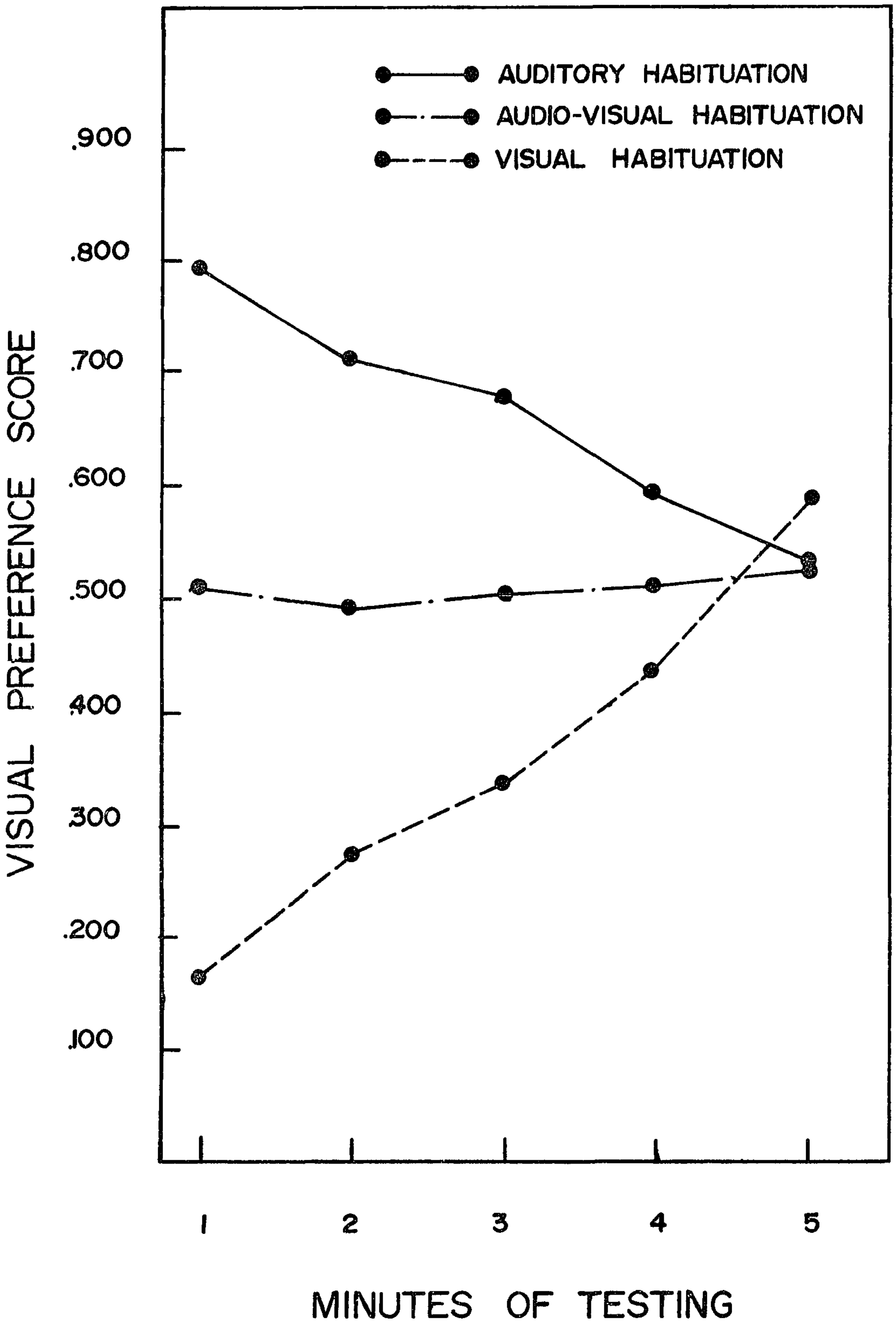

Figure 7. Mean Visual Preference (VP) Scores Plotted for Habituation x Minutes Interaction.

Interaction of Delay, Habituation, and Minutes. It can be seen in Table 4 that the delay x habituation x minutes interaction had a statistically significant linear trend ($p < .01$). Means related to this analysis are reported in Table 6, and plotted in Figure 8. It can be seen that mean VP scores for subjects in the SA and LA groups decreased as time in testing increased, and that mean VP scores for subjects in the SA group were consistently higher than those in the LA group during each minute of testing. At the same time, mean VP scores were consistently lower for subjects in the SV group when compared with those in the LV group. Mean VP scores for the SAV and LAV groups fluctuated around the .500 level. These data, for which F is highly significant, support Hypothesis IV: there are differences in subjects' mean VP scores resulting from the interaction of delay, habituation, and minutes of testing.

Interpretation of the results obtained for this second order interaction is similar to that for the interaction of habituation and minutes, and for the habituation x delay interaction. That is, differences in subjects' VP scores are a function of the amount and type of preliminary habituation, the amount of delay between preliminary and testing sessions, and the frequency and type of stimulus exposures during testing sessions.

While this experiment provided direct evidence to support the conclusion that the children's investigatory responses were a function of the type of habituation and delay treatments administered, results interpreted in terms of the effect of minute-by-minute exposures for stimuli during testing were only speculative. Therefore, it remains for further research to determine the relative importance of what may be regarded as two levels of habituation: (a) habituation generated via a preliminary "exposure" to stimuli; (b) habituation occurring as a result of minute-by-minute exposures during testing.

TABLE 6

MEAN VISUAL PREFERENCE (VP) SCORES FOR DELAY, HABITUATION, AND MINUTES

		Minutes					
Delay	Habituation	1	2	3	4	5	Total
Short Delay	Aud	.912	.852	.771	.657	.560	.750
	Aud-Vis	.497	.493	.499	.531	.544	.512
	Vis	.074	.158	.215	.338	.510	.259
	Total	.494	.501	.495	.508	.537	.507
Long Delay	Aud	.676	.576	.593	.537	.510	.578
	Aud-Vis	.523	.494	.509	.489	.513	.506
	Vis	.258	.388	.459	.536	.672	.463
	Total	.486	.486	.520	.521	.565	.515

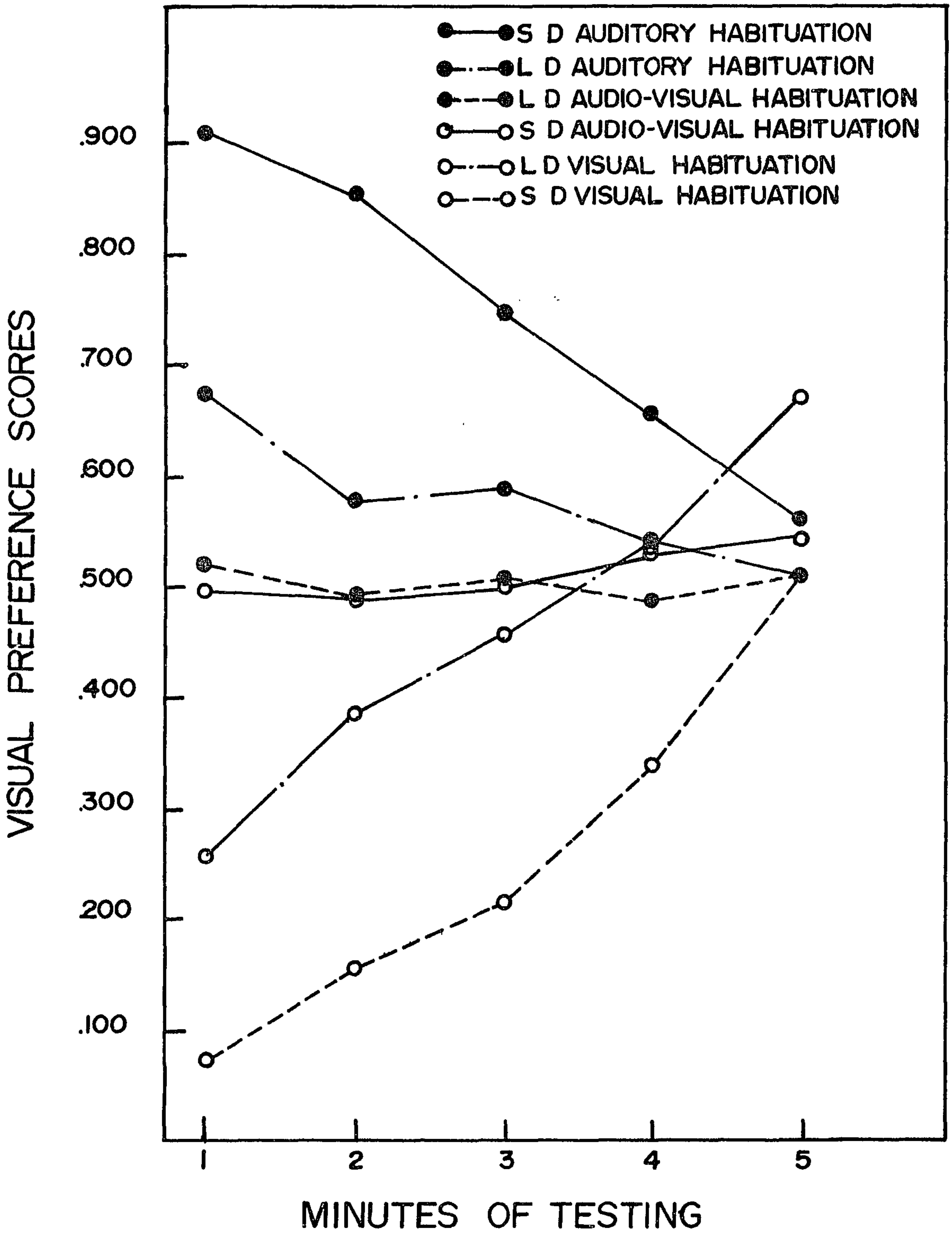

Figure 8. Mean Visual Preference (VP) Scores Plotted for Delay x Habituation x Minutes Interaction.

In general, the principles outlined in the introduction of this dissertation were upheld. Novel stimuli, operationally defined as stimuli that are not presented during habituation sessions, evoked more investigatory responses from the children than stimuli which were familiar. The auditory habituation groups (SA and LA) made more responses for novel (visual) stimuli than for familiar (auditory) stimuli during testing. The visual habituation groups (SV and LV) also made more responses for novel (auditory) stimuli than for familiar (visual) stimuli during testing. Children in the audio-visual habituation groups (SAV and LAV) demonstrated no marked preference for either auditory or visual stimuli.

The children's investigatory responses for novel stimuli decreased as a function of time in the presence of the novel stimuli. Thus, for children in the auditory habituation groups, the decrease in responses for novel (visual) stimuli was a linear function of time. Conversely, for children in the visual habituation groups, the increase in responses for familiar (visual) stimuli was also a linear function of time. The performance of the audio-visual groups (SAV and LAV) support the speculation that the effect of novelty was increased when the novel and familiar stimuli were more different from each other in their stimulus properties.

These results lend support to Berlyne's (1950) theory of curiosity motivation, but any attempt to fit the results into the framework of learning or motivation theory would be premature at this time, due to the limited information which the experiment yields. Further information concerning the effects of varying degrees of habituation and delay is needed before such an attempt is made.

The concept of habituation is in need of further refinement. There may be qualitative as well as quantitative aspects to the length of the habituation period. In any case, the effect of shorter or longer habituation periods on the investigatory activity of children appears to be an important variable for study.

The positive results found in this experiment between preference for novelty of kindergarten children suggests another important area for further research: the problem of preferences for novelty at other stages of development. Although pre-test data for this experiment did not show sex differences with respect to preferences for the experimental stimuli, the matter of sex preferences for novelty should be further explored.

In summary, it may be said that a conception of the child's early exploratory behavior based primarily, at least in the early stages of experimental analysis, on the nature of the antecedent stimulus events of the behavior in question, may offer more than appears to be customarily recognized toward advancing our understanding of the child's early learning and toward the oft stated goals of prediction and control. Admittedly, stimulus events are often subtle, complex, and are difficult to study. But continued experimental research of the stimulus-exploratory behavior relationship should enable theorists to formulate a more adequate conceptualization of the motivational processes underlying the child's early learning of environmental events.

CHAPTER IV

SUMMARY AND CONCLUSIONS

This investigation was undertaken because of an interest in the discovery of suitable variables and hypotheses for relating the young child's early learning of environmental events to the large body of theory that exists on stimulus determinants of exploratory behavior. To the extent that the child's behavior is influenced by his responsiveness to the external environment, an understanding of external stimulation and the stimulus-exploratory behavior relationship appears to be vital to interpretation of the significance of these factors as a motivational process underlying the child's early learning.

This was an "exploratory experiment" designed to investigate the effects of certain external stimulus events by which the young child's investigatory behavior may be maintained, extinguished, strengthened, or weakened. The specific purpose of the experiment was to determine and compare the effects of recency of habituation of varied auditory, visual, and audio-visual stimuli on the perceptual investigatory responses of kindergarten children. Two delay intervals (5-minutes and 5-days) and three types of habituation (auditory, visual, and audio-visual) were studied. Factorial analysis of variance made it possible to analyze the independent and interactive effects of these variables on the investigatory responses of the children during five minutes of testing.

A review of theory and research on exploratory behavior in humans and nonhumans indicated that: (a) novel stimuli evoke more investigatory responses than familiar stimuli; (b) investigatory responses for novel stimuli decrease as a function of time in the presence of the novel stimuli; and (c) the more different novel and familiar stimuli are in their properties, the greater the effect of novelty on investigatory responses.

These conclusions served as a basis for deducing a general hypothesis concerning the investigatory responses of the children in the experiment. The general hypothesis was: a child's investigatory response patterns during five consecutive 1-minute periods of testing are a function of the amount and type of preliminary habituation he receives, the delay interval between his preliminary and testing sessions, and the frequency and type of stimulus exposures he makes during his testing session.

The population of this study consisted of 144 children drawn from three church-related kindergartens in Greensboro, North Carolina. Thirty six of these children, with an equal distribution of boys and girls, were randomly selected from each kindergarten. Within each of these groups, subjects were assigned to six experimental conditions: (1) Short delay auditory habituation (SA); (2) Short delay audio-visual habituation (SAV); (3) Short delay visual habituation (SV); (4) Long delay auditory habituation (LA); (5) Long delay audio-visual habituation (LAV); and (6) Long delay visual habituation (LV). The remaining 36 children, with an equal number of boys and girls, were assigned to a "replacement" group. Children were randomly selected from the latter group to replace experimental subjects, who, for various reasons, were unable to complete the experiment.

The stimuli, varied sounds and color-pictures, were presented with a simple motor task in which pressing manipulanda (rubber bulbs) produced auditory and visual stimuli. Prior to testing sessions, subjects in the SA and LA groups were exposed to auditory stimuli; subjects in the SAV and LAV groups were exposed to auditory and visual stimuli; and subjects in the SV and LV groups were exposed to visual stimuli.

Subjects in the SA, SAV, and SV groups had a 5-minute delay interval between the preliminary (habituation) sessions and the testing sessions, whereas subjects in the LA, LAV, and LV groups had a 5-day delay between preliminary and testing sessions. All sessions were conducted in a cubicle, where the children were seated at a small table in front of a clown's face.

The number of bulb-pressing responses were recorded separately for each child during each minute of testing. These responses were designated <u>auditory</u> if they resulted in the presentation of sounds or <u>visual</u> if they resulted in the presentation of color-pictures. The original scores were transformed to visual preference scores by the following formula: $VP = \frac{V}{(V + A)}$, where VP is the visual preference score of a subject, V is the frequency of his visual responses, and A is the frequency of his auditory responses.

An analysis of variance for a 2 x 3 x 5 factorial design for repeated measures on the same subjects, as described by Edwards (1960, pp. 233-246), was performed on the VP scores of 18 subjects in each of the six experimental groups. It was concluded from the results of the analysis that the four major hypotheses of this research were supported:

I. There are differences in subjects' mean VP scores resulting from varied types of habituation.

II. There are differences in subjects' mean VP scores resulting from the interaction of amount of delay and type of habituation.

III. There are differences in subjects' mean VP scores resulting from the interaction of type of habituation and minutes of testing.

IV. There are differences in subjects' mean VP scores resulting from the interaction of amount of delay, type of habituation, and minutes of testing.

Four minor hypotheses were also supported: (A) Mean VP scores are greatest for subjects in the SA group, next greatest for subjects in the SAV group, and least for subjects in the SV group; (B) Mean VP scores are greatest for subjects in the LA group, next greatest for subjects in the LAV group, and least for subjects in the LV group; (C) Mean VP scores are greater for subjects in the SA group than for subjects in the LA group; (D) Mean VP scores are greater for subjects in the LV group than for subjects in the SV group.

In accordance with Berlyne's (1960) formulations, the behavior under investigation has been termed investigatory behavior. The influence of novelty of stimuli in evoking such behavior was indicated by (a) an increase in responsiveness upon the appearance of a new set of stimuli, (b) an increase of responsiveness after a delay interval, and (c) a decrease of interest in the stimuli with repeated exposure. The phenomenon termed habituation was seen to be relatively long lasting (persisting over a 5-day period), and represented a type of learning.

It is plausible to believe that certain stimulus properties, i.e., pitch, color, may have been important in the activity patterns of the children. But it is presumed that the effectiveness of novelty may have surpassed the effects of other stimulus properties. Attention to the novel stimuli, and decline of interest with habituation, were conspicuous characteristics of the investigatory activity of the children.

Finally, it may be said that the results of the experiment indicated that certain auditory, visual, and audio-visual stimuli can function as activators for children's investigatory behavior and that the effectiveness of such activators can be modified by the manipulation of habituation and delay factors.

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APPENDIXES

APPENDIX A.

RAW SCORES OF SUBJECTS IN EACH OF THE EXPERIMENTAL GROUPS

ITEM 1

MALE AND FEMALE SUBJECTS' AUDITORY AND VISUAL RAW RESPONSE SCORES DURING FIVE CONSECUTIVE ONE-MINUTE PERIODS OF TESTING UNDER THE SHORT DELAY AUDITORY HABITUATION CONDITION

Type of Response	Subject	MINUTES 1	2	3	4	5
Auditory	M 1	3	2	0	6	8
	M 2	5	2	5	7	3
	M 3	6	0	8	6	8
	M 4	2	8	8	9	7
	M 5	3	6	11	6	7
	M 6	3	4	7	9	11
	M 7	1	2	5	8	12
	M 8	2	3	6	8	8
	M 9	1	3	5	5	7
	F 10	0	5	5	3	6
	F 11	0	0	1	6	11
	F 12	3	3	4	4	6
	F 13	0	1	2	8	12
	F 14	2	3	8	8	12
	F 15	2	5	3	11	11
	F 16	1	2	3	3	8
	F 17	0	2	3	4	11
	F 18	1	3	6	7	2
Visual	M 1	23	18	21	15	12
	M 2	13	17	18	15	18
	M 3	20	26	17	17	12
	M 4	25	16	18	13	8
	M 5	33	20	18	12	14
	M 6	20	24	14	15	8
	M 7	16	17	13	4	12
	M 8	23	21	19	20	13
	M 9	19	16	12	8	11
	F 10	6	12	13	16	11
	F 11	28	24	27	16	14
	F 12	16	10	15	15	10
	F 13	24	22	20	15	10
	F 14	23	15	13	18	8
	F 15	22	19	21	9	6
	F 16	16	15	11	5	5
	F 17	23	16	18	10	7
	F 18	8	13	16	13	12

ITEM 2

MALE AND FEMALE SUBJECTS' AUDITORY AND VISUAL RAW RESPONSE SCORES DURING FIVE CONSECUTIVE ONE-MINUTE PERIODS OF TESTING UNDER THE SHORT DELAY AUDIO-VISUAL HABITUATION CONDITION

Type of Response	Subject	MINUTES 1	2	3	4	5
Auditory	M 19	13	13	13	17	10
	M 20	8	13	11	5	9
	M 21	7	13	9	9	6
	M 22	12	11	12	8	11
	M 23	11	18	10	7	11
	M 24	15	7	6	6	4
	M 25	13	15	10	8	7
	M 26	5	11	7	7	6
	M 27	10	8	8	10	7
	F 28	8	9	12	12	7
	F 29	7	9	13	11	11
	F 30	12	8	11	8	8
	F 31	8	11	10	8	10
	F 32	8	8	10	8	7
	F 33	13	7	8	5	2
	F 34	7	7	7	11	7
	F 35	8	11	6	8	7
	F 36	8	9	9	9	10
Visual	M 19	12	15	15	15	15
	M 20	12	8	12	15	10
	M 21	9	5	5	9	3
	M 22	15	10	10	15	8
	M 23	13	15	5	10	8
	M 24	10	8	8	10	7
	M 25	16	13	8	10	11
	M 26	10	11	15	10	10
	M 27	7	7	11	5	6
	F 28	8	12	11	10	11
	F 29	6	15	12	8	12
	F 30	7	15	10	8	10
	F 31	11	8	7	6	10
	F 32	1	5	8	12	13
	F 33	12	10	9	12	9
	F 34	10	8	7	6	10
	F 35	10	10	11	10	7
	F 36	9	10	10	8	7

ITEM 3

MALE AND FEMALE SUBJECTS' AUDITORY AND VISUAL RAW RESPONSE SCORES DURING FIVE CONSECUTIVE ONE-MINUTE PERIODS OF TESTING UNDER THE SHORT DELAY VISUAL HABITUATION CONDITION

Type of Response	Subject	MINUTES 1	2	3	4	5
Auditory	M 37	24	20	16	14	11
	M 38	23	12	12	16	4
	M 39	26	18	21	14	8
	M 40	20	15	12	13	11
	M 41	14	14	12	10	6
	M 42	32	26	23	17	15
	M 43	36	18	16	14	8
	M 44	16	16	11	9	8
	M 45	18	16	16	11	4
	F 46	18	13	10	5	5
	F 47	24	21	14	11	11
	F 48	23	18	17	12	9
	F 49	26	19	17	16	11
	F 50	22	18	17	17	13
	F 51	21	15	16	15	13
	F 52	25	20	22	13	9
	F 53	14	13	9	7	5
	F 54	26	15	12	8	7
Visual	M 37	0	5	8	11	17
	M 38	2	3	5	5	6
	M 39	3	5	6	8	8
	M 40	2	1	3	6	12
	M 41	3	1	2	4	5
	M 42	1	3	6	7	12
	M 43	0	6	6	8	8
	M 44	2	2	3	3	6
	M 45	2	3	5	5	15
	F 46	2	3	3	5	6
	F 47	0	2	5	8	6
	F 48	2	4	6	5	11
	F 49	2	4	5	6	9
	F 50	3	5	5	11	11
	F 51	4	3	1	5	8
	F 52	1	1	5	11	16
	F 53	1	2	1	3	7
	F 54	0	6	3	4	4

ITEM 4

MALE AND FEMALE SUBJECTS' AUDITORY AND VISUAL RAW RESPONSE SCORES DURING FIVE CONSECUTIVE ONE-MINUTE PERIODS OF TESTING UNDER THE LONG DELAY AUDITORY HABITUATION CONDITION

Type of Response	Subject	MINUTES 1	2	3	4	5
Auditory	M 55	6	12	15	7	8
	M 56	7	7	7	12	13
	M 57	7	13	6	8	8
	M 58	8	9	8	12	12
	M 59	9	12	7	7	4
	M 60	5	8	13	13	12
	M 61	6	12	12	8	13
	M 62	11	11	11	10	5
	M 63	3	3	2	6	7
	F 64	6	14	13	12	15
	F 65	10	13	13	15	10
	F 66	7	7	6	4	6
	F 67	16	13	6	11	3
	F 68	6	11	6	5	12
	F 69	9	10	9	16	11
	F 70	5	8	11	11	13
	F 71	5	6	7	8	11
	F 72	5	5	10	12	8
Visual	M 55	20	15	11	12	14
	M 56	15	15	10	10	13
	M 57	15	9	15	10	10
	M 58	15	12	11	8	10
	M 59	15	8	10	16	11
	M 60	20	15	13	12	12
	M 61	23	13	14	18	8
	M 62	8	9	13	15	15
	M 63	8	11	8	3	3
	F 64	20	14	17	16	13
	F 65	15	15	10	15	9
	F 66	16	15	15	10	15
	F 67	13	13	12	16	6
	F 68	15	11	15	13	5
	F 69	11	15	15	7	8
	F 70	21	19	19	16	6
	F 71	15	13	10	6	12
	F 72	11	9	8	8	8

ITEM 5

MALE AND FEMALE SUBJECTS' AUDITORY AND VISUAL RAW RESPONSE SCORES DURING FIVE CONSECUTIVE ONE-MINUTE PERIODS OF TESTING UNDER THE LONG DELAY AUDIO-VISUAL HABITUATION CONDITION

Type of Response	Subject	MINUTES 1	2	3	4	5
Auditory	M 73	15	15	13	15	10
	M 74	15	11	10	15	10
	M 75	12	9	10	11	8
	M 76	13	12	9	11	10
	M 77	12	8	12	8	9
	M 78	7	7	7	8	10
	M 79	7	9	7	13	9
	M 80	12	14	12	12	11
	M 81	13	12	11	12	12
	F 82	11	11	11	13	9
	F 83	9	10	12	11	13
	F 84	9	10	12	8	8
	F 85	8	5	5	2	6
	F 86	11	12	12	8	7
	F 87	12	9	8	6	9
	F 88	9	14	11	11	13
	F 89	14	13	9	8	7
	F 90	12	13	12	12	8
Visual	M 73	11	11	15	11	15
	M 74	16	13	14	12	16
	M 75	13	9	11	11	10
	M 76	13	13	9	10	10
	M 77	15	10	8	8	10
	M 78	13	8	8	6	7
	M 79	11	11	8	8	9
	M 80	18	10	16	5	10
	M 81	15	8	12	10	12
	F 82	10	10	10	10	14
	F 83	12	12	9	13	11
	F 84	12	11	7	13	10
	F 85	6	7	9	5	5
	F 86	6	9	11	8	10
	F 87	10	12	10	6	9
	F 88	16	11	8	15	9
	F 89	13	12	13	8	7
	F 90	13	9	12	13	7

ITEM 6

MALE AND FEMALE SUBJECTS' AUDITORY AND VISUAL RAW RESPONSE SCORES DURING FIVE CONSECUTIVE ONE-MINUTE PERIODS OF TESTING UNDER THE LONG DELAY VISUAL HABITUATION CONDITION

Type of Response	Subject	MINUTES 1	2	3	4	5
Auditory	M 91	17	10	8	9	9
	M 92	14	12	11	9	9
	M 93	15	14	12	10	5
	M 94	18	13	12	10	7
	M 95	17	11	11	9	6
	M 96	14	13	16	10	8
	M 97	16	15	15	10	5
	M 98	18	13	15	15	13
	M 99	16	14	10	5	5
	F 100	18	17	11	5	4
	F 101	14	14	12	10	11
	F 102	11	6	6	3	5
	F 103	21	12	12	12	5
	F 104	20	17	10	10	5
	F 105	19	16	11	11	7
	F 106	17	13	8	8	7
	F 107	10	7	7	5	3
	F 108	19	16	13	8	7
Visual	M 91	6	8	8	11	13
	M 92	8	7	8	8	11
	M 93	6	9	14	15	17
	M 94	4	8	7	8	14
	M 95	6	7	7	11	18
	M 96	8	10	13	12	13
	M 97	6	11	12	11	16
	M 98	4	10	11	14	16
	M 99	10	10	10	5	8
	F 100	8	8	12	12	16
	F 101	6	12	9	12	16
	F 102	3	4	6	6	10
	F 103	4	5	12	8	10
	F 104	4	9	7	8	14
	F 105	5	8	10	8	15
	F 106	6	8	8	12	14
	F 107	3	4	5	7	8
	F 108	6	11	12	13	14

APPENDIX B.

VISUAL PREFERENCE (VP) SCORES OF SUBJECTS IN EACH OF THE SIX EXPERIMENTAL GROUPS

ITEM 7

MALE AND FEMALE SUBJECTS' VISUAL PREFERENCE SCORES DURING FIVE CONSECUTIVE ONE-MINUTE PERIODS OF TESTING UNDER THE SHORT DELAY AUDITORY HABITUATION CONDITION

	M I N U T E S				
Subject	1	2	3	4	5
M 1	.885	.900	1.000	.714	.600
M 2	.722	.895	.783	.682	.857
M 3	.769	1.000	.680	.739	.600
M 4	.926	.667	.692	.591	.533
M 5	.917	.769	.621	.667	.667
M 6	.870	.857	.667	.625	.421
M 7	.941	.895	.722	.333	.500
M 8	.920	.875	.760	.714	.619
M 9	.950	.842	.706	.615	.611
F 10	1.000	.706	.722	.842	.647
F 11	1.000	1.000	.964	.727	.560
F 12	.842	.769	.789	.789	.625
F 13	1.000	.957	.910	.652	.455
F 14	.920	.833	.619	.692	.400
F 15	.917	.792	.875	.450	.353
F 16	.941	.882	.786	.625	.385
F 17	1.000	.889	.857	.714	.389
F 18	.889	.813	.727	.650	.857

ITEM 8

MALE AND FEMALE SUBJECTS' VISUAL PREFERENCE SCORES DURING FIVE CONSECUTIVE ONE-MINUTE PERIODS OF TESTING UNDER THE SHORT DELAY AUDIO-VISUAL HABITUATION CONDITION

	M I N U T E S				
Subject	1	2	3	4	5
M 19	.480	.536	.536	.469	.600
M 20	.600	.381	.522	.750	.526
M 21	.563	.278	.357	.500	.333
M 22	.556	.476	.455	.652	.421
M 23	.542	.455	.333	.588	.421
M 24	.400	.533	.571	.625	.636
M 25	.552	.464	.444	.556	.611
M 26	.667	.500	.682	.588	.625
M 27	.412	.467	.579	.333	.462
F 28	.500	.571	.478	.455	.611
F 29	.462	.625	.480	.421	.522
F 30	.368	.652	.476	.500	.556
F 31	.579	.421	.412	.429	.500
F 32	.111	.385	.444	.600	.650
F 33	.480	.588	.529	.706	.818
F 34	.588	.533	.500	.353	.588
F 35	.556	.476	.647	.556	.500
F 36	.529	.526	.526	.471	.412

ITEM 9

MALE AND FEMALE SUBJECTS' VISUAL PREFERENCE SCORES DURING FIVE CONSECUTIVE ONE-MINUTE PERIODS OF TESTING UNDER THE SHORT DELAY VISUAL HABITUATION CONDITION

	M I N U T E S				
Subject	1	2	3	4	5
M 37	.000	.200	.333	.440	.607
M 38	.080	.200	.294	.238	.600
M 39	.103	.217	.222	.364	.500
M 40	.090	.062	.200	.316	.522
M 41	.176	.067	.143	.286	.455
M 42	.030	.103	.207	.292	.444
M 43	.000	.250	.273	.364	.500
M 44	.111	.111	.214	.250	.429
M 45	.100	.158	.238	.313	.789
F 46	.100	.187	.231	.500	.545
F 47	.000	.087	.263	.421	.353
F 48	.080	.182	.261	.294	.550
F 49	.071	.174	.227	.273	.450
F 50	.120	.217	.227	.393	.458
F 51	.160	.167	.059	.250	.381
F 52	.038	.048	.185	.458	.640
F 53	.067	.133	.100	.300	.583
F 54	.000	.286	.200	.333	.364

ITEM 10

MALE AND FEMALE SUBJECTS' VISUAL PREFERENCE SCORES DURING FIVE CONSECUTIVE ONE-MINUTE PERIODS OF TESTING UNDER THE LONG DELAY AUDITORY HABITUATION CONDITION

	MINUTES				
Subject	1	2	3	4	5
M 55	.769	.556	.423	.632	.636
M 56	.682	.682	.588	.455	.500
M 57	.682	.409	.714	.556	.556
M 58	.652	.571	.579	.400	.455
M 59	.625	.400	.588	.696	.733
M 60	.800	.652	.500	.480	.500
M 61	.793	.520	.538	.692	.381
M 62	.421	.450	.542	.600	.750
M 63	.727	.786	.800	.333	.300
F 64	.769	.500	.567	.571	.464
F 65	.600	.536	.435	.500	.474
F 66	.696	.682	.714	.714	.714
F 67	.448	.500	.667	.593	.667
F 68	.714	.500	.714	.722	.294
F 69	.550	.600	.625	.304	.421
F 70	.808	.704	.633	.593	.316
F 71	.750	.684	.588	.429	.522
F 72	.688	.643	.444	.400	.500

ITEM 11

MALE AND FEMALE SUBJECTS' VISUAL PREFERENCE SCORES DURING FIVE CONSECUTIVE ONE-MINUTE PERIODS OF TESTING UNDER THE LONG DELAY AUDIO-VISUAL HABITUATION CONDITION

	M I N U T E S				
Subject	1	2	3	4	5
M 73	.423	.423	.536	.423	.600
M 74	.516	.542	.583	.444	.615
M 75	.520	.500	.524	.500	.556
M 76	.500	.520	.500	.476	.500
M 77	.556	.556	.400	.500	.526
M 78	.650	.533	.533	.429	.412
M 79	.611	.550	.533	.381	.500
M 80	.600	.417	.571	.294	.476
M 81	.536	.400	.522	.455	.500
F 82	.476	.476	.476	.435	.609
F 83	.571	.545	.429	.542	.458
F 84	.571	.524	.368	.619	.556
F 85	.429	.583	.643	.714	.455
F 86	.353	.429	.478	.500	.588
F 87	.455	.571	.556	.500	.500
F 88	.640	.440	.421	.577	.409
F 89	.481	.480	.591	.500	.500
F 90	.520	.409	.500	.520	.467

ITEM 12

MALE AND FEMALE SUBJECTS' VISUAL PREFERENCE SCORES DURING FIVE CONSECUTIVE ONE-MINUTE PERIODS OF TESTING UNDER THE LONG DELAY VISUAL HABITUATION CONDITION

	M I N U T E S				
Subject	1	2	3	4	5
M 91	.261	.444	.500	.550	.591
M 92	.364	.368	.421	.471	.550
M 93	.286	.391	.538	.600	.773
M 94	.182	.381	.368	.444	.667
M 95	.261	.389	.389	.550	.750
M 96	.364	.435	.448	.545	.619
M 97	.273	.423	.444	.524	.762
M 98	.182	.435	.423	.483	.552
M 99	.385	.417	.500	.500	.615
F 100	.308	.320	.522	.706	.800
F 101	.300	.462	.429	.545	.593
F 102	.214	.400	.500	.667	.667
F 103	.160	.294	.500	.400	.667
F 104	.167	.346	.412	.444	.737
F 105	.208	.333	.476	.421	.682
F 106	.261	.381	.500	.600	.667
F 107	.231	.364	.417	.583	.727
F 108	.240	.407	.480	.619	.667

APPENDIX C.

DATA SHEET USED FOR RECORDING RAW SCORES

DATA SHEET

NAME______________________________ CA________ SEX________

HOME ADDRESS________________________ TELEPHONE__________

CHURCH____________________________ TEACHER__________

TREATMENT SESSION____________ TIME________ DATE__________

TEST SESSION________________ TIME________ DATE__________

MINUTES	RESPONSES FOR VIS/STIMULI	RESPONSES FOR AUD/STIMULI
1		
2		
3		
4		
5		
TOTAL		

COMMENTS: