PICTURE PREFERENCE AND STIMULUS SATIATION IN NORMAL AND RETARDED CHILDREN

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By

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ABSTRACT

PICTURE PREFERENCE AND STIMULUS SATIATION

IN NORMAL AND RETARDED CHILDREN

by Karen Grover Duffy

The present study examined the relationship of picture preference and stimulus satiation in 48 normal and 48 retarded children. Using 6 categories of stimulus pictures, Experiment One examined picture preference for IQ, sex, and age. An analysis of variance showed no significant subject variable effects but a significant categories effect.

Two categories from Experiment One, Scenery and Geometric Designs, were selected as the high and low preferred categories respectively for use in Experiment Two. The high and low preferred condition was paired in all possible combinations with constant (repeated) and varied (changing) stimuli to produce four preference treatments.

Two 2 by 2 by 6 analyses of variance of the mean difference scores in looking time in seconds between a single slide in Experiment One and a similar slide in Experiment Two showed that all results were as predicted. The constant stimuli produced satiation while the varied stimuli produced little or no satiation for both IQ groups. Similarly the high preferred conditions produced

satiation whereas the low preferred conditions did not for both normals and retardates.

Implications for past research and for education were discussed.

Approved ______________________
Major Professor

Date ______________________

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INTRODUCTION

Stimulus satiation represents a reduction of responsiveness to a stimulus as a result of repeated exposure to that stimulus. Past studies have provided only a partial search for the variables interacting with stimulus satiation. Complexity (Denny, Duffy, and Dickie; unpublished) and intelligence (Terdal, 1967) have been variables manipulated in studies of stimulus satiation. Terdal's study produced interesting but ambiguous findings on the relationship between intelligence and stimulus satiation. These results were ambiguous because Terdal used only very complex stimuli, perhaps too complex for his retarded Ss. The present study is a follow-up to these studies in which the relationship between stimulus satiation and stimulus preference was studied using retarded and normal children.

One reason for studying stimulus satiation and intelligence is that retardates are poor incidental learners. (This is important since much human learning usually occurs incidentally.) Incidental learning is related to stimulus satiation in that in incidental learning the necessary sets are not pre-established for the S as they are in intentional learning. If the S is repeatedly distracted by extraneous stimuli (he does not satiate), it becomes even more difficult for him to establish these sets and establish the appropriate stimulus and response connections. This might result in poor incidental learning. Singer (1963) found no differences between normals and retardates on intentional learning tasks but big differences in incidental learning tasks.

Retardates, besides being poor incidental learners, are generally characterized by such traits as distractability and perseveration. These characteristics might be a result of lack of satiation. Several studies indicate that familiar objects do not undergo satiation, a condition which is incompatible with attending to novel stimuli. For instance, Davenport and Berkson (1963) found that their retarded Ss showed little response to novel objects but perseverative responses to familiarized objects. Similarly in studies by Feldman (1953) and by Barnett (1960) retardates perseverated or exhibited an inability to shift attention from item to item on various psychological tests.

Lewin (1935) reported that the distraction of retardates by irrelevant stimuli or extraneous stimuli accounted for their excessive number of errors in several of his experiments. This distractability can also be attributed to the idea that retardates satiate slowly on extraneous stimuli, and this sometimes interferes with their learning.

Many specialists who work with the retarded hope that retardates will some day approach normal levels of intellectual activity in many areas of functioning through learning and stimulus enrichment. If retardates are easily distracted in learning situations and are slow satiators to familiar stimuli, they will not learn easily and they will be denied novel and enriching stimulation. Neither of these situations is conducive to increasing their level of intellectual functioning. It is ultimately hoped that the study of satiation will aid in the development of educational programs and techniques which will overcome some of the retardates' disabilities.

Relevant Research

Previous to 1965 researchers had examined only response satiation in retardates. Lewin (1935) presented normal and retarded children of various ages with a drawing task. They were instructed to draw a particular object for as long as they could. He found that the retarded children, especially the oldest ones, persisted with the task longer than the normals. Kounin (1941) used Lewin's technique to study the generalization of response satiation. Here the normals and retardates were instructed to draw several objects, in turn, for as long as they could. Once again the retardates took longer to satiate and also showed less generalization of satiation. More recently Zigler, Hodgen, and Stevenson (1968) repeated parts of Kounin's study. This time length of game-playing was used as a measure of response satiation. Here, too, the retardates spent the longest times on each game.

Terdal (1967) was the first researcher to examine stimulus rather than response satiation in retardates. Because of this he followed a somewhat different procedure than did the above studies. In his experiment, complex "Kohs" block designs were employed in two conditions. In one condition the same design was repeated on every trial. In the other condition a different design was simultaneously paired with those of the first condition on every trial. Looking time was used as the measure of satiation. Retardates once again satiated much more slowly than their mental age controls.

In a follow-up to the Terdal study, Denny, Duffy, and Dickie (unpublished) hypothesized that Terdal's Kohs block designs were so complex for the retardates that this confounded his measure of satiation. That complexity played a role in looking time had been examined previously by both Leckart (1966) and Brown, Larry, and Lucas (1966). Denny et al, by altering Terdal's procedure and designs, were able to show that there was a trend towards an interaction between complexity, satiation, and retardation.

The Present Experiment

In the present experiment, Terdal's stimulus satiation study is expanded upon. Denny, Duffy, and Dickie hypothesized that complexity played a role in satiation. The present E proposed that preference affects satiation. This hypothesis is logical when other research is reviewed. In these studies satiation (sometimes referred to as familiarization) was used to change preferences.

Becknell, Wilson, and Baird (1964), for instance, studied satiation and preference by using nonsense syllables. The more familiar the nonsense syllables, the more preferred they were. A similar finding was the result of Connor's work (1964). This time visual familiarization was used (nonsense shapes).

Connor's results were that Ss visually fixated longer on and found more aesthetically pleasing those nonsense shapes that were only slightly discrepant from those used in a schema which gradually developed throughout presentation. A finding contrary to this has been discussed by Cantor (1968). He had children rate familiarized and nonfamiliarized stimuli as to whether they liked or disliked them. This time the nonfamiliarized stimuli were more preferred. Using real objects instead of merely pictures of them, Harris (1965) found results which concur with those of Cantor. Following familiarization with several toys, Ss were given a choice of these toys in the first experiment. The Ss alternated equally between the toys. In the second experiment, the children were asked to choose from several toys, but this time one of them was novel or unfamiliar. A significant number of the choices were now of the novel toy. Whether the familiarized object is most preferred or least preferred, then, seems to be a function of the type of stimulus employed.

In the study of most relevance to the present one, Sackett (1966) looked at response to differences in visual complexities according to different etiologies of retardation. He used mongoloids, brain-damaged children, and cultural-familial retardates. Subjects viewed one of three different levels of complexity in designs after being adapted to one of the levels. His results showed that mongoloids and cultural-familial retardates prefer designs which were greater in complexity than the adapted ones. The brain-damaged _S_s, on the other hand, chose designs much lower in complexity than the adapted ones.

From these experiments it can be seen that stimulus satiation does interact with preference to change preference levels. It was proposed, then, that just the inverse was true, too. In the present experiment it was hypothesized that preference interacts with satiation and intelligence level to affect satiation levels. This hypothesis was tested in Experiment Two using retarded and normal _S_s in a satiation procedure which was similar to Terdal's and which employed four different preference treatments.

Subject Variables Affect Preferences

One specific problem posed by the hypothesis that preference may affect satiation is in measuring the effect of levels of preference. Numerous experiments showed sex and age differences in preference for objects, and, when a variety of _S_s are used, these differences must be taken into account. Since research with retardates employs at least several different age levels of normals as controls, these differences in preference are relevant to Experiment Two, the satiation experiment.

In order to control for preference in the satiation experiment, Experiment One was designed. This study used looking time as a function of age, sex, and IQ differences as a measure of preference for categories of pictures. That such differences should exist was based on research reviewed below.

The developmental or age-difference studies of preference are many. McDougall (1908), Valentine (1913-14) and Marsden (1903) were all early experimenters who investigated color preferences in infants. Using a fixation time procedure, Staples (1932) studied the same thing. He found that color preference may not be too consistent for any one child or for any one group of infants. More recently Spears (1964) used ten-month-old Ss who received two presentations of four Munsell colors. For the first presentation, he found that blue was the most preferred followed by red, yellow, and gray. For the second presentation, he found that the order was the same except that blue and red were reversed. Curney (1956) also examined color preferences over age groups (eleven to thirty-five years old). He wanted to discern the emotional effect of colors and to find the influence of motivation on the process of color preference with regard to change in ontogenesis. To do this he used reaction time for choosing a color. His results yielded the fact that the preferred colors are chosen faster than nonpreferred colors. He also found that with an increase in age there is a concomitant decrease in preference for high saturation.

Other experiments have studied form or shape preference developmentally, too. Fantz (1963), using ocular fixation, studied pattern preferences in infants under forty-hours old, two to five day olds, and two to six month olds. He found also that faces were most preferred, then circles, newsprint, plain white, yellow, and red.

Studies of sex differences in preferences are not as numerous as studies of age differences but just as important to the interpretation of the present experiment. McElroy (1955), using an aesthetics test on Scotch children, found a sizable sex difference in preference for shapes. This same study was replicated by Jahoda (1956) who used a cross-cultural design. He not only replicated the results of McElroy but showed that there is a large sex difference in shape-preference in several cultures. Johnson and Knapp (1963) also found sex differences in aesthetic preference. They found that both sexes seem to prefer artistic forms incorporating associated qualities commonly ascribed to their own sex. Taylor and Eisenmann (1968) found sex differences as well as birth-order differences in color-form and complexity-simplicity preferences. They found, for example, that females prefer more complex designs than do males. They also found that first-born males and later-born females prefer more complexity than their respective sex groups.

Finally several studies have examined both sex and age differences in preference for various objects. Chin and Wang (1965) used preschoolers and university students and found no developmental trends for either color or form. For instance, circles were preferred most by both groups. They also found that there were no sex differences for preschoolers for form or color, but they did find that there were sex differences, especially for color, for the university students. Rump and Southgate (1967) studied color and form preference in children of seven, eleven, and fifteen years of age as well as in adults. They determined that seven and eleven year olds liked realistic familiar pictures. Bright colors were also found to be preferred by all groups. And contrary to the Chin and Wang study, they found very marked sex differences for their youngest group.

The present studies examine picture preference among normals and retardates and the effect of preference on stimulus satiation.

EXPERIMENT ONE

Experiment One investigated picture preference as a function of age, sex, and IQ in order that preference levels could be controlled in Experiment Two on stimulus satiation. No single study has reviewed preferences using age, sex, and IQ level. Sex and age have previously been shown to be variables affecting preference, and this investigator hypothesized that IQ was an additional relevant variable. It was assumed that CA, IQ, and sex all affect preference.

Several categories of pictures were chosen on the basis of pilot work. For instance, it was noted that females looked at colored slides of children more than did males and that males viewed pictures of manmade objects longer than did females. On the other hand, both sexes enjoyed seeing animals. Retarded Ss appeared to look at simple stick figures much more than normals, while normals looked at more complex and meaningful items longer.

On the basis of this research six distinct categories of slides were arranged: single children, single adults, man-made objects, animals, scenery, and geometric designs. These categories were constructed especially to point out sex, age, and IQ differences. It was assumed that girls and boys would look at pictures that contained items commonly attributed to be preferred by their sexes. It was also assumed that younger children would prefer different categories than older children. Finally it was posited that differences would appear between the normals and retardates. For example, it was assumed that retardates would avoid the abstract and approach the familiar.

METHOD

Subjects

Subjects were 48 retarded children and 48 normal children with an equal number of boys and girls in each group. The normal children were of average IQ. Test scores were not available for the normals so teacher ratings were used to select "average" individuals. The retarded Ss average IQ was 46 with a range from 31 to 69. Both IQ groups were divided into three CA groups. The youngest groups of retarded children were 7 yrs. 3 mos; this group's range was from 6 yrs. 5 mos. to 7 yrs. 8 mos. Their normal CA match was 6 yrs. 8 mos. with a range of 5 yrs. 9 mos. to 7 yrs one mo. The second group of retarded children averaged 9 yrs. 4 mos. with a range of 8 yrs. 10 mos. to 11 yrs. 4 mos. The normal control group averaged 9 yrs. 7 mos. and ranged from 8 yrs. 8 mos. to 10 yrs. 10 mos. The final 2 groups were the oldest groups with an average CA of 13 yrs. 5 mos. for the retarded Ss (range equalled 11 yrs. 11 mos. to 15 yrs.) and with an average CA of 13 yrs. 6 mos. for the normals (range equalled 12 yrs. 8 mos. to 14 yrs. 7 mos).

Normal Ss were obtained at the Westphalia-Pewamo schools in Westphalia, Michigan. Retarded Ss were obtained from the Torrent School, Jackson, Michigan.

Apparatus

A Kodak "650" Carousel projector was used to project the stimuli onto a wall. No projection screen was used as it could have been distracting, especially to the retardates. A remote changer control was connected to the projector and used to change the stimuli. A 60 second electric timer was operated manually to aid in recording looking time.

Stimulus Materials

The stimuli were two sets of 30 colored 35 mm slides. Each set of slides contained 5 slides of each of 6 different categories. The categories had been determined by pilot work, and they included scenery, single adults, single children, animals, geometric designs, and man-made objects. Most of these categories are self-explanatory. Geometric designs were nonsense pictures which consisted of four equal-sized rectangles of four different colors arranged to form a larger rectangle which filled the whole slide (leaving no white margins). Slides of man-made objects included such things as a boat, the Eiffel tower, a statue, a car and other similar objects. For each set of stimuli, the 30 pictures were arranged in a haphazard fashion. This same arrangement was shown to every S, but each S saw only one set of slides. The arrangements were similar for both sets of slides. If the first picture of set one was of a single child, the first picture of set two was of a single child and so on. An equal number of boys and girls of each age group received each set.

Procedure

Subjects were seen by E one at a time. They were seated in a chair slightly in front of and beside the projector 10 feet away from the wall onto which the pictures were projected. Each S was then instructed by E as follows:

"We are going to look at some pictures. You look at the pictures and when you want to see the next one, say 'New picture'. I will change the picture for you. Remember that you can look at each picture for as long as you want. When you want to see the next one, say 'New picture'. Are you ready for the first picture?"

After these instructions, 6 training pictures were shown to demonstrate the procedure. If, at the end of these training pictures, an S did not seem to understand the procedure, the instructions were repeated again and the training pictures were shown once more. After training, the S was again instructed:

"We are going to look at a lot more pictures just like these. You do exactly the same thing you just did. Look at each picture as long as you want. When you would like to see a new picture, say 'New picture'. I will change the picture for you. Don't ask questions while you look at the pictures. After we are finished going through them for the first time we can talk about them if you like. Do you understand? O.K. Are you ready for the first picture?"

The procedure was identical to that used in training except that the first three pictures were not included in the tabulated data. These three pictures functioned as warm-up pictures; pilot work established that the first few pictures were looked at most regardless of their content.

During the showing of the rest of the slides, the E sat with her back toward the viewing wall so that her timing of looking-time would remain unbiased. As each picture was shown, the timer ran. When an <u>S</u> said "New picture", the E stopped the timer and quickly recorded the seconds of looking time. All of E's work could be completed in three-tenths of a second.

All normal Ss learned the procedure without error on the first set of training trials. Five retarded Ss needed more than one set of training trials. Three of the Ss learned after 2 sets of training trials. The other 2 Ss were extremely active during the training trials and they were returned to their classrooms after several attempts to train them. These same 2 Ss were trained the next day after their morning drug dosage on one set of training slides and then completed the task. Retarded Ss were rewarded with candy after successful completion of the task; many of these Ss expected a reward for they had participated in previous experiments where they were also rewarded. Normal Ss were not given any primary rewards.

A 2 by 2 by 3 by 6 (IQ by sex by age by category) analysis of variance of looking times revealed significant differences only for categories ($p<.01$) and for the IQ category by age interaction ($p<.05$). Trends toward significance also appeared for sex ($p<.10$) and for the IQ by age interaction ($p<.10$). A summary of the complete analysis of variance is given in Table 1.

For the two most important findings (the categories main effect and the IQ by category by age interaction), the data contributing to the analysis can be found in Table 2. Perhaps the most striking data in this table is the difference in looking time over ages and IQ levels between category six (geometric designs) and the five remaining categories (scenery, single adults, man-made objects, single children,

TABLE 1

Summary of the analysis of variance for Experiment One

SOURCE	DF	MS	MS ERROR	F
IQ	1	1434.51	S	.71
AGE (A)	2	3199.25	S	1.51
SEX (S)	1	5757.01	S	2.84 *
CATEGORY (C)	5	776.98	C by S	20.55 ***
SUBJECTS (S)	84	2026.98		
IQ by A	2	5026.52	S	2.48 *
IQ by B	1	3075.62	S	1.41
IQ by C	5	61.92	C by S	1.63
A by B	2	860.89	S	.42
A by C	10	49.24	C by S	1.31
B by C	5	37.82	C by S	1.11
C by S	420	961.91		
IQ by A by B	2	29.39	S	.47
A by B by C	10	80.53	C by S	.77
IQ by A by C	10	60.83	C by S	2.14 **
IQ by B by C	5	35.27	C by S	1.61
IQ by A by B by C	10		C by S	.74

* $P < .10$
** $P < .05$
*** $P < .01$

TABLE 2

Total and mean looking times in seconds for each category of picture for the three age groups of normal and retarded children.

CATEGORY	NORMALS Age 1	Age 2	Age 3	Total	RETARDATES Age 1	Age 2	Age 3	Total	Total All Ss
1. Scenery	396 $\bar{X}$=24.7 SD=11.4	496 $\bar{X}$=31.0 SD=13.4	434 $\bar{X}$=27.1 SD=13.8	1299	307 $\bar{X}$=19.1 SD=14.2	250 $\bar{X}$=15.6 SD=8.1	538 $\bar{X}$=33.6 SD=41.9	1095	2394
2. Adults	340 $\bar{X}$=21.2 SD=8.01	466 $\bar{X}$=29.1 SD=12.7	400 $\bar{X}$=25.0 SD=13.5	1206	309 $\bar{X}$=19.3 SD=14.0	249 $\bar{X}$=15.5 SD=10.0	544 $\bar{X}$=34.0 SD=24.2	1112	2318
3. Man-made Objects	388 $\bar{X}$=24.2 SD=9.9	556 $\bar{X}$=34.8 SD=21.4	403 $\bar{X}$=25.2 SD=12.7	1347	306 $\bar{X}$=19.1 SD=12.4	241 $\bar{X}$=15.1 SD=7.8	536 $\bar{X}$=33.5 SD=24.1	1083	2430
4. Children	366 $\bar{X}$=22.9 SD=8.5	480 $\bar{X}$=30.0 SD=15.2	427 $\bar{X}$=26.7 SD=12.2	1273	323 $\bar{X}$=20.2 SD=13.6	275 $\bar{X}$=17.2 SD=13.2	508 $\bar{X}$=31.8 SD=36.5	1106	2379
5. Animals	359 $\bar{X}$=22.4 SD=11.2	495 $\bar{X}$=30.9 SD=14.2	429 $\bar{X}$=26.8 SD=14.3	1282	324 $\bar{X}$=20.3 SD=14.6	267 $\bar{X}$=16.7 SD=13.3	561 $\bar{X}$=35.1 SD=42.1	1152	2434
6. Geometric Designs	276 $\bar{X}$=17.3 SD=9.2	320 $\bar{X}$=20.0 SD=7.8	294 $\bar{X}$=18.4 SD=9.2	890	258 $\bar{X}$=16.1 SD=9.5	229 $\bar{X}$=14.3 SD=7.51	353 $\bar{X}$=22.1 SD=22.2	840	1730
Total	2098	2812	2387	7297	1827	1511	3050	6388	13685
$\bar{X}$	21.7	29.3	24.9		19.03	15.73	31.77		

and animals). For all ages and for all IQ levels, this was by far the least preferred category as measured by looking time in seconds.

Another interesting way of examining the data for preference is by rank. The results of this are depicted in Table 3. These rankings were used to select the categories for Experiment Two. (When looking at ranks, the numerical totals must be kept in mind, however, for in some cases only a few seconds of looking time separates one rank from another.) By looking at the ranks for each category, it can be seen that for normals there was again very little variability

TABLE 3

Ranks of the various categories for age and IQ.

CATEGORY	Normals			Rank of Total	Retardates			Rank of Total
	age 1	age 2	age 3		age 1	age 2	age 3	
1.Scenery	5	5	6	5	3	4	4	3
2.Adults	2	2	2	2	4	3	5	4
3.Man-made	6	6	3	6	2	2	3	2
4.Children	4	3	4	3	5	6	2	5
5.Animals	3	4	5	4	6	5	6	6
6.Designs	1	1	1	1	1	1	1	1

with age. For the youngest and middle age groups there was very little difference except for categories 5 and 4 (animals and children). And here the difference was not great in rank or in total looking time. The oldest group showed more of a difference from the other 2 groups of normals with category 3 (man-made objects) showing the greatest difference in rank.

Findings were quite similar for the retarded Ss. Age group 1 and 2 were most similar. At first glance they did not appear to be so similar, but total looking time needed to be considered. For instance, for the youngest group of retardates only 3 seconds looking time separates the first 3 categories in Table 2: Scenery was 307 seconds, adults was 309 seconds, and man-made objects was 306 seconds. Consequently the rankings of these 3 categories were nearly interchangeable, and therefore more similar to those of age group 2 than they first appeared to be. Once again age group 3, the oldest normal Ss, showed the most discrepancy of all groups. For these older Ss category 4 (Children) was most different in rank from the other age groups.

A comparison of the ranks of total looking time for the retarded and normal Ss shows that there is actually little difference between the IQ levels. For all other categories except Man-made Objects there is no more than a difference of 2 rank points between retardate and normal ranks. For the Man-made category, there is the biggest difference between normals and retardates with a difference of 4 rank points.

DISCUSSION

In reviewing the findings of this experiment, it is helpful to know some of the biographical data on the Ss.

The normal Ss all lived in Westphalia or Pewamo, Michigan. Both locations are small, rural, German-Catholic towns. Many of the inhabitants are related to one another. This is born out in the fact that several family names dominate the list of Ss used in the experiment. In sum, these Ss were quite homogeneous as a group.

The retarded Ss were all citizens of Jackson County, Michigan. They varied in IQ and etiology as well as race. Some of the Ss came from the city of Jackson itself while a few came from the more rural surrounding area. This sample, then, was more heterogeneous than the normal sample. It should be noted, however, that in this sample there were also several Ss from the same family.

Sex Effects

In light of the above description, the non-significant status of most findings was surprising. One non-significant result was for the sex effect. Two categories of pictures were especially selected to bring out this effect; Man-made Objects (masculine preference) and Children (female preference). All categories were looked at similarly by each sex, though. The reasoning to explain this is that the individual pictures making up the categories did not differentiate between the sexes even though the categories as a whole were thought to do so. One example will suffice here. The category Children was presumed to be more preferred by females. Perhaps the actual case was that rather than the females looking at all children the most, the male Ss looked at the male children as much as the female Ss looked at the female infants. This may have occurred throughout enough categories to produce no difference in total looking time for the sexes.

Age Effect

That there were no age differences was surprising. The finding that there were no significant age differences is justifiable when the 3 ages used are analyzed. These ages were chosen for several reasons. A group as young as possible was wanted especially for the determination of the effects of sex. The younger the child, the less likely he is to have been exposed fully to his sex role (Thompson, 1962, p. 475). Very young retarded Ss are difficult to locate. The minimum age obtainable was at the kindergarten level. The oldest group was likewise chosen for a specific reason. Around the age of 13-14 years is when puberty is reached by most children. It is at this age when they go through many physiological as well as psychological changes (Munn, 1965. pp. 548-556). It was desirable to obtain a group of this age on this basis. The other age group was selected because it fell in the middle of the other two groups, and both retarded and normal Ss of this age were available. Unfortunately, the spread between the 3 age groups chosen (6 to 7 year olds, 9 to 10 year olds, and 13 to 14 year olds) was not great enough to produce the age differences which have frequently been obtained in other research.

IQ Effects

The most difficult non-significant finding to explain was that the IQ variable was not effective by itself. In view of the description of the IQ samples, it is very interesting that they reacted similarly. Perhaps this can be accounted for by considering the procedure itself. A loose comparison can be made to the Denny, Duffy, and Dickie (unpublished) experiment. This study also used looking time in seconds as its dependent variable. In the present experiment, each S chose his looking time at each picture. He looked at each picture for only as long as he wished. In the Denny et al study the Ss' looking time was imposed on them. Each stimulus was exposed for 10 seconds. In this 10 second period the S could look or not look. The retardates had much more non-looking time (less looking time) than did the normals. In the present experiment there was virtually no non-looking time. This made each trial quicker which perhaps enhanced the looking time of the retardates up to that of the normals. Perhaps it also shortened each trial enough to coincide with the attention span of the retardates (which might not have been 10 seconds as Denny et al assumed).

Age by IQ Effect

There was a trend ($P < .10$) toward significance for the age by IQ interaction. Table 2 again indicates the data pertinent to this analysis. For normals, age group 3 had the longest looking times followed by age groups 2 and one respectively. For the retardates, however, this linear relationship between age and looking time did not hold. Age group 3 spent the most time looking at the stimuli as did age group 3 for the normals. However, the relationship between age group one and 2 for the retardates was the reverse of that for normals. For these retarded Ss, age group 2 spent the least time looking at the stimuli. Age group one was the middle group as far as looking time was concerned.

This interaction between age and IQ may in part explain why neither of the main variables, age and IQ, was significant. If in fact preferences change differently for retardates than for normals as age increases while over all ages and categories average looking time is about the same for both groups within the ranges tested, the effect of age and IQ on preference would appear as a significant interaction.

Categories Effect

The fact that the categories effect was highly significant is important because two of the categories were to be used in Experiment Two. More important, however, is the result of category 6 or the Geometric Designs. It should be remembered what these stimuli were. Geometric Designs were pictures which consisted of four equal squares of four different colors. The four squares were arranged to form a larger square which filled the whole slide. In other words these pictures were not familiar and were not meaningful. For every single age group and IQ group these pictures were by far the least preferred. The raw data shows that for five-sixths of the Ss this was the least preferred category. For the remaining Ss this category was hardly ever most preferred.

This finding was not surprising, but it is important in that these stimuli were identical to some of those used in the Denny, Duffy, and Dickie study. These E's examined stimulus satiation and found that there were large amounts of time spent looking at objects other than the stimuli. That these stimuli are unpreferred accounts for this in part. If the Ss did not prefer the stimuli and therefore did not look at the stimuli, then they did not satiate of them. More meaningful or more preferred pictures might have provided better measures of satiation. Further testing of this hypothesis was performed in Experiment Two.

EXPERIMENT TWO

This experiment studied stimulus satiation under differing stimulus preference levels in retarded and normal _S_s. Other experiments have reviewed mostly response satiation in normals compared to retardates. Two others, however, have covered stimulus satiation (Terdal, 1967; Denny, Duffy, and Dickie, unpublished). These two experiments indicated that retardates probably satiate slower than normals.

In this experiment the preference results of Experiment One were used to produce 4 satiation treatments. These treatments took advantage of the most preferred and least preferred categories of Experiment One to study the relationship between preference and stimulus satiation. The four treatments consisted of the four possible combinations of varied (changing) high or low preferred stimuli and constant (repeated) high or low preferred stimuli.

It was predicted that these preference treatments would affect the rates of satiation to various degrees. For example it was hypothesized that pairing a high-preferred constant with a high-preferred varied would produce slowest satiation. On the other hand, pairing a low-preferred constant with a low-preferred varied should produce the fastest satiation and briefest looking times. When the two preference rankings (high and low) were intermixed, the measures of satiation should have fallen in between the above two. The high-preferred varied paired with the low-preferred constant should tend to produce slightly slower satiation than the low-preferred varied and the high-preferred constant, though.

It was also predicted that retardates would generally satiate slower than normals over all trials (constant plus varied) and over especially the constant trials.

METHOD

Subjects

Subjects were the same Ss used in Experiment One. This time they were equally divided into 4 experimental groups; there were 4 groups of 12 retardates and 4 groups of 12 normals. Of these 12 Ss in each group, there were 4 (2 girls and 2 boys) from each age group in Experiment One. Determination of which 2 girls and which 2 boys of a given age entered each experimental group was haphazard.

Apparatus

The apparatus used in this experiment was the same as that used in Experiment One.

Stimulus Materials

There were 4 different sets of stimulus pictures. Of the 36 pictures in each set, 18 were varied and 18 were constant. The varied pictures were 18 different pictures from one category. The constant pictures were multiple copies of a single picture. The 36 pictures were arranged so that constant and varied stimuli alternated, (i.e. the sequence an S saw was c_1, v_1, c_1, v_2, c_1, $v_3 \ldots c_1$, v_{18}).

The 4 sets of pictures consisted of 4 combinations of constant and varied. In set one, the constant picture was high-preferred (Scenery) but the varied was low-preferred (Geometric Designs). In set two both the constant and varied were high-preferred. In the third set, the constant was one of low preference as was the varied. In the final set, the constant had a low preference ranking, but the varied had a high preference ranking. These preference rankings were determined by the results of Experiment One. The category of Geometric Designs was chosen as the low-preferred category, and Scenery was selected as the high-preferred category.

It should be noted that the 18 varied pictures of each group consisted of the 10 pictures used in Experiment One as well as 8 new pictures. The constant picture was chosen on the basis of its best representing the category of Scenery or of Geometric Designs. It was duplicated 18 times. For the 2 groups receiving a high-preferred constant, the constants were the same. This was also true of the low-preferred constants.

RESULTS

For the four treatment groups in Experiment Two there was no balancing of preference from Experiment One. There was balancing of age, IQ and sex from Experiment One to Experiment Two and this made the balancing of preference unfeasible. To control for preference in this experiment mean difference scores between performance in Experiment One and performance in Experiment Two were used as data for Experiment Two. That is the average looking time per slide on Experiment Two was subtracted from the average looking time per slide from the appropriate category from Experiment One. Table 4 gives these mean difference scores by condition for normals and retardates.

Table 5 presents mean difference scores for blocks of trials for the constant versus varied stimuli for normals and retardates. An analysis of variance of this data showed all 3 main effects to be highly significant: for IQ $F=63$, $df=1,5$, $p<.01$; for constant-varied $F=104$, $df=1,5$, $p<.01$; for blocks of trials $F=25$, $df=5, 5$, $p<.01$. Although none of the interactions reached significance, the trial blocks by constant-varied interaction approached significance ($F=4$, $df=5, 5$, $.05<p<.01$).

Figure 1 shows the change in looking time over trials for normals and retardates under the constant-varied conditions. Figure 2 shows the performance of the retardates over trials for each condition. There is clear evidence of

TABLE 4

Mean difference scores in looking time in seconds by condition for normals and retardates.

	TREATMENT	Blocks of Three Trials: 1	2	3	4	5	6
NORMALS	Low Constant	-.10	-.09	-.58	-.72	-.89	-.87
	Low Varied	+.21	+.37	-.52	-.54	-.83	-.31
	High Constant	-.83	-2.00	-2.49	-2.93	-2.92	-3.18
	High Varied	-.99	-1.50	-2.64	-1.63	-2.42	-1.48
	Low Constant	+.74	+.61	+.25	+.05	-.28	-.29
	High Varied	-.46	-1.03	-.70	-.39	-.62	+.52
	High Constant	-2.31	-2.59	-2.47	-2.51	-2.36	-2.37
	Low Varied	-.73	-1.11	-.82	-.80	-1.00	-1.14
RETARDATES	Low Constant	-.97	-.26	-1.20	-1.25	-1.20	-1.43
	Low Varied	-.67	-.75	-1.15	-.95	-1.21	-1.24
	High Constant	-1.22	-1.97	-1.88	-1.77	-1.94	-1.99
	High Varied	-1.39	-1.72	-1.49	-1.65	-1.64	-1.81
	Low Constant	-.67	-1.09	-1.05	-.82	-.92	-.78
	High Varied	-1.39	-1.65	-1.69	-1.67	-1.61	-1.46
	High Constant	-2.06	-2.44	-2.83	-2.61	-2.94	-4.00
	Low Varied	-.67	-.31	-.67	-.69	-.56	-.87

TABLE 5

Mean difference scores in looking time in seconds for normals and retardates at constant and varied stimuli.

		BLOCKS OF THREE TRIALS						
		1	2	3	4	5	6	Total
NORMALS	Constant	-.63	-1.01	-1.32	-1.52	-1.62	-1.67	7.77
	Varied	-.46	-.81	-1.17	-.83	-1.22	-.86	5.35
RETARDATES	Constant	-1.23	-1.44	-1.73	-1.61	-1.75	-2.05	9.81
	Varied	-1.03	-1.11	-1.25	-1.25	-1.25	-1.34	7.23
	Total	-3.35	-4.37	-5.47	-5.21	-5.84	-5.92	30.16

Figure 1

Mean difference score in looking time in seconds for retardates and normals at constant and varied stimuli regardless of preference over blocks of trials.

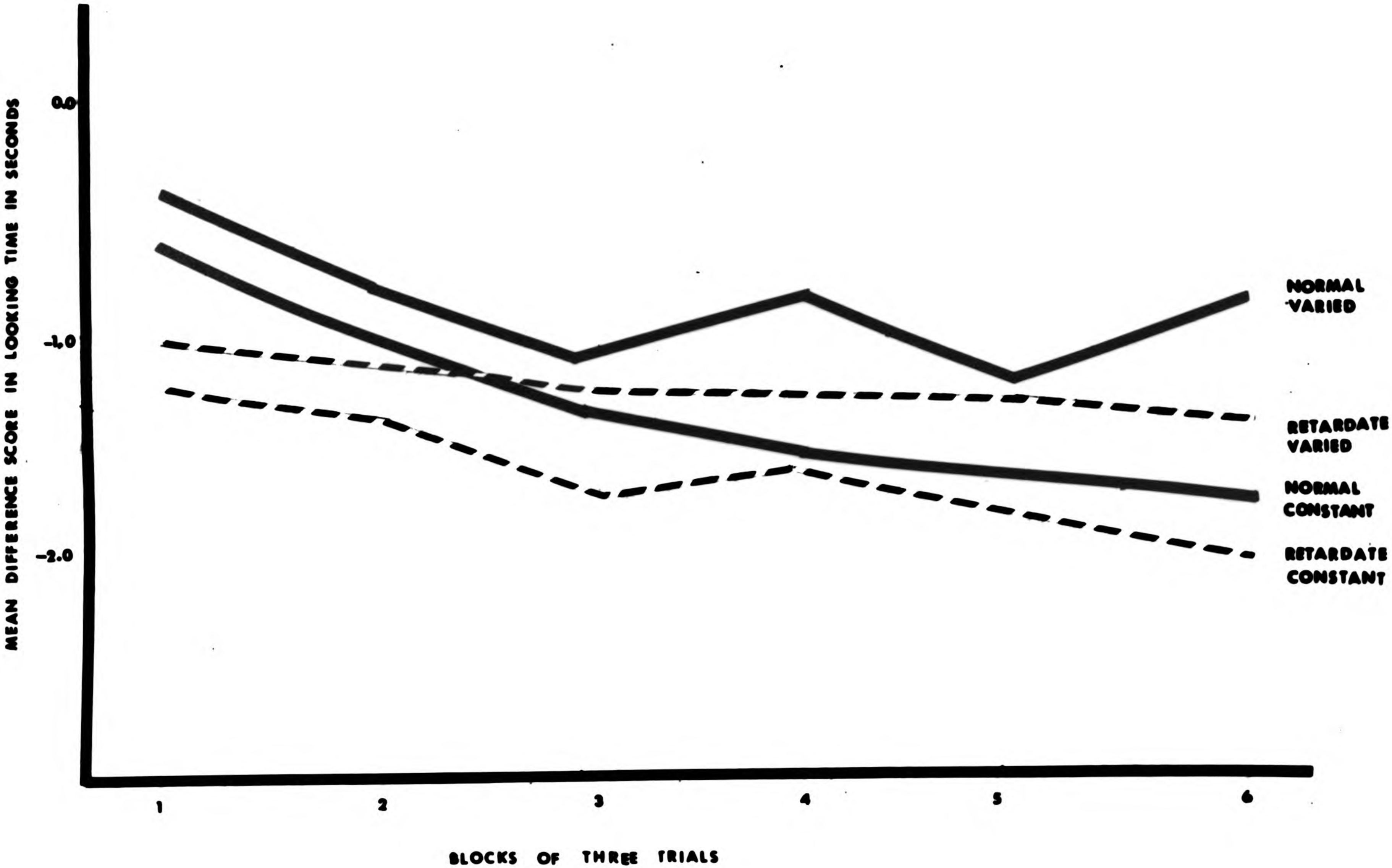
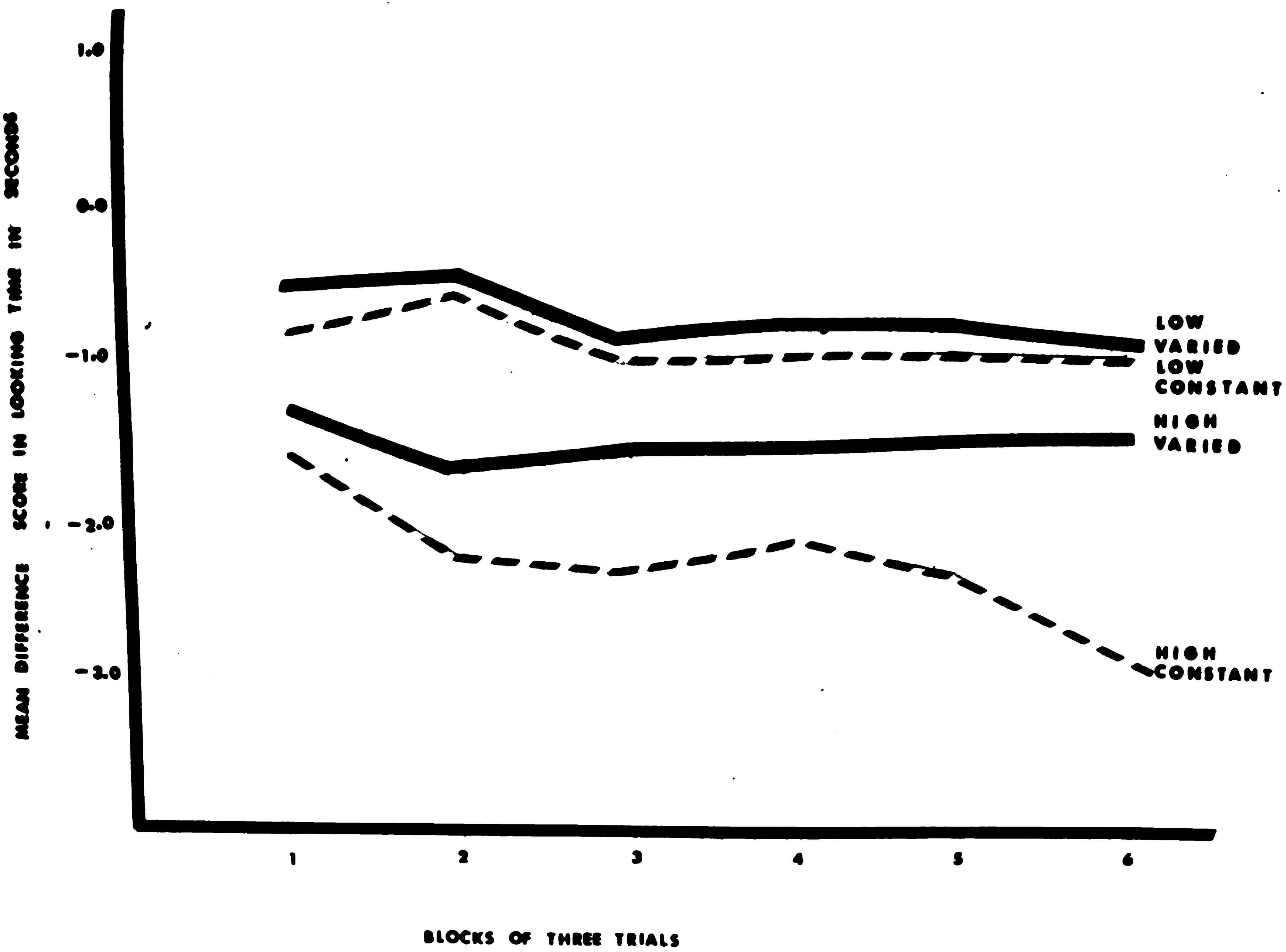

MEAN DIFFERENCE SCORE IN LOOKING TIME IN SECONDS
0.0
-1.0
-2.0
NORMAL VARIED
RETARDATE VARIED
NORMAL CONSTANT
RETARDATE CONSTANT
1
2
3
4
5
6
BLOCKS OF THREE TRIALS

Figure 2

Mean difference score in looking time in seconds for retardates at constant and varied stimuli of each preference level over blocks of trials.


MEAN DIFFERENCE SCORE IN LOOKING TIME IN SECONDS
1.0
0.0
-1.0
-2.0
-3.0
LOW VARIED
LOW CONSTANT
HIGH VARIED
HIGH CONSTANT
1
2
3
4
5
6
BLOCKS OF THREE TRIALS

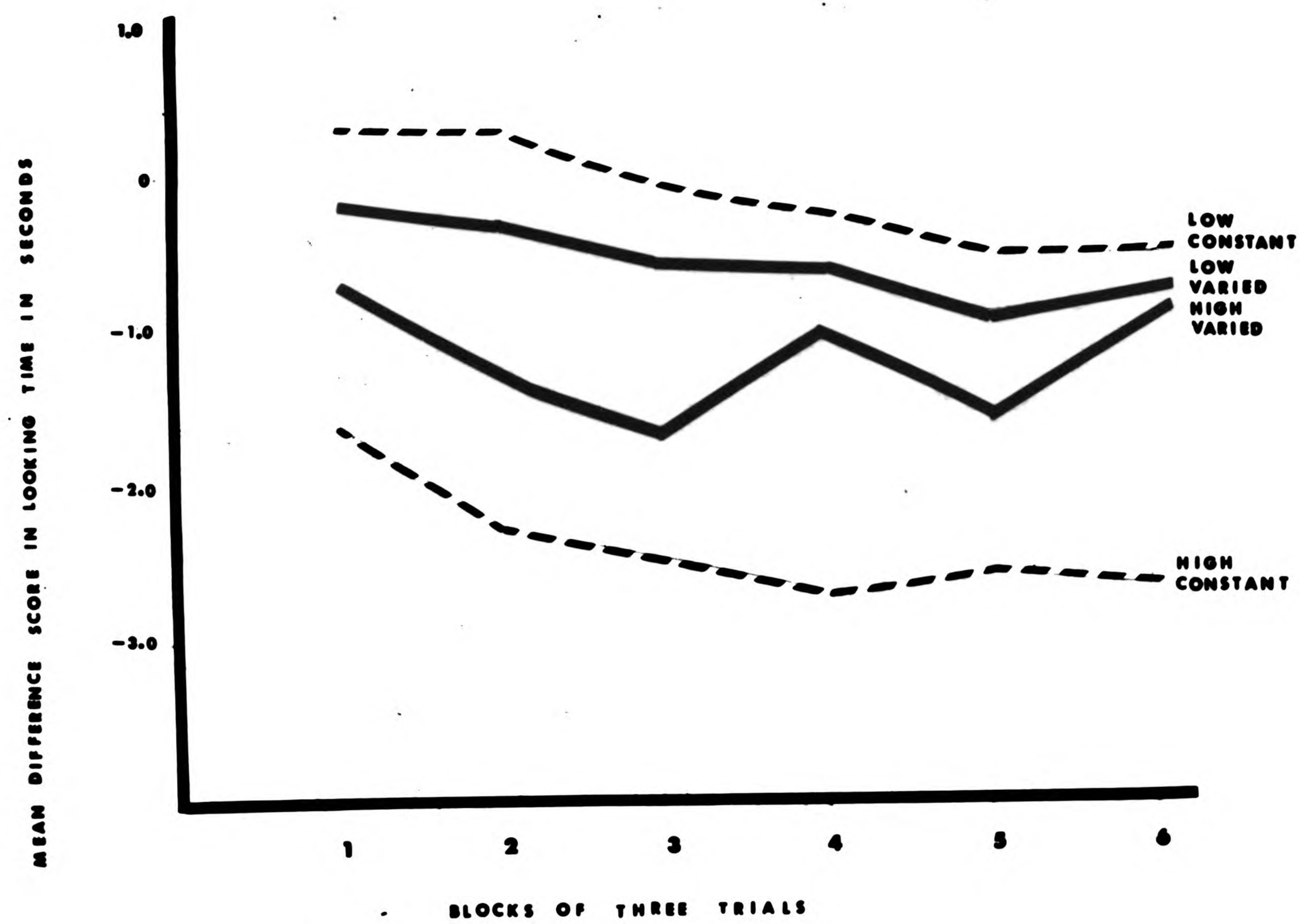
satiation over trials under the high constant condition and no evidence of satiation under any other condition. Figure 3 shows the performance of normals over trials for each condition. It is clear that there was little or no satiation for the two varied conditions for normals where there appears to be some satiation for both constant conditions.

Table 6 presents mean difference scores for blocks of trials for the high preferred and low preferred stimuli for normals and retardates. As expected from the previous analysis both IQ ($F=78.8$, $df=1, 5$, $p<.01$) and blocks of trials ($F=31.3$, $df=5, 5$, $p<.01$) were highly significant. In addition the high preferred and low preferred distinction was highly significant ($F=1133.6$, $df=1, 5$, $p<.001$). There was also a significant IQ by treatment interaction ($F=23.6$, $df=1, 5$, $p<.01$). Figure 4 shows the change in performance of normals and retardates over the treatment conditions. It can be seen from this figure that there was a difference in performance over trials on the high preferred conditions but no noticeable difference in performance over trials on the low preferred conditions.

A further explanation of the IQ by treatments interaction can be made by referring to Table 2 from Experiment One. Although there were no overall IQ differences in preference in Experiment One, this table shows that there were preference differences for scenery between normals

Figure 3

Mean difference score in looking time in seconds for normals at constant and varied stimuli of each preference level over blocks of trials.



MEAN DIFFERENCE SCORE IN LOOKING TIME IN SECONDS
1.0
0
-1.0
-2.0
-3.0
LOW CONSTANT
LOW VARIED
HIGH VARIED
HIGH CONSTANT
1
2
3
4
5
6
BLOCKS OF THREE TRIALS

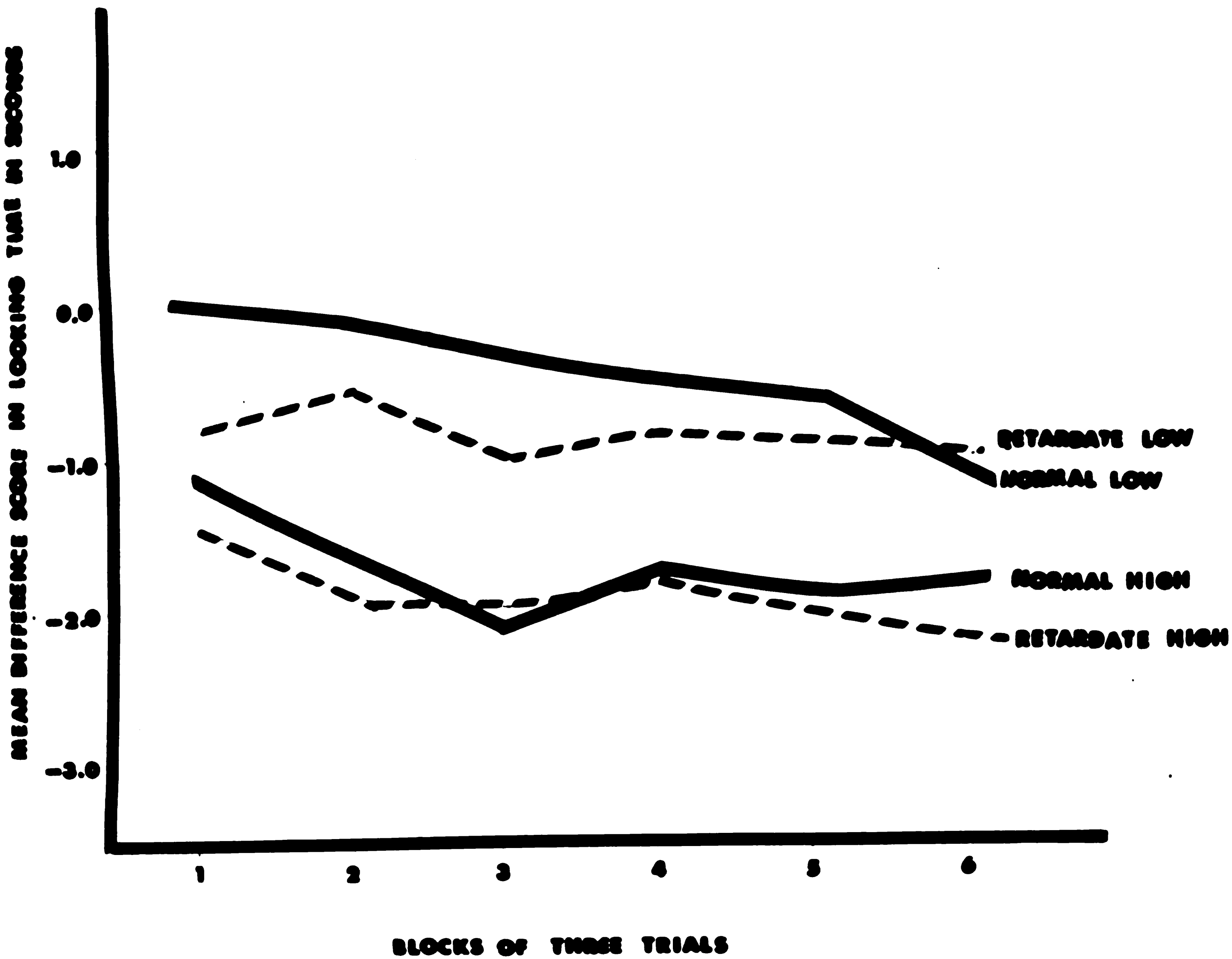
TABLE 6

Mean difference scores in looking time in seconds for normals and retardates at high and low preferred stimuli.

		BLOCKS OF THREE TRIALS						
		1	2	3	4	5	6	Total
NORMALS	High	-1.12	-1.77	-2.07	-1.86	-2.08	-1.88	10.78
	Low	+.03	-.05	-.42	-.50	-.75	-.66	2.35
RETARDATES	High	-1.51	-1.94	-1.97	-1.92	-2.03	-2.31	11.68
	Low	-.75	-.61	-1.01	-.93	-.98	-1.07	5.35
	Total	-3.35	-4.37	-5.47	-5.21	-5.84	-5.92	30.16

Figure 4

Mean difference score in looking time in seconds for retardates and normals at high and low preferred stimuli regardless of whether they are constant or varied over blocks of trials.



MEAN DIFFERENCE SCORE IN LOOKING TIME IN SECONDS
1.0
0.0
-1.0
-2.0
-3.0
RETARDATE LOW
NORMAL LOW
NORMAL HIGH
RETARDATE HIGH
1
2
3
4
5
6
BLOCKS OF THREE TRIALS

and retardates. The normals spent more time looking at the geometric designs than did retardates but this difference was not as significant. Therefore the difference in preference for these two categories was greater for normals than for retardates and explains this interaction.

Summary tables of the 2 analyses of variance performed on the above data appear in the Appendix.

DISCUSSION

Interpretation

The main interest of this study was examining stimulus satiation under various preference treatments. There were clear differences in satiation for the various treatments for the IQ groups. Figure 4 is pertinent here.

Both normals and retardates spent very little time looking at the low preferred stimuli regardless of the constant-varied condition. There was very little chance for satiation to occur on the low-preferred stimuli then. This was clearly the case in this experiment. Both groups operated under a floor effect. They started with such low looking times on the first few trials that there was no room for even less looking time on the following trials; little satiation occurred. A comparison of Figure 3 with Figure 2 shows that for normals a little satiation did occur for the low-preferred stimuli whereas for retardates there was no satiation. This slight difference is explained by referring to Table 2 from Experiment One. Normals initially looked at the low-preferred stimuli (Geometric Designs or Category 6) a little more than retardates. In Experiment Two, then, they had a slightly higher level from which to start before reaching the floor effect.

Under the high-preferred conditions both IQ groups performed quite differently than they did under the low-preferred conditions. First, both groups spent less average time looking at the high-preferred stimuli in Experiment Two than they did in Experiment One, as evidenced by the negative mean difference scores. One could reason from this that some satiation had taken place as a result of Experiment One. Second, when high-preferred stimuli were varied there was no change in performance over blocks of trials in Experiment Two for either normals or retardates. No satiation occurred. However, when the high-preferred stimuli were repeated many times as in the high-constant condition, there was a noticeable decrease in looking time over blocks of trials. In other words, satiation occurred for the high-constant but not for the high-varied.

One can conclude from the above description of the effects of high- and low-preference that preference plays a large role in satiation. Two related changes in satiation performance may occur as a result of preference. First of all, an S must look at a stimulus before he can satiate on it. When an S does not attend to the stimulus, satiation does not occur for that stimulus. This is, in essence, what happened during the low-preferred stimulus trials. Ss looked very little during the first few trials and could not and did not satiate on these stimuli. In contrast, on the high-preferred stimuli, Ss looking times were much higher initially; satiation could and did occur.

Figure 4 is most pertinent to this interpretation.

The second and related effect that preference has on satiation is that if a stimulus is low-preferred, immediate satiation may occur. The stimulus is so low-preferred that the S satiates rapidly on the initial trials and again operates under a floor effect. The S cannot possibly satiate or decrease his looking time further unless he is not looking at the stimulus at all, in which case his looking time is zero.

Summary of IQ Effects

In Experiment One there was no significant IQ effect. There was a significant IQ by age by category interaction ($p<.05$). This was interpreted to mean that retardates' preferences for the 3 ages differed significantly from the normals' preferences for the 3 ages. More specifically, in the IQ by age interaction which approached significance ($p<.10$) the normal data exhibited a linear relationship between age and looking time in seconds. The older the group, the more the total looking time. The retardate data did not exhibit this linear relationship. The reason for this was that age group 2 (rather than age group 3 as for normals) showed the highest total looking times. Developmental differences in preference, then, were found between normals and retardates.

For the 2 preference categories from Experiment One used in Experiment 2, there was little difference between normals and retardates. Both groups preferred scenery much more than the geometric designs. Both groups looked at the geometric designs in similar amounts. But the normals looked at the scenery significantly more than did the retardates. This comparison is important to the interpretation of Experiment 2.

In Experiment 2 results for both groups were quite similar. The best satiation occurred on the high preferred stimuli for both groups. Little satiation occurred on the low preferred stimuli for both normals and retardates. Similarly the best satiation occurred on the constant stimuli for both groups. Little satiation was evidenced on the varied stimuli for normals or retardates.

When the preference conditions and constant-varied conditions were paired in all combinations, results for both groups were once again very similar. Satiation was greatest for the high preferred constant stimuli for both IQ levels. There was no satiation for the varied stimuli of either preference for both groups. The one big difference between normals and retardates, then, was in the rate of satiation over the low preferred constant conditions. Normals showed slight satiation over these trials where retardates showed none. This difference was produced by the difference in the initial amount of looking time at the low preferred constant on the first few trials. Both groups showed very low looking times at these stimuli but the retardates showed even less than the normals. The normals, then, had some room for satiation. The retardates, with slightly lower looking times, operated under the influence of a floor effect. They could look no less at these stimuli than they already were. They could not and did not satiate.

Past Research

These results of the experiments reported here lead to a simple explanation of the results of the previous related studies (Terdal, 1967; Denny, Duffy, and Dickie, unpublished). In both the Terdal and Denny, *et al* studies retardates showed very little satiation. Similarly in both studies various types of geometric designs were used as stimuli. (As a matter of fact, the geometric designs used in the present experiments were identical to some of those used in the Denny, *et al* study.) That these studies found such low satiation rates is to be expected according to the results of the present experiments. Geometric designs are of very low preference and retarded *S*s start at such low initial levels of looking time that they can not satiate or decrease their looking time by very much. Support for the interpretation that these stimuli were low in preference can be found within the two studies themselves. Because of the constant and varied stimuli's successive presentation over a 10 second trial interval, a measure of nonlooking time (time spent looking at objects other than the experimental stimuli) was obtainable. Nonlooking time in both studies increased over trials. In terms of the present study, the stimuli were not preferred and the Ss preferred to spend most of the 10 second interval looking at objects other than the experimental stimuli. These E's, in order to obtain satiation, should have considered preference in selecting their stimuli. Given that preferred stimuli are used, stimulus satiation will occur in retarded Ss.

Implications

The implications of this study are important to the field of education. Recall that retardates are poor incidental learners. This has been attributed to the fact that they are slow satiators. Retardates do not satiate of familiar stimuli so that they can attend to novel and enriching stimuli which may contribute to incidental as well as intentional learning. In order for satiation to occur for retardates, stimuli must be high preferred by them. Further studies of preferences of retardates should be performed to determine what stimuli satiate faster than others. Then the learning environments of retardates should be ordered appropriately to insure maximum learning.

Another implication for education concerns a second trait of retardates. Retardates are noted for perseverative behavior. This type of behavior is detrimental to the learning of retardates. It is an undesirable trait because perseveration of one behavior is incompatible with performance of other behaviors. This trait has also been hypothesized to be the result of poor stimulus satiation. Retardates must be made to shift attention from behavior to behavior in order that they might enjoy the benefits of novel and enriching experiences. Since retardates do satiate of high preferred stimuli, they can be trained to satiate of these stimuli and trained to shift attention from one preferred stimulus to another. Once again, to maximize the learning experiences of retardates, ordering of the educational environment should be carried out along the lines of preferences.

LIST OF REFERENCES

Barnett, D. D. Learning in Familial and Brain-Injured Defectives. American Journal of Mental Deficiency, 1960 64, 894-901.

Becknell, J., Wilson, W., and Baird, J. The Effect of Frequency of presentation on the choice of nonsense syllables. Journal of Psychology, 1963, 56, 165-170.

Brown, L., and Lucas, J. Supplemental Report: Attentional Effects of Five Physical Properties of Visual Patterns. Perceptual and Motor Skills, 1966, 23, 343-346.

Cantor, G. Children's "Like-dislike" Ratings of Familiarized and Non-familiarized Visual Stimuli. Journal of Experimental Child Psychology, 1968, 6, 651-657.

Chin, L. and Wang C. Color and Form Preference. Acta Psychologica Sinica, 1965, 32, 265-269.

Connor, K. Visual and Verbal Approach Motives as a Function of Discrepancy from Expected Levels. Perceptual and Motor Skills, 1964, 18, 457-464.

Curney, L. Color Preference in Ontogenesis: Its Relationship to Motivation of Subjects. Psychologica, 1965, 16, 229-242.

Davenport, R., and Berkson, G. Stereotyped Movements of Mental Defectives: II Effects of Novel Objects. American Journal of Mental Deficiency, 1963, 67, 879-882.

Denny, M. R., Duffy, K. G., and Dickie, J. R. Complexity and Stimulus Satiation in Normal and Retarded Children. (unpublished).

Fantz, R. Pattern Vision in Newborn Infants. Science, 1963, 140, 296-297.

Feldman, I. S. Psychological Differences among Moron and Mental Defectives as a Function of Etiology. American Journal of Mental Deficiency, 1953, 57, 484-494.

Harris, L. The Effects of Relative Novelty on Children's Choice Behavior. Journal of Experimental Child Psychology, 1965, 2, 297-305.

Jahoda, G. Sex Differences in Preference for Shapes: A Cross-cultural Replication. British Journal of Psychology. 1956, 47, 126-127.

Johnson, L., and Knapp, R. Sex Differences in Aesthetic Preferences. Journal of Social Psychology, 1963, 61, 279-301.

Kounin, J. S. Experimental Studies of Rigidity: I The Measurement of Rigidity in Normal and Feebleminded Persons. Character and Personality, 1941, 9, 251-273.

Leckart, B. Looking Time: The Effects of Stimulus Complexity and Familiarity. Perception and Psychophysics, 1966, 1, 142-144.

Lewin, K. A. A Dynamic Theory of Personality. New York: McGraw-Hill, 1935.

McDougall, W. An Investigation of the Colour Sense of Two Infants. British Journal of Psychology, 1908, 2, 338-352.

McElroy, W. A Sex Difference in Preference For Shapes. British Journal of Psychology. 1945, 209-216.

Marsden, R. A Study of the Early Color Sense. Psychological Review, 1903, 10, 37-47.

Munn, N. The Evolution and Growth of Human Behavior. Boston: Houghton Mifflin Company, 1965.

Rump, E., and Southgate, V. Variables Affecting Aesthetic Appreciation in Relation to Age. British Journal of Educational Psychology, 1967, 37, 58-72.

Sackett, G. Response to Differential Visual Complexity in Four Groups of Retarded Children. Journal of Comparative and Physiological Psychology, 1967, 64, 200-205:

Singer, R. Incidental and Intentional Learning in Retarded and Normal Children. (Unpublished).

Spears, W. Assessment of Visual Preference and Discrimination in the Four-month-old Infant. Journal of Comparative and Physiological Psychology, 1964, 57, 381-386.

Staples, R. The Responses of Infants to Color. Journal of Experimental Psychology, 1932, 15, 119-141.

Taylor, R., and Eisenman, R. Birth Order and Sex Differences in Complexity-simplicity, Color Form Preference, and Personality. Journal of Projective Techniques and Personality Assessment, 1968, 32, 383-387.

Terdal, L. Stimulus Satiation and Mental Retardation. American Journal of Mental Deficiency, 1967, 61, 881-885.

Thompson, G. Child Psychology: Growth Trends in Psychological Adjustment. Boston: Houghton Mifflin Company, 1962.

Valentine, C. The Colour Perception and Colour Preferences of an Infant During Its Fourth and Eighth Months. British Journal of Psychology, 1913-14, 6, 363-386.

Zigler, E., Hodgen, L., and Stevenson, H. The Effect of Support and Nonsupport on the Performance of Normal and Feebleminded Children. Journal of Personality, 1958, 26, 106-122.

APPENDIX A

Summary of the analysis of variance for IQ, blocks of trials, and treatments.

SOURCE	DF	MS	F	
IQ	1	.63	78.8	**
B (Blocks)	5	.25	31.3	**
T (Treatments)	1	9.07	1133.8	***
IQ by B	5	.03	3.8	*
IQ by T	1	.19	23.8	**
B by T	5	.04	5.0	*
IQ by B by T	5	.008		

* $p<.10$
** $p<.01$
*** $p<.001$

APPENDIX B

Summary of the analysis of variance for IQ, blocks of trials, and constant-varied.

SOURCE	DF	MS	F	
IQ	1	.63	63	**
B (Blocks)	5	.25	25	**
C (Constant-Varied)	1	1.04	104	**
IQ by B	5	.03	3	
IQ by C	1	.01	1	
B by C	5	.04	4	*
IQ by B by C	5	.01		

* $p < .10$
** $p < .01$