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ABSTRACT

This longitudinal study examined the effects of one year of full-day Head Start day care experiences on the long-term motivational and cognitive changes in 29 low-income black children aged 51-61 months. The children were separated into two groups; one attended a full-day kindergarten similar to Head Start, and the other was sent to half-day public kindergarten. A control group, composed of 20 children who attended private nursery school and subsequently attended kindergartens in their own neighborhoods, was also used. During the day care program and through the middle of the first grade year, data were collected in seven time periods for three areas of motivational/cognitive interaction: (1) changes in the relationship between personal interaction variables, (2) changes in intrinsic need to interact effectively and competently with the environment, and (3) changes in the impulsivity/reflectivity dimension. Comparison of the data from the two experimental groups showed little indication that the kindergarten program had produced significant effects; the small effects shown late in the year would have required an extension of the program for verification. However, there were no indications of fade-out effects of Head Start for either group. In addition, the disadvantaged groups performed comparably to the economically advantaged group except on tests which depended on high verbal ability. (GO)

LONG-TERM MOTIVATIONAL-COGNITIVE EFFECTS OF DAY CARE[1]

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LONG-TERM MOTIVATIONAL-COGNITIVE EFFECTS OF DAY CARE[1]

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Many preschool children spend a portion of their time enrolled in day care centers. Their experiences there may vary in quality from receiving mere custodial care to being exposed to educationally stimulating curricula. Among the programs which were specifically developed to provide day care experience of the enriching variety is the Head Start Program (Office of Economic Opportunity, 1968). The major purpose of the present study was to examine the effects of a Head Start Day Care program both during the program and after the children have left the program to enroll in public schools. Both motivational and cognitive changes were of interest, as well as the nature of the relationship between motivational and cognitive factors and how they may be affected by the day care experience.

Long-term effects: The Theoretical Issue

The issue of long-term effects is of central theoretical importance in determining the meaning to be given to the term "intervention" in educational intervention programs. In a provocative article, Campbell and Frey (1970) have argued that even if one assumes middle-class and impoverished children to be identical in their learning capacity, educational intervention programs given to the children of poverty would have only a short-term measureable effect. The termination of the program would be followed by an extended period of fade-out, they argue, accompanied by catching up of untreated children, because the treated children would no longer be receiving an adequate level of "effective environmental stimulation". The key word in this construct is "effective".

Clearly, environmental stimulation by itself would be a psychologically meaningless variable, ignoring the active role which humans exercise in filtering, structuring, and selectively extracting information provided by the environment. Anokhin (1961), for example, provides evidence for filtering at the physiological level, Miller (1956), a discussion of conceptual structuring, and Hunt (1965), Kessen (1963), and Piaget (1952), a documentation of active organization of environmental input in the young child.

The forces which make environmental stimulation effective or ineffective are not well understood, but motivational factors are clearly implicated. An examination of the literature regarding the relationship between motivational factors and cognition in children and adults (Zigler, 1971) leads one to speculate that such motivational stances as fear of adults, expectation of punishment, fear of failure, low expectancy of success, anxiety, and distrust of one's own capabilities may be major forces in preventing a disadvantaged child from taking maximum advantage of the environmental input he receives. To the extent that such expectations lead a child to develop an overall style of minimal interaction with the world about him they may be self-retarding.

Since the Campbell and Frey model provides a base of departure for examining assumptions and expectations regarding the long-term effects of intervention programs, it deserves presentation in some detail here. As a specific example, Campbell and Frey use the acquisition of vocabulary as a performance measure and assume, arbitrarily, that the advantaged group receives twice as effective an environmental exposure to vocabulary as the disadvantaged at all times except for an equality of exposure during the compensatory program. The estimate of "twice" is arbitrary, but only the magnitude and timing of the eventual fade-out would be influenced by changes in the magnitude of this value. Figure 1 diagrams their assumptions.

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Insert Fig. 1 about here

Even at the risk of redundancy, it should be stressed that the diagram in Figure 1 does not imply a passive process in the recipient, since the construct being diagrammed is effective environmental exposure rather than simply exposure itself.

Given this model plus a single mathematical formula to predict growth rate as a function of amount of effective exposure, performance curves such as those shown in Figure 2 would be generated.

Insert Fig. 2 about here

These curves bear a close resemblance to the results obtained in several previous studies of the long-term effects of Head Start (see Stearns, 1971): namely, that the Head Start children made rapid gains during the Head Start period but slowed down after the program was terminated, while the children who had had no Head Start gradually caught up with them. (These phenomena have been called "fade-out" and "catching up", respectively.) The most important point about this model is that the same formula is used to calculate the rate of growth for all three groups--a formula which assumes that all these children learn new information at the same rate and that when they forget, they do so at equivalent rates. The only difference is assumed to be in effective environmental exposure. The fade-out effect occurs because the return to a limited effective environmental exposure puts a low ceiling on the eventual performance

level. If there were no drop in effective environmental exposure, the Head Start children would eventually catch up with the advantaged children.

In the Campbell and Frey model, fade-out is predicted if the level of effective environmental input drops precipitously when the intervention program ceases. Yet if one examines the original goals of the Head Start program carefully, it is evident that the intent was that the drop would not be precipitous because of changes wrought in the children's ability to interact with the environment. The effectiveness of environmental stimulation is theoretically influenced by a child's physical condition and by the nature of his home life in addition to direct factors such as his attitudes about his capabilities, all of which were factors recognized and included in the original planning of Head Start (Office of Economic Opportunity, 1968). Defined in this broad manner, it is clear that changes in Campbell and Frey's core theoretical construct of effective environmental input were the central goal of Head Start programs.

Stated in this manner, is there any evidence that the Head Start effort has been successful? Surprisingly, there are very few interpretable data available to answer this question. The most widely-publicized study of long-term effects, the Ohio University-Westinghouse Report, concluded that by the end of the second grade any gains due to the Head Start experience had disappeared and that experimental and control children were performing in a manner indistinguishable from each other and undistinguished in comparison with national norms. Despite its widely publicized results, however, the Westinghouse Report, as a one-time, cross-sectional study with serious sampling problems (Campbell & Erlebacher, 1970; Smith & Bissell, 1970) provides no truly useful data to answer the question regarding long-range effects. Other studies, such as

longitudinal studies of specialized, intensive intervention programs have provided mixed findings. For example, the results of Gray and Klaus (1970) show a fade-out effect similar to that of the Westinghouse Report (and Figure 2), while those of Weikart and his colleagues (1970) do not. It does not seem particularly profitable to examine all the relevant studies in detail, since the general conclusion is that methodological problems have rendered many of them uninterpretable and that among those which have been relatively free of design problems the results are mixed.

The most profitable approach, rather, would seem to be to examine the effects of the Head Start experience in more fine-grained detail. Datta (1969), for example, has suggested that we should look for specific variables which might mediate the positive or negative influences of subsequent school experiences, i.e., whether the Head Start graduates in a public school classroom represent a majority or a minority of the class. A similar promising line of research would be to study both motivational and cognitive changes during the Head Start experience in order to determine the influences of Head Start upon these separate factors, and to determine the nature of the relationship between them. In particular, it would be interesting to compare the nature of changes occurring among children who are sent to public schools with children who remain in a specialized program of maximum similarity and continuity with their Head Start experience, then to examine both groups of children in later years when all of the children are attending public schools. Since, as Stearns has pointed out (1971), small-scale, intensive programs produce more obvious and measurable results than large-scale, loosely-structured programs, the program chosen for experimental study should be a small, intensive program with a

reasonably-clearly articulated philosophy of educational approach. Given Sprigle's findings (Van de Riet, et al., 1968, 1970) that children who receive a follow-up academic experience which is highly similar to their nursery-school experience continue to show academic gains, it could be predicted that whatever motivational and cognitive changes were wrought by the Head Start experience would be maintained and enhanced during a follow-up kindergarten year. The nature and extent of any fade-out could be assessed separately for the children who entered public school kindergarten and for those who received an extra year of compensatory experience before entering public school in the first grade.

Purpose of the Present Study

The present study was designed in accordance with the above considerations to examine a group of children who had received at least one year of full-day Head Start experience. These children were separated into two groups, one of which received a follow-up kindergarten continuation of the program, the other of which was sent to public kindergarten. Both groups were followed longitudinally beginning before the separation and continuing until the middle of their first-grade year.

Three approaches to the study of the motivational-cognitive interchange seem especially promising, all three were employed in the present design. The first was an examination of the relationship between personal interaction variables, such as lack of trust and fearfulness of adults, and expression of cognitive abilities. The second was the study of changes in effectance motivation, defined as an intrinsic need to interact effectively and competently with one's environment (White, 1959), a factor which can apparently be strongly

influenced by life circumstances (Zigler, 1971). Third was the study of the impulsivity-reflectivity dimension, during and following intervention. This variable, which Kagan has called "conceptual tempo" (Kagan, 1966), may also be a core construct with strong linkages to both motivation and cognition. In addition to studying how these variables are influenced by the day care experience, the present study also examined a group of age-matched nondisadvantaged children in order to obtain longitudinal information regarding normal developmental changes in such traits as curiosity, reflectivity, and strivings for competence.

Method

Design

The design was a multiple-time-series which closely resembles a longitudinal design, of which it is a special case, but into which a specific treatment is introduced (Campbell, 1971; Campbell & Stanley, 1963). For the nondisadvantaged comparison sample, the design was a standard longitudinal study (see Figure 3).

Insert Fig. 3 about here

Independent variables. The major independent variable was the assignment to a full-day kindergarten program which represented a continuation of nursery school Head Start conditions versus assignment to a public half-day kindergarten. It is important to consider the nature of this treatment variable in detail, as there are a number of differences between the two conditions beyond the difference in half-day versus full-day program.

The Elm Haven Day Care Center represents an unusually intense intervention effort in comparison with many Head Start centers. It is the only full-day Head Start center in New Haven (there are 20 part-day centers). A wide range of professional services are available to the children. For example, a consulting pediatrician-child psychiatrist gives medical examinations twice a year to each child and psychiatric treatment as required. Dental services are readily available. A nutritionist prepares the menu guided by medical information regarding the children's special needs (i.e., recently introducing more iron into the diet to counteract a high prevalence of anemia). Strong efforts are made to involve parents in the activities of the Center, including having three parents serve on a Policy Advisory Committee and providing sessions on nutrition and on consumer information for parents. The adult-child ratio is low, with one consistent staff member (teacher or aide) per five children. In addition, there are always numerous volunteers. Of the three head teachers, one has a Master's degree, one has a Bachelor's degree and one is working toward a degree. The educational philosophy of the Center is based upon the Bank Street Model, with an open-classroom approach and an emphasis on encouraging natural discovery processes in the child (Maccoby & Zellner, 1970, provide a fuller description of this model and how it resembles and differs from other models). Additional examples could be provided, but the basic conclusion is that this particular Head Start Center provides what is probably maximal contrast with the prevailing conditions of an economically deprived neighborhood both educationally and in terms of services available to the entire family. The assigned treatment in this study, therefore, was a multifaceted, expensive intervention effort.

Dependent variables. The dependent variables were:

(1) A battery of measures of effectance motivation (see White, 1959) including measures of (a) curiosity for novel stimuli; (b) preference for challenging tasks; (c) preference for variability of stimulus input rather than repetitiveness; (d) tendency to structure environmental input as problems to be solved; and (e) intrinsic satisfaction in mastery behavior (Harter, et al., 1971; Harter & Zigler, 1974).

(2) Five cognitive measures: (a) The Peabody Picture Vocabulary Test (Dunn, 1965), a recognition vocabulary measure requiring no vocal response from the child; (b) and (c) the vocabulary and the general information subscales of the Wechsler Preschool and Primary Scale of Intelligence (WPPSI) (Wechsler, 1967), or the Wechsler Intelligence Scale for Children (WISC) (Wechsler, 1949); both of these measures required the child to verbally provide definitions or information rather than permitting nonverbal responses; (d) and (e) the block design and picture completion subtests of the WPPSI or the WISC; both of these tests are nonverbal, performance measures of problem-solving ability.

(3) Three measures of the reflective-analytic mode of problem solving: (a) the Kansas Reflection-Impulsivity Scale (KRISP) (Wright, 1971); (b) the Matching Familiar Figures Test (Kagan, 1965; Kagan, Rosman, Day, Albert, & Phillips, 1964); (c) a psychometrically scaled color-form attention task (Seitz, 1971; Seitz & Weir, 1971).

Subjects

The experimental and control group consisted of 29 children who had attended the Elm Haven Day Care Center in New Haven, Connecticut for at least 8 months as of March, 1972, and who were eligible for entrance into kindergarten in

September, 1972. The ages of these children in March, 1972, ranged from 51 to 61 months with a mean of 56 months and a standard deviation of 2.8 months. Eleven were boys and 18 were girls. All children were black, and, for all of the children, English was the native language. All children resided in a low-income housing project in which the day care center was located.

The group of 29 children were divided into an experimental group of 16 children (6 boys, 10 girls) who remained in the center for a kindergarten program designed to provide maximum continuity with their nursery school program. The remainder were a control group of 13 children (5 boys, 8 girls), who attended public or parochial kindergarten programs and for whom no other special services were provided. The Head Start kindergarten program was a full-day program, whereas the public and parochial programs were of half-day duration. Selection and treatment were confounded rather than random, with children whose parents worked or for whom the lack of a full day program would present special hardships being given priority for inclusion in the experimental group. It was therefore anticipated that such a selection method might result in two groups which differed from each other on the dependent measures even before the kindergarten program began. For this reason, a multiple-time-series design was chosen (Campbell, 1971) based upon the suggestion that interpretation problems in such a situation can be resolved if one takes sufficient measures, beginning before the initiation of the specialized treatment, and the recommendation "that we give up trying to adjust away pretreatment differences. Rather, we should live with them, use them as a base line, and demand that an effective treatment significantly modify that difference" (1971, p. 94). In fact, however, no

differences were found between experimental and control group children, who were thus comparable before they were separated into groups.

The middle-class comparison group consisted of 20 children (10 boys, 10 girls) enrolled in a private tuition-supported nursery school in Woodbridge, Connecticut. The ages of the comparison children were comparable to those of the experimental and control children, with a range of 51 to 65 months and a mean of 56 and standard deviation of 3.7 months in March, 1972. The neighborhood which the nursery school served was predominantly middle-to-upper-middle income, and all children were white.

Apparatus and Procedure

General procedure. Experimental and control children were tested at seven time periods, as shown in Figure 3. Comparison children were tested at the same times, except for the initial testing in March, 1972. The extra testing for experimental and control children was conducted in order to provide more stable baseline information about these groups prior to the start of the experimental kindergarten program. It was anticipated that the low-income children would show greater initial test anxiety than the middle-income children and thus that a second testing might provide better baseline values for them.

Children were tested individually. Since the time required to administer the complete set of measures was approximately 1½ to 2 hours, the testing was divided into two sessions with an intersession interval of 2 days to 2 weeks. The first testing session of each time period was devoted primarily to motivational measures and consisted of the following sequence (each measure is described more fully below): (1) a color-form attention task; (2) a "box maze" measure of variation seeking; (3) a pictorial curiosity task; (4) a measure of

the tendency to structure tasks into problems to be solved; (5) a KRISP or Matching Familiar Figures measure of reflectivity. The second testing session more heavily emphasized cognitive measures, though it began and ended with game-like motivational measures. The sequence for the second session was: (1) a "puzzles" measure of preference for challenging tasks; (2) the Wechsler Vocabulary subtest; (3) the Peabody Picture Vocabulary Test; (4) The Wechsler Picture Completion subtest; (5) the Wechsler Block Design subtest; (6) the Wechsler Information subtest; (7) a re-administration of the structuring task from session one in order to determine whether the child was capable of solving the task (during the first session, the child was free to respond to the task in any manner he chose); (8) a replication of the puzzles measure of preference for challenging tasks, using a different puzzle from that used to begin the session. In the final session of the study, at the end of all other tasks, each child was tested for color-blindness using the Dvorine Pseudoisochromatic Plates.

During both sessions, an effort was made to maintain warm rapport between the examiner and child. During the nursery school and kindergarten phases of the study, all black children were tested by a young black woman examiner and all white children were tested by a young white woman examiner. The first-grade testing for all children was conducted by a third examiner, a young white woman. All examiners were trained in the administration of psychological tests and had had considerable experience testing young children. The examiner who conducted the first-grade testing was unaware of the experimental or control group status of the low-income children during the testing.

Color-form attention measure. Tha apparatus consisted of 51 cards in each of which there were three colored geometrical stimuli arranged in a triangular configuration with a reference stimulus at the apex and two comparison stimuli symmetrically placed below the reference. For example, the reference stimulus might be a red triangle and the comparison stimuli might be a red circle and a blue triangle. On each trial the child was asked to point to the comparison stimulus which was most like the reference. On any particular card it was sometimes possible to match on either form or color as in the example just given, or there might an appropriate match for only one of the two dimensions with the possibility of making an error if the child was not attending to that dimension. Cards were arranged in a counterbalanced sequence to prevent positional responding from being mistaken for any other strategy. No reinforcement was provided for any choice though occasionally the child was told that he was a "good game player" while the stimuli were not in view. Testing required approximately 7 minutes. Four different scores were obtained from this measure. The first was a measure of the child's initial strategy in approaching the task, and consisted of the number of form matches which the child made on the first 4 trials of the task. This measure, called pre-forced-choice preference, is comparable to those employed in most earlier studies of color-form preference and is therefore useful in permitting cross-study comparisons. A second, and more rigorous, measure of attentional strategy consisted of the number of form choices made on trials 7-51 of the task (maximum = 15). This measure, called post-forced-choice preference, assesses the child's strategy after he has been exposed to two forced choice trials, on one of which he must match on color to avoid an error, and on the other of which he must match on form. Evidence

exists to show that post-forced-choice preference represents a more considered and thoughtful performance from the child rather than simply his first impulse, and that it is thus a better indicator of his actual attentional capabilities (Seitz, 1971; Seitz & Weir, 1971). Two other measures from this task were the number of errors which the child made when forced to match on color, and the number of errors he made when forced to match on form (Maximum = 16 in each case). Three different versions of this task were constructed so that generality of preference across different stimulus sets could be assessed and so that the children would not become overly familiar with any one particular set. The three sets were: (a) red or blue triangles and circles; (b)yellow or green T-shapes and squares; (c) orange or violet parallelograms and plus-shapes.

Box maze measure of variation seeking. In his treatise on effectance motivation, that is, children's motivation to interact effectively with their environment, White suggested that response variation was an important component of effectance motivation, arguing that there is a drive to act upon stimuli until "a situation has been explored to the point that it no longer presents new possibilities" (1959, p. 322). In order to measure such change-seeking behavior, Harter and Zigler (1974) developed a task which consisted of a box maze shaped drawing depicting numerous possible alternative paths or streets from the figure of a boy to a store. The maze contains no blind alleys and is constructed so that regardless of which path is chosen, the distance to the goal remains identical, i.e., 10 segments long. The subject is presented with the same box maze for five successive trials, with each of the five mazes printed on a different colored sheet of paper, and he is told that he should "show the boy a way to get to the store" and that he can draw the pathway any

way he pleases. Since each maze presents the child with the opportunity to alter the path he chose on the preceding maze, a measure of variation was obtained by comparing performance on successive mazes. At the end of the five mazes, the experimenter asked the child the reasons for his choices of the pathways he drew and recorded the answers. The scoring procedure, based upon Harter and Zigler (1974) consisted of comparing the pathway on each maze with that of the immediately preceding maze (generating a maximum difference score of 10 segments), summing these four difference scores and multiplying this value by the number of absolutely different pathways the child had drawn on the five trials. The final score, thus, had a maximum value of 200. A total of six different variations of the task were constructed for presentation on different testing occasions, so that children would not become overly familiar with any one version or bored with obvious repetition. The six versions maintained an identical box maze structure and procedure, but varied the nature of the objects which were depicted. Instead of having a boy go to a store, for example, alternate versions showed a pirate and his treasure, a mouse and some cheese, and so forth.

Pictorial curiosity. Another component of effectance motivation, in White's conceptualization of this construct, consists of curiosity for novel stimuli. As in the case for variation seeking, the present study employed a task designed by Harter and Zigler (1974) to assess this trait. The pictorial curiosity task consists of the presentation of a series of 10 cardboard houses on the front of which are two separate doors. On one door of each house is a picture, behind which there is an identical picture. On the outside of the other door there is no picture; however, behind this blank door there is an

unknown, or novel, picture. The relationship between the two doors and the pictures behind them was explained and shown to the child, who was given three practice trials to permit him to verify the accuracy of the instructions. The series of 10 houses was then presented one at a time. On each trial the child was given the opportunity to open only one of the doors; the final score was the percentage of trials on which he chose to look at the novel picture behind the blank door. After the task, the child was asked how he decided which door to pick. This task is conceptualized as a measure of pictorial curiosity to the extent that the more curious child should be more likely to choose to open the blank door in order to see the novel picture. Again six different sets of houses and pictures were constructed for the present study.

Structuring task. The rationale for including such a task in a battery of effectance measures is based on White's assertion that the child does not simply have a need to interact with the environment, but to do so competently. This urge toward competence or mastery leads to activities which are "selective, directed, and persistent" and which will be performed for the "sole reward of engaging in them". Harter and Zigler designed a graduated-peg task as a general measure of the child's motivation to demonstrate such a mastery urge by creating a problem-solving situation where there are no explicit demands to do so and by then performing the task competently in order to derive a sense of efficacy. Both the Harter and Zigler graduated peg task and a number of original alternative versions of this task were employed in the present study. On all these tasks, in order for the child to perform the task competently under the minimal instructions condition, he had to first structure the task as a problem-solving situation in which there is a solution, and secondly be motivated to

master it. Performance under the explicit instructions served as a test of the assumption that all of the children had the cognitive and perceptual-motor abilities to perform each task. That is, if all children were to do so, then any differences obtained during the unstructured trials could be interpreted as motivational differences in the children's approach to the task rather than representing differences in cognitive or perceptual-motor skills. Since the variations on the Harter and Zigler structuring task employed in this study were more extensive than the variations on the box maze and pictorial curiosity tasks, each version will be described in detail.

The apparatus for the Harter and Zigler graduated peg task was a Creative Playthings oblong wooden block. The block consisted of 10 wells, each of which had the same diameter but a different depth, arranged in a graduated series from ½" deep to 2" deep. For each hole or well, there was a corresponding peg of the same height. Any peg would fit into any well, however, since each of the 10 pegs was the same diameter. Each child was given the task in two parts, under two different sets of instructions, first a brief set of minimal instructions, and second, more explicit instructions on how to perform the task. Under both types of instructions, the pegs were randomly placed in a pile in front of the block of wood and the child was asked to put the pegs in the block. In the first condition, no further instructions were given. After the child had completed the task, he was asked how he decided where to place the pegs. He was then asked to place the pegs in the block so that they "won't stick up so high or sink down" but will "fit just right" (the examiner demonstrated). The percentage of correct placements under each condition was recorded as well as the pattern of placements of the specific pags.

A second structuring task consisted of a marble dropping apparatus with five chutes into which marbles could be dropped. The entrance to each chute was a circular hole which was surrounded by an area painted red, blue, green, yellow, or black. Children were given a total of 25 marbles, one at a time, and told that they could drop each marble into any hole they wished. Although the marbles were presented in no particular order, five of the marbles were red, five were blue, and so forth. Several patterns based upon color matching were possible in this task, including simply matching the color of the marble to the color surrounding a hole, or creating patterns such that the first marble dropped into each hole was red, the next blue, and so forth. The marbles were clearly visible in the chutes after dropping, and the child was given the freedom to remove them and to place them in another fashion if he wished. This instruction was added to guarantee that the child's effectance tendencies would not be penalized by presenting him with a too-difficult task. After the child had completed the task, he was asked how he had decided where to drop the marbles. The number of correct color matches was recorded and the experimenter also recorded any alternate pattern which the child had used. In a second administration of the task, the ability of the child to color match was assessed by instructing him to drop each marble into the hole which matched it in color. A third structuring task was nearly identical to the second except that it employed five different shaped wooden forms--plus shapes, triangles, diamonds, circles, and squares--which could be dropped into correspondingly shaped holes cut into a wooden house. Again the child was given 25 forms to drop in any manner he wished during the first session and in a matching condition during the second session.

A fourth structuring task permitted children to match on the basis of texture. A pegboard was constructed with five rows of five small circular dowels in each row. The tops of the dowels were covered with white terry cloth, silk, paint, wood, or painted sandpaper with five exemplars of each. The pegboard was similarly divided into five zones such that the holes into which the dowels could be placed were surrounded by one of the five coverings just described. The child was given the dowels one at a time and allowed to insert them anywhere he pleased. In a second session, the child was asked to match the covering of each dowel to the surrounding material on the board.

The fifth structuring task consisted of 25 plain wooden dowels all of equivalent diameter but representing different lengths. The child was asked to insert these dowels into holes drilled in the floor of a box which had sloping sides such that the heights of the dowels could be made to correspond with the height of the sides of the box. As in the earlier tasks, the child was allowed to alter his choices if he wished, he was asked his reasons for placements upon completion of the task, and a record was made of whether or not he had used a structuring pattern in placing the dowels. Also as in the earlier tasks, a second session was conducted in which the child was asked to match the dowel heights to the height of the sides of the box in order to determine whether this performance was within his capabilities.

A final structuring task permitted children to structure according to form or color or both. Twenty-five wooden forms were constructed in each of five shapes--plus shapes, diamonds, squares, circles, and triangles--and each of the five exemplars of each shape was painted a different color--red, blue, green, yellow, or black. The child was asked to place these forms onto a board which

was laid out like a checkerboard with five rows and five columns. Each of the rows was of a different color, matching the five colors of the wooden forms, and each of the columns had placed above it a black painted wooden form to correspond with each of the five shapes represented in the objects to be placed. The child could thus choose to match objects according to a single dimension or according to both or he could choose to create a nonmatching strategy based on either dimension (i.e., placing all yellow objects onto blue squares, etc.). Following the child's completion of the task he was asked how he had decided where to place the objects, and a record was made of his performance and whether or not he had employed any systematic strategy. In a second session, the child was asked to place the objects matching by both color and form.

Puzzle preference. A final component of effectance motivation measured in the present study was preference for challenging tasks. According to White, one implication of the effectance motivation construct is that the child's urge toward competence should manifest itself in his choice of task situations which are optimally challenging, since mastery of such tasks should provide the greatest sense of efficacy. As in the Harter and Zigler (1974) study, the present study employed a puzzle preference task in which children were allowed to choose which of four puzzles, varying in difficulty, they wished to complete.

The materials employed at each administration of the task were puzzles from the age-graded Playskool series (Old King Cole, Cats, Gingerbread Man) or puzzles especially constructed for the present study. Each contained either 13 or 14 pieces. These puzzles were carefully selected or constructed so as to be appropriate for the 5-7 age level. The child was shown four identical puzzles (e.g., Old King Cole), varying in the number of pieces which had been

removed (from 3 to 13), and was asked to choose one puzzle to complete. The experimenter then covered the remaining puzzles and allowed the child to complete the puzzle of his choice. During the nursery school and kindergarten testings children were allowed a maximum of 3 minutes. In the first grade testings they were permitted unlimited time. The measures recorded were: (a) difficulty level chosen; (b) time required to complete the puzzle; (c) whether or not the puzzle was completed correctly; and (d) whether the child smiled upon completing the puzzle. The child was asked why he chose the puzzle he completed, which puzzle he thought was the hardest and why, and which puzzle he thought was the easiest and why. These inquiry questions were included in order to determine whether the children's choices were based on the dimension of difficulty and whether or not the children actually perceived the differences in difficulty level.

Reflective-analytic style. On the basis of pretesting it had been determined that the Matching Familiar Figures test (Kagan, 1965) was too difficult and frustrating for four-year-olds. For this reason, a special preschool scale, the Kansas Reflection-Impulsivity Scale (KRISP, Wright, 1971) was employed for the nursery school and the first kindergarten testings. For the remaining four test periods the Matching Familiar Figures (form 1-F) was alternated with a similarly constructed task created for the present study to resemble the MFF test in format, number of choices, and number of items, but to differ from it in specific content. The use of an alternate form was deemed necessary in order to prevent the children's becoming too familiar with the test materials. Both form 1-F and the alternate, specially constructed form were given twice each. For all such tests, the child's task was essentially the same: the child was

asked to choose on each trial from a page of pictured alternatives a picture which was identical to a reference picture. The number of errors, length of time spent before making an initial choice, and the number of glances to the reference stimulus were recorded.

Formal cognitive measures. The Peabody Picture Vocabulary Test, Forms A and B and the Vocabulary, Information, Block Design, and Picture Completion subtests of the WPPSI or the WISC were administered in accordance with the directions in the manuals. The WPPSI was employed during the nursery school tests and in the first test period at the kindergarten level and was replaced by the WISC for the final four test periods. In addition to recording scale scores for each measure, the number of items tried, number of errors, and smiling behavior on each item were recorded. Smiling was recorded on a 4-point scale (0 = no smile; 1 = slight smile; 2 = full smile; 3 = laugh or giggle) which has been employed in previous research, where it has been found to have high interjudge rating reliability (Harter, 1972; Harter, Shultz, & Blum, 1971; Shultz & Zigler, 1970).

Schedule of administration of tasks. Since a variety of alternate forms were employed, Table 1 provides a summary of the specific forms administered at each test period. Table 2 provides a summary of the chronological and mental ages of the subjects at each test period.

Insert Tables 1 and 2 about here

Results

The major focus of the present study was the comparison of Head Start children who received an additional year of Head-Start-like kindergarten experience

(the experimental group) with Head Start children who did not receive the extra year (the control group). The evaluation of the impact of the kindergarten program and the examination of the data for any indications of fade-out effects after leaving Head Start will therefore be presented in the first section of the results. No subjects were lost from the experimental or control groups during the course of the study; occasionally, however, there were isolated instances of incomplete data because of refusal to respond.

A second purpose of the present study was to establish information on developmental changes in effectance motivation, smiling, and other measures employed to evaluate the educational program effects. The second portion of the results section, therefore, presents findings specifically related to this issue. One subject was lost from the comparison group in first grade because of a parental request to withdraw her; another comparison subject was not tested during the kindergarten year because her family had temporarily moved. Eighteen of the 20 comparison children, however, were tested at each session.

Comparison of Experimental and Control Groups

It had been anticipated that the experimental and control groups might differ even before they received the kindergarten program because group status was not assigned randomly. To determine the initial comparability or non-comparability of the two groups, *t* tests were conducted for each dependent variable. The possibility of initial sex differences was also examined by conducting *t* tests to compare the sexes both for the entire sample of 29 Head Start children and for the two sexes within the experimental and control groups. Despite the large number of *t* tests conducted, not a single comparison between experimental and control group was significant for either of the two nursery

school test periods. A few sex differences were nominally significant at the .05 level. The number of such findings, however, constituted only 3.5% of the total number of t tests conducted; thus it seems safe to conclude that there were neither sex differences not experimental group differences present at the beginning of the study.

Given the absence of initial differences, further comparisons of the groups were made using a repeated measures analysis of variance. Such a method of analysis has the advantage of being highly powerful in detecting significant change over time (Winer, 1971). In order to determine whether sex should be included as a factor in the repeated measures analysis, t tests to compare sexes were conducted for the scores on each dependent variable at each test period. Again, the sexes were compared within each group as well as for the two groups combined. In no case was the number of nominally significant t test values greater than 5% of the number of tests conducted, and only three t test values attained nominal significance at the .01 level. For this reason, sex of subject was ignored in further analyses of the experimental and control children. As had been anticipated, the performance of both the experimental and control group children at the first test period in March was considerably lower than their performance approximately 6 weeks later in May. The May scores were therefore considered to be the pre-kindergarten-program baseline values, and the repeated measures time of testing factor was taken to have six levels beginning with May, 1972.

Dependent variables were analyzed by a Group (Experimental vs. Control) X Time of Testing (1-6) unweighted means analysis of variance with repeated measures on the time of testing factor (Winer, 1972). In no instance was there a

significant main effect for group, nor was the Group X Time interaction, which would have denoted differential change over time for the two groups, significant for any variable.

In order to explore the data as completely as possible for any indications of program effects, the experimental and control groups were compared by t tests at each testing period, and proportional data were compared nonparametrically. This procedure yielded several indications of significantly better performance by experimental than by control children during the kindergarten program. Table 3 summarizes the significant t test values found in comparing the experimental and control groups.

Insert Table 3 about here

Examination of General Developmental Changes

Most data for this portion of the analysis were analyzed by a Group (Experimental, Control, Comparison) X Time of Testing (1-6) unweighted means analysis of variance with repeated measures on the time of testing factor (Winer, 1971). Where appropriate, proportion data were analyzed nonparametrically. Figures 4-16 illustrate the performance of all three groups of children on the effectance measures, the reflectivity measures, and the comparisons of verbal and performance measures of cognitive ability. The first group of these figures (4-7) presents information regarding the four basic components of effectance motivation.

Insert Figures 4-7 about here

For curiosity, variation seeking, and puzzle choice, the main effect for time of testing was highly significant ($F = 16.97$, $df = 5/205$, $p < .001$; $F = 3.76$, $df = 5/205$, $p < .01$; and $F = 3.87$, df 5/200, $p < .01$, respectively). For the box maze score, there was also a significant main effect for groups ($F = 9.36$, $df = 2/41$, $p < .001$), reflecting the fact that the comparison group scored higher than the combined experimental and control groups ($\bar{X} = 93$ vs. $\bar{X} = 39$, respectively). As may be seen in the figures, scores on curiosity, variation seeking, and level of preference for challenging tasks generally increased as a function of age. On the structuring tasks, however, performance appeared to be highly influenced by the specific version of the task which was used, with all children tending to structure or not to structure the problem depending upon its particular characteristics. Nonparametric analysis revealed that the three groups did not differ significantly from each other in their structuring performance on any task.

Evidence concerning the interrelationships of these four components and their general coherence across time may be seen in the matrix of intercorrelations among the components. Table 4 presents this matrix for the experimental and control children and Table 5 presents a similar matrix for the comparison group.

Insert Tables 4 and 5 about here

As Tables 4 and 5 indicate, for curiosity, variation seeking, and puzzle preference, correlations across adjacent times for the same task were generally higher than correlations among tasks within the same testing period. The structuring task, however, did not fit this pattern, again suggesting task

specificity for this component. The puzzle task showed the greatest consistency across time of the four tasks.

Other information related to effectance motivation consisted of the smiling data. Figures 8-10 present proportion data on smiling behavior following success and following failure on a verbal cognitive task (the PPVT) and following success on a nonverbal task (puzzles). (Failure on puzzles was rare; and smiling following failure on the puzzles was nearly nonexistent). Since the PPVT is constructed such that each subject will make a reasonably large number of successes and failures during each administration of the test, it was possible to calculate the proportion of each type of occasion resulting in smiling for each individual subject. For the puzzles, proportions were calculated for the entire group of subjects in order to generate an adequate sample size for determining proportions.

Insert Figures 8-10 about here

As may be seen in Figures 8 and 9, smiling was consistently greater following success than failure (with but a single exception, in which the values were equal, for control subjects at the end of kindergarten). The analyses of variance for thest two measures revealed a significant main effect for time of testing for smiling to correct responses ($F = 3.38$, $df = 5/200$, $p < .01$), indicating that the tendency to smile fluctuated considerably across the two-year period. For both measures, the Group X Time of Testing interaction was significant ($F = 2.65$, $df = 10/200$, $p < .01$ for smiling to correct responses; $F = 2.12$, $df = 10/200$, $p < .05$ for smiling to errors), reflecting the fact that the comparison children showed a particularly sharp rise in smiling from the

first through the third test occasions. While the difference between comparison and other children in smiling following success was significant during the middle and end of kindergarten ($p < .01$ at each time) it was no longer significant during the first grade testings. Smiling to errors became more characteristic of comparison children with increasing age, but the differences among groups at any test occasion were not statistically significant. Nonparametric analyses of the number of children in each group smiling or failing to smile following successful puzzle completion indicated three significant comparisons. At the nursery school testing, comparison children smiled less than did experimental and control children ($X^2 = 14.91$, $df = 1$, $p < .001$). As was true for smiling to PPVT successes, comparison children were significantly more likely than experimental and control children to smile during the middle and end of kindergarten ($X^2 = 13.11$, $df = 1$, $p < .001$; $X^2 = 12.79$, $df = 1$, $p < .001$, respectively). The differences were no longer significant during first grade. The control children showed a generally higher smiling level than experimental children, and the differences between the groups were statistically significant during both first grade testings ($p = .02$ at both times by Fisher's Exact Test).

Evidence relating to developmental changes in reflectivity and attention may be seen on two measures, the Matching Familiar Figures (MFF) task and the color-form preference task. Figures 11-14 present the data for these tasks. The KRISP data are not included in these graphs and analyses because of a major discontinuity in difficulty level between the MFF and the KRISP, a discontinuity which would render presentation on the same graphic scale misleading. Also, in general, the KRISP suffered from floor effects with most children giving nearly errorless performances.

Insert Figures 11-14 about here

As Figure 11 indicates, there was a nearly linear relationship for all groups between age and number of glances at the standard stimulus on the MFF test. In addition to the highly significant main effect for time of testing ($F = 6.32$, $df = 3/123$, $p < .001$), the main effect for group was also significant ($F = 10.41$, $df = 2/41$, $p < .001$). The comparison group children made more glances to the standard ($\bar{X} = 45.8$) than did the experimental and control children (pooled $\bar{X} = 30.6$). The increasing number of glances to standard with age was accompanied by an improvement in performance. As Figure 12 shows, there was a general decline in errors with age. Again the main effects for time and for groups were significant ($F = 8.41$, df 3/123, $p < .001$; $F = 23.08$, $df = 2/41$, $p < .001$, respectively). The Group X Time of Testing interaction was not significant.

Differences between groups were less marked for the color form attention task. As Figure 13 shows, on this task, there was a precipitous drop for all groups of children in the number of errors. The significant main effect for time of testing reflects this improvement ($F = 19.68$, $df = 5/205$, $p < .001$). The main effect for group was also significant ($F = 4.75$, $df = 2/41$, $p < .05$), although less so than for the MFF task. As in the MFF, the decrease in errors with age was paralleled by an increase in quality of performance, as reflected on this task in the use of a consistent form strategy (see Figure 14). The main effects for time of testing and for group were also both significant on this measure ($F = 5.08$, $df = 5/205$, $p < .001$, and $F = 8.30$, $df = 2/41$, $p < .001$, respectively).

Figures 15-16 present information comparing performance on different cognitive tasks as a function of the specific task demands made upon the child. Figure 15 compares the PPVT score values (transformed to have a mean of 10 and a standard deviation of 3, to correspond with the Wechsler measures), and the average scale scores for the two Wechsler verbal measures (vocabulary and information). (Data are not available for May, 1972 for the comparison group because of experimenter error in failing to administer the information subtest at this time).

Insert Fig. 15 about here

The analysis of variance for these data yielded a significant main effect for time ($F = 6.74$, $df = 4/156$, $p < .001$). Neither the main effect for group nor the Group X Time of Testing interaction was significant. As Figure 15 shows, the time effect reflects an increase from the middle to the end of kindergarten and a decrease from that time on for all groups on this score. These changes reflect a tendency for PPVT scores (based upon nonverbal responding to verbal stimuli) to be substantially higher than the Wechsler scores (which depend upon a verbal response from the child to verbal stimuli) during the kindergarten period.

Figure 16 illustrates another comparison of interest, i.e., the comparison between performance and verbal scores on the Wechsler tests. (Again a data point is missing through experimenter error in failing to administer the picture completion subtest to the comparison group in May, 1972).

Insert Fig. 16 about here

Analysis of variance for these data yielded a significant main effect for group ($F = 10.46$, $df = 2/38$, $p < .001$), and a significant main effect for time of testing ($F = 10.01$, $df = 4/152$, $p < .001$). The Group X Time of Testing interaction was not significant. The significant group effect reflects the fact that for comparison children the performance and verbal scores are approximately equivalent to each other whereas for experimental and control children there is a considerable discrepancy between the two types of scores, with the performance score exceeding the verbal score by an average of 2.7 scale score points.

Examination of Possible Fade-Out Effects on Cognitive Measures

Figures 17-19 present mean scale score values for the experimental and control groups for the PPVT and for the average of the two verbal subtests of the Wechsler tests and the average of the two performance subtests.

Insert Figures 17-19 about here

Group X Time of Testing repeated measures analyses of variance for these three measures yielded a significant main effect for time of testing for the PPVT ($F = 3.01$, $df = 3/125$, $p < .05$) and for the mean verbal score ($F = 8.14$, $df = 5/105$, $p < .001$). The effect of time for the performance score was not significant, nor were there significant group effects or interactions between group and time of testing. As Figures 17 - 19 indicate, the mean s scores on the performance subtests were not only higher than mean scores on the verbal, but they were also consistently above average a oss the two-year time span of the study.

Discussion

The major purpose of the present study was to compare two groups of children, one of which had received an additional year beyond Head Start of a similar Head-Start-like kindergarten experience and another of which had entered public school during kindergarten. Comparison of these two groups before, during, and after the kindergarten year yielded little indication that the kindergarten program had produced significant effects. Of many measures which were administered, only six entered into any significant differences between children attending the two kinds of programs: the color-form attention task, the Peabody Picture Vocabulary Test, the box maze measure of variation seeking, the graduated peg task of structuring tendency, the WISC Block Design subtest, and the assessment of smiling following successful completion of the puzzles task. Because of the very large number of assessments made, these few nominally significant comparisons should be viewed cautiously. Nevertheless, the fact that most of the differences were found during the middle and the end of the kindergarten program does raise the possibility that the program was having an effect but that it would have been necessary to continue it into the following year in order for its effects to be seen more clearly. Further indication that the program may habe been beginning to show effects is provided by the fact that in all cases of significant differences during the duration of the program, the direction of difference favored the experimental group children.

Failure to find major program effects during kindergarten should be assessed against the consideration that the Head Start program may have had its greatest influence during the nursery school year. If this were the case, then a comparison of the children in the experimental kindergarten with kindergarten children who had not had Head Start experience might have yielded many significant results. The purpose of the present study, however, was not an assessment of Head Start per se, but rather a determination of whether an additional year of such a program would have measurable consequences. A conservative interpretation of the data suggests that the answer to this question is a negative one. The failure to find effects of the special program probably did not arise because the measures and testing procedures were insensitive to the kinds of differences which might have occurred. The present study tested subjects individually and over an extended period of time. It also employed measures which have been shown to be sensitive to variations in the life histories of young children and measures which should be sensitive in detecting differences in children's attitudes towards their learning abilities. Despite these efforts, few program differences were found.

Another intent of the study was to examine the timing of possible fade-out effects of Head Start. In this regard the present results are encouraging. There is no indication of fade out effects for either the control group, which left the Head Start program at the kindergarten level, or for the experimental

group which left the program to enter first grade. As Figures 17-19 indicate, fluctuations across time were not related to when the children left the Head Start program. The performance on the PPVT appears to reflect some sensitivity to the particular form which was administered and a pattern over time which is definitely not a decreasing one. For the Wechsler verbal measures, the dip at the middle and end of kindergarten reflects a shift from the WPPSI to the WISC and an apparent subsequent recovery. Interestingly, the comparison children also showed a significant sharp decline when the WISC was first administered and a subsequent recovery. Although the two Wechsler tests were intended to be equivalent, it appears that this ideal was not met for five-year-old children of either middle- or lower-class backgrounds. The overall picture for the entire two-year period, however, permits the interpretation that there has been no fade out and that performance has been relatively stable across this time. Particularly strong evidence that fade out has not occurred for either the experimental or control group may be seen in Figure 19. As Figure 19 indicates, both groups performed slightly above average on the Wechsler performance subtests during first grade as was also true at the end of their Head Start nursery school year.

Effectance Motivation

In addition to examining program effects, the present study sought to provide information on a number of measures which might be useful in other studies of experimental preschool programs, particularly measures concentrating on the nature of the child's problem solving motivation and motivation to interact with adults. The first of these, problem-solving motivation, is discussed here under the rubric of "effectance motivation", as it has been described by White (1959) and by Harter and Zigler (1974).

Effectance motivation, by its very name, would seem to be a crucially important variable to include in any study of the effects of intervention programs. White (1959) has argued that "being interested in the environment implies having some kind of satisfactory interaction with it" (p. 313) and has postulated the existence of a motive which impels humans toward competence and is manifested in such behaviors as curiosity, exploration, play, and mastery. Engaging in such behaviors, White suggests, increases the likelihood of a person's discovery of the ways in which he can control the surrounding world; consequently considerable learning takes place as a by-product of the satisfaction of the motive for competence. Central to this formulation is the notion of the intrinsic pleasure derived from competently interacting with the environment.

There is little doubt that such a motive exists and is important in human behavior. Indeed, effectance motivation and/or its derivatives such as curiosity and play behavior have long been of interest to many comparative and developmental psychologists (Berlyne, 1960; Harlow, 1950; Hebb, 1949; Hunt, 1961; Piaget, 1952). If one assumes that human motivation is multi-leveled, as Maslow has suggested (1954), and that the relative potency of motives can be described by a hierarchical structure for any particular individual, then one may speculate on the position which effectance motivation occupies in an individual's hierarchy. Zigler (1971) has argued that the biological significance of effectance motivation places it within the category of "life-fulfilling" rather than "life-preserving" needs and that the strength of the motive is consequently relatively vulnerable to modification through experience. Zigler, and Harter and Zigler (1974) present considerable evidence to suggest that in individuals who have suffered particularly debilitating life experiences, effectance

motivation can become subordinated to the need for security, avoidance of failure, avoidance of strange adults, and other such defensive rather than self-fulfilling motives.

The potential usefulness of measures of effectance motivation in evaluating special intervention programs for young children is thus quite clear. If a program can raise the position of effectance motivation in a child's hierarchy it may have its lasting impact by having initiated a process which can be self-maintained when the program ends. If, for example, it reawakens curiosity, and can instill a strong sense of innerdirectedness, perhaps a child may not be harmed by having adverse educational experiences later. The present study therefore sought to establish normative information for effectance measures through longitudinal study of changes in effectance motivation during the preschool years for both disadvantaged and nondisadvantaged children. Longitudinal change in performance was of special interest since previous study has been restricted to cross-sectional age comparisons and because it has not examined performance during the preschool years, a developmental period for which many intervention programs have been designed.

The four components of effectance motivation examined in the present study yielded four different patterns of performance across time. Three of the four--curiosity, variation seeking, and preference for challenging tasks--showed increases from nursery school through first grade. Furthermore, for curiosity and preference for challenging tasks, all groups of children behaved quite comparably.

The change from nursery school to first grade performance on the curiosity task was of considerable magnitude. This may best be seen if one translates

the averages shown in Figure 4 into numbers of children showing unusually high or low curiosity at the first and last test periods. Since the task gives children 10 trials on which to choose a blank or nonblank door, a nonchance performance is one which deviates significantly from a score of 5. Using the binomial theorem, scores of 0, 1, or 2 blank doors would therefore denote a significantly noncurious strategy, while scores of 8, 9, or 10 denote a curiosity strategy. At the end of nursery school, 14 of the experimental and control children (approximately half) and 10 of the comparison children (exactly half) showed a significant noncuriosity strategy, and only 5 experimental and control and 1 comparison child showed a curiosity strategy. By the middle of first grade, these proportions had virtually become reversed, with 16 experimental and control and 14 comparison children showing high curiosity and only 2 children (1 experimental, 1 control) showing a significantly noncurious performance. There was thus a distinct and marked rise in curiosity about unseen pictures in preference to viewing an already seen picture. The performance of the children when they were younger seemed motivated by a desire to perform the task as a matching task. Indeed, they frequently smiled when they found that the picture inside the door was indeed the same as that on the outside, appearing to take satisfaction in their successful "prediction" of what would be found. It is thus interesting that most children spontaneously abandoned this strategy as they matured in favor of exploring the unknown. The change in strategy did not appear to be a reflection of any change in test anxiety or trust of the examiner. The increase was gradual over time rather than showing any abrupt rise from one test to another and was equivalent for all groups of children.

The present results indicate that the curiosity measure is a useful one for children of kindergarten age and older but that it is not informative for children of nursery school age and younger, most of whom are likely to choose the nonblank doors. In comparison with the results reported by Harter and Zigler (1974), the present results are positive in suggesting continued growth for all groups of children with no suggestion of fade out effects. Harter and Zigler, for example, reported that normal children of 6 years were significantly more curious than MA-matched retarded children and that among retarded children, institutionalized children were particularly low in curiosity. The absence of group differences in the present study and the rather high performance of the children when in first grade are thus very encouraging.

Performance on the puzzles measure of preference for challenging tasks revealed a similar increase with age and lack of group differences. Unlike the curiosity measure, however, there was no basic developmental change in strategy, and correlations across time tended to be higher than for other tasks. This was particularly true for the Head Start children, for whom correlations on puzzle choice across the entire two-year time span were particularly high. Of the 15 possible intercorrelations for these children, all but 3 were statistically significant. It is also interesting that the children who chose difficult puzzles did so even though they risked failure in such choices. Throughout the nursery school and kindergarten testings, children were limited to 3 minutes per puzzle and the failure rate averaged approximately 25% among Head Start children. Nevertheless, their level of aspiration continued to rise into the first grade testing (when they did not initially realize that the procedure had changed and that they would be permitted extra time). With the provision of

sufficient time, the failure rate dropped to zero, while many children continued to choose very difficult puzzle levels and to persist until they had completed them.

Again a comparison with the Harter and Zigler results is encouraging. Harter and Zigler found significant group differences on this measure with normal children exceeding retarded children of equivalent cognitive maturity in level chosen. Among the retarded children, institutionalized retarded children chose higher levels than noninstitutionalized retarded children, who appeared highly anxious about their performance and unwilling to risk failure despite their equivalent ability to perform the task. The present results indicated a considerable willingness to attempt difficult problems among the Head Start children as well as among advantaged children and a willingness to persist in solving a difficult task once chosen. Although there was a general increase with age on this measure, there was also considerable variation in performance, indicating that this measure is a particularly useful one, sensitive to consistent individual differences even among very young children. Some children in all three groups were very consistent in preferring to choose the easiest puzzle levels and to terminate the task as effortlessly as possible. Others refused to attempt any level but the hardest over the entire two year period.

The third effectance measure to show increases over age, the box maze measure of variation seeking, also showed a significant group difference between comparison group and Head Start children and, at one time period, a further group difference within the Head Start sample, with experimental children exceeding control children. The increase with age is consistent with the Harter and Zigler finding with older children, that 8-year-olds showed more variation-

seeking than did 6-year-olds. In the present study, children showed more variation seeking as 6-year-olds than they did as 4-year-olds. The group differences in the present study may reflect a genuine difference in life histories associated with living in a low-income neighborhood with clearly defined routes to be traveled daily as opposed to living in an economically privileged neighborhood where a variety of routes may effortlessly be traversed by car. In contrast to a low-income child's shopping at the neighborhood corner grocery store to and from which there is one particularly efficient route, the upper-middle-class child who accompanies a parent on a shopping trip may go to one store for meat, another for produce, and a third for baked goods, taking a variety of routes among them as the parent runs other errands. Such a child may also be accustomed to various trips for music lessons, swimming, tennis, and visiting school friends who do not live nearby. The Harter and Zigler study found this measure to be sensitive to whether children lived in an institution rather than at home, with institutionalized children having lower scores despite being matched for cognitive level to noninstitutionalized children. The present findings may be reflective of a similar relative rigidity of patterns of movement outside of institutions for children living under restricted economic circumstances.

The final component of effectance motivation--the tendency to structure tasks as problems to be solved--was found to be highly specific to the particular task used in assessment. Unlike the other components, for which performance curves showed a coherent pattern across alternate versions of the tasks, the structuring performance fluctuated markedly in a manner which seemed directly related to the apparent difficulty of the task. With the exception of the first

task administered, the graduated peg task, the success rate was near 100% for all groups on all tasks. The difficulty of the tasks varied markedly, however, as assessed by the length of time required to complete them successfully. The children's comments also confirmed that they perceived some of the tasks as being more difficult than others. The first task employed, the graduated peg task, as used by Harter and Zigler with 6-year-olds, was somewhat too difficult for the children in the present study when they were of nursery school age. The failure rate was near 50% in the initial March testing and was almost 25% at the re-administration in May. The significant difference between the experimental and control children in tendency to structure at this testing should probably therefore be discounted as an isolated and meaningless result since the sample size was reduced, thus rendering proportional data particularly unstable. In contrast, with the marble dropping task employed at the next testing period (September, 1972) all children were able to structure the task correctly when asked, as was true with very rare exception of all subsequent tasks.

Differences across groups for all tasks after the first were nonsignificant. The form-dropping and color-form-board tasks elicited very high rates of structuring of 75% or higher for all groups, and the dowel task, which the children found very difficult, elicited very low structuring. The two remaining tasks, marble dropping and the texture board, showed the greatest amount of individual differences within each group and would therefore seem the best choices as tasks to be employed in future studies with children of kindergarten age. Since Harter and Zigler (1974) found one version of this task to be an effective discriminator between institutionalized and noninstitutionalized children, this type of task might be useful in future studies of effects of special educational

programs. Such usefulness would not extend, however, to cases where longitudinal data were needed, since the measure depends upon the child's unfamiliarity with the task and since alternate forms--even those which would appear to be highly similar, as marble dropping and form dropping--do not show high intercorrelations.

In addition to examining the children's performance on effectance tasks, their smiling behavior was also monitored on several tasks. Smiling as a measure of intrinsic satisfaction for problem-solving success seemed promising for inclusion in a study of the effects of an intervention program with preschool children, as an additional indicator of effectance motivation. Even children younger than two have been observed to smile to demonstrate intrinsic pleasure for cognitive mastery (Piaget, 1952; Shultz & Zigler, 1970) as have normal elementary-school children (Harter, Shultz, & Blum, 1971); such smiling behavior, however, has not been observed in school-aged retarded children (Harter, 1972). While group differences have thus been shown on smiling, little work has been done to investigate this variable longitudinally to determine its normal developmental course.

In the present study, smiling was found to follow quite similar patterns across very different kinds of tasks. Two will be discussed here, the Peabody Picture Vocabulary Test and the puzzles task from the effectance battery. While smiling was generally higher following successful completion of puzzles than following a successful choice on the PPVT, as Figures 8 and 10 show, in both cases Head Start children showed a decrease in smiling during kindergarten followed by a recovery in first grade. Comparison children showed a sharp increase from nursery school to kindergarten and a relatively more stable level of

smiling thereafter. The reasons for the timing of the peaks and valleys in smiling behavior are not readily apparent, but it is interesting that they were found both for the test-like, verbal, PPVT, and for the game-like, performance, puzzles task.

Smiling also occurred following failure, but to a lesser degree. Since children were not given feedback regarding the correctness of their responses on the PPVT, some of this smiling may have arisen from children's mistaken belief that they had correctly answered certain questions. In general, however, the lowered rate of smiling suggests both that the children often knew when an answer was a guess rather than a solution and that they were less likely to smile when they were not certain they had solved the problem.

The significant difference between the experimental and control groups on smiling to puzzles during first grade is difficult to explain on the basis of program effects. As Figure 10 shows, both groups showed a sharp increase in smiling to puzzles from the end of kindergarten to the beginning of first grade. Since the control group had left the Head Start program more than a year earlier while the experimental group had left the program only 3 months previously, it seems unlikely that this was the result of program effects. Rather, the increase coincides with a shift in procedure from timed to untimed administration of the puzzles, a change which increased both success rate and apparent satisfaction as expressed by smiling. Figure 10 also suggests that control children generally tended to smile more than experimental children throughout the study, with the differences attaining significance only at the end of the two year period.

On the basis of Harter's (1972) finding of lack of smiling in retarded school aged children, it was encouraging to find all groups of children in the

present study smiling following successful problem solving. Again this measure supports the conclusion that fade-out effects were not occurring for either experimental or control children after leaving the Head Start program. Because of the highly variable pattern of smiling across time, no clear statement can be made regarding developmental changes in smiling during the preschool years.

Impulsivity-Reflectivity

Another variable which is believed to be closely related to both motivational and cognivite functioning is the impulsivity-reflectivity dimension. "Conceptual tempo" as Kagan (1966) has called this variable, may be a central underlying variable in a child's approach to learning. Specifically, children who are impulsive react to stimuli too quickly to allow themselves time to process the information which is available to them. This style is clearly self-defeating in a testing situation. In addition to contributing to the child's incomplete expression of his knowledge, an impulsive style is perhaps most disturbing in its implications for the child's future development. Distrust in one's own abilities can lead to a failure to benefit from the information which even the most barren environment provides (the physical laws governing falling bodies can be studied as adequately using a rusted tin can as by using a Creative Playthings wooden cylinder); in contrast, the belief that one can rely upon one's own ability to reason is probably crucial to the development of an independent, inquiring style of interacting with the environment.

In the present study, as Figures 11 and 12 show, there were both significant increases in reflectivity over time and a significant difference between Head Start and middle-class children. These findings are congruent with those in other studies. An increased reflectivity among older children has been

reported by Kagan and his colleagues (1964), and there is evidence that the impulsive style is found more frequently in lower-class than middle-class children (Hess & Shipman, 1965; Schwebel, 1966), and that this style tends to be stable across time and tasks (Kagan et al., 1964; Schwebel, 1966).

Kagan (1964) has argued that lower-class children are particularly likely to experience failure in school-related tasks. The development of an impulsive style in such cases would serve a defensive, anxiety-reducing purpose: a child feels less blameworthy for producing an incorrect answer rapidly than after devoting lengthy and obvious thought to the problem. The present findings, however, indicate the existence of a social class difference even before entrance into school. Unlike the findings of Klaus and Gray (1968) of decreases in impulsivity and increases in the reflective-analytic mode among children who were subjects in their special intervention program, the present study found no evidence of program effects upon reflectivity. Again, however, the effects may have occurred prior to the kindergarten year.

A study by Katz (1971) has suggested that there is a link between the impulsivity-reflectivity dimension and performance on color-form dimensional preference tasks. Katz found that reflective children, as measured by Kagan's Matching Familiar Figures test, were more likely to prefer the form dimension while impulsive children were more likely to prefer color. Partially because of its apparent relationship to cognitive tempo, but also because it is a measure of capability to respond to more than one stimulus attribute and to shift point of view, the color-form attention task was also included in the present study. The results indicated, as for the Matching Familiar Figures test, an increased reflectivity as measured by errors on the task as well as an increase

in the use of form strategies over time. In comparison with the MFF test, social class differences were much less marked. There was also a suggestion of a significant program effect with experimental children showing less tendency to employ the immature color preference strategy than control children.

Motivational-Cognitive Interactions

In an often-cited study of the effects of a Head Start program, Zigler and Butterfield (1968) concluded that the Head Start experience had been successful in ameliorating motivational factors, such as wariness of adults and fearfulness of being tested, which had been operating to prevent the children from competently expressing the level of knowledge which they possessed. They further argued that "in trying to improve the deprived child's general level of performance, it would appear at least as important to attempt to correct his motivational inadequacies by developing nursery programs geared specifically toward changing his adverse motivational patterns as it is to concentrate on teaching cognitive skills and factual knowledge" (p. 12). This important conclusion, however, was based upon inferred rather than directly measured motivational changes. In the present study, a more direct test of possible motivational changes was made by comparing performance on measures which theoretically measure the same cognitive construct but which differ in the degree to which they require active interchange with an adult. An additional variable of interest was introduced by varying the content of the test, i.e., verbal versus nonverbal.

Comparison of performance on the Peabody Picture Vocabulary Test with average performance on the two verbal Wechsler tests revealed only a time of testing effect. During the middle to late kindergarten period, children tended to perform better on the PPVT than on the WISC verbal measures. By the middle of

first grade, however, the two sets of scores were nearly equivalent. The PPVT is a measure of recognition vocabulary, requiring a minimal response from the child, who simply points to a picture which corresponds to a word on each trial. The Vocabulary and Information subtests of the Wechsler tests might be considered expressive rather than recognition, verbal measures, since the child is asked to define the meaning of specific words or to produce specific information on request. The research of Labov (1970) suggests that the expressive measures should be depressed relative to the recognition measure for children who are fearful of the examiner, and this pattern was indeed found during the kindergarten period. It is fortunate, however, that the present study included a group of nondisadvantaged children. Without this group's performance, it might have been mistakenly concluded that the Head Start children were particularly subject to wariness during kindergarten. Instead, the differences among the three groups on this discrepancy measure were not significant at any testing period. Apparently during kindergarten the PPVT produces higher estimates of verbal ability than the two WISC subtests regardless of whether the children are lower- or middle-class. It seems probable that this result reflected the unusual difficulty of the WISC subtests for the kindergarten children rather than a motivational difficulty, as earlier and later PPVT-Wechsler test comparisons were not significant.

The difference between the verbal and the performance test scores as shown in Figure 16 is a provocative one. The Wechsler tests were designed such that verbal and performance estimates of ability should generally be approximately equivalent, and for the middle-income children in the present study, this was the case. The low-income children, however, would be considered to be somewhat

above average in ability on the basis of their performance scores alon and somewhat below average on the basis of their verbal scores alone. This pattern might seem to suggest some kind of specific verbal disfunction; much recent evidence, however, indicates that the low-income black child's culture is a richly verbal one, and that, outside of school and test-like settings, such children are highly proficient linguistically (Baratz & Shuy, 1969; Fasold & Shuy, 1970; Houston, 1970; Labov, 1970; Labov, 1972). Also, as the present findings indicate, upon at least one occasion the experimental children were performing at the average level on the PPVT, a verbal measure of recognition vocabulary. The present results might therefore more reasonably be seen as a reflection of subcultural differences in attitudes towards verbal tests and/or, possibly, of difficulty in responding in a relatively unfamiliar dialect, rather than any specific verbal disability. The difficulties of cross-cultural and subcultural comparisons are well known (Baratz & Baratz, 1970; Brislin, Lonner, & Thorndike, 1973; Cole & Bruner, 1971; Cole, Gay, Glick, & Sharp, 1971; Tulkin & Konner, 1973) and are re-exemplified in the present findings.

In summary, the present study found little evidence that an additional year of Head-Start like experience following a Head Start day care program produced any measurable effects. It is possible, however, that effects were not found largely because the program had been effective before the additional year was provided. In many regards, children who had attended the original Head Start program, with or without the additional year, performed comparably to economically advantaged children who had attended a private nursery school. For example, they performed comparably on measures of curiosity, preference for challenging tasks, and tendency to structure tasks as problems to be solved.

Also, while the Head Start children performed below the level of the nondisadvantaged children on formal cognitive measures, they nevertheless consistently showed above-average scores on Wechsler performance tests. There was no evidence of "fade-out" effects on any measure.

Overall, one gets the impression that the Head Start group was able to respond capably to a number of test demands with the single exception of tests which required producing definitions of words and other verbal information. It now seems quite clear, on the basis of the present study as well as many previous studies, that even a well-designed Head Start program will not necessarily affect verbal scores, although it may have numerous other salutary effects. For those who define cognitive ability solely in terms of demonstrated verbal ability, such a conclusion might be seen as overshadowing all others and marking the Head Start program as a relative failure. The above-average nonverbal problem solving skills of these children, however, and their general competence on most tasks argues against taking too simple a view of the depressed verbal scores. Considerable information is now accumulating regarding the nature of the language spoken by young black children. If this information were incorporated into a Head-Start-like program, one might reasonably expect to find an influence upon children's performance in the verbal as well as the nonverbal areas. Because of known dialectal differences and differences in the cultural view of the uses of language, it seems likely that effecting changes specific to performance on verbal measures in standard English may require programs especially designed to recognize and deal with the special problems inherent in bidialectalism. In combination with what is now known about establishing preschool programs, programs thus designed would seem very promising.

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Table 1

Schedule of Tasks Administered

	Nursery School		Kindergarten			First Grade	
	March 72	May 72	Nov 72	Feb 73	May 73	Nov 73	Feb 74
Weschler Tests	WPPSI	WPPSI	WPPSI	WISC	WISC	WISC	WISC
PPVT Form	A	A	B	A	B	A	B
Variation Seeking Box Maze	Boy--Store	Boy--Store	Boy--Store	Dog--Bone	Mouse--Cheese	Child--Playground	Pirate--Treasure
Structuring Task	Graduated Peg	Graduated Peg	Marble Dropping	Form Dropping	Texture Board	Dowel Task	Color-Form Board
Curiosity Houses Set	1	1	2	3	4	5	6
Puzzles Set	1	2	3	4	5	6	7
Color-form Attention Set	Yellow-Green	Yellow-Green	Red-Blue	Orange-Violet	Red-Blue	Orange-Violet	Yellow-Green
Reflectivity	KRISP A	KRISP A	KRISP B	MFF-1-F	MFF-Var	MFF-1-F	MFF-Var

Table 2

Mean Chronological and PPVT Mental Ages at Each Test Period

Time of Testing

	Nursery-1		Nursery-2		KG Start		KG Middle		KG End		1st Gr St		1st Gr Mid	
Group	CA	MA	CA	MA	CA	MA	CA	MA	CA	MA	CA	MA	CA	MA
Experimental	55.2	44.6	59.0	53.9	63.3	57.9	66.7	67.2	69.4	61.0	75.4	73.9	79.9	74.7
Control	56.8	41.3	58.5	49.1	63.5	54.7	66.1	59.4	69.0	60.8	75.1	69.0	79.7	72.6
Comparison			59.0	76.0	65.5	82.6	67.5	92.6	70.5	93.1	76.7	100.6	81.6	100.6

Table 3

Experimental versus Control Groups Comparisons
Yielding Significant t Test Values

Time	Variable	Experimental $\bar{X}$	Control $\bar{X}$	Probability
March, 1972	--	--	--	--
May, 1972	--	--	--	--
Sept, 1972	Pre-forced choice Form choices	2.47	.85	p=.02
Jan, 1973	PPVT MA	67.2	59.4	p=.04
	Box Maze	54.4	24.5	p=.05
May, 1973	WISC Block Design	11.6	9.3	p=.01
	WISC Performance	11.4	10.1	p=.04
	PPVT vs. Block Design	-3.95	-1.21	p=.04
Sept, 1973	--	--	--	--
Jan, 1974	Post-forced-choice Form choices	9.3	6.3	p=.04
	Smile to puzzles	.34	.96	p=.02

Table 4

Correlations Among Effectance Measures for Pooled Experimental and Control Children

		Number of Blank Doors						Variation Score					
		1	2	3	4	5	6	1	2	3	4	5	6
Number Blank Doors	1	1.00	.28	.16	.11	.06	.12	.24	.11	.24	.40*	.35	.40*
	2		1.00	.63***	.21	.27	.13	.32	.08	.42*	.16	.38*	.44*
	3			1.00	.50**	.26	.19	.01	.16	.22	.16	.05	.31
	4				1.00	.32	.66**	.29	.20	.19	.20	-.03	-.04
	5					1.00	.24	.43*	.09	.32	.13	.16	-.03
	6						1.00	.35	.17	.20	.02	.15	.11
Variation Score	1							1.00	.36	.26	.00	.01	-.15
	2								1.00	.14	.29	-.01	-.05
	3									1.00	.23	.33	.34
	4										1.00	.34	.24
	5											1.00	.69***
	6												1.00
Puzzle Mean Level	1												
	2												
	3												
	4												
	5												
	6												
Correct Structuring	1												
	2												
	3												
	4												
	5												
	6												

Table 4 (cont.)

Correlations Among Effectance Measures for Pooled Experimental and Control Children

		Puzzles Mean LOA						Correct on Structuring					
		1	2	3	4	5	6	1	2	3	4	5	6
Number Blank Doors	1	.05	.22	.16	.01	.27	.17	-.20	-.14	-.11	.10	-.11	-.01
	2	.13	.05	.09	-.04	.17	.04	-.11	-.18	-.21	.21	-.07	.30
	3	.31	.22	.30	.09	-.00	-.10	-.12	-.24	.10	.11	-.24	.23
	4	.33	-.07	.33	-.15	.02	.04	-.13	-.04	.05	-.01	-.28	.15
	5	-.09	-.40*	-.01	-.32	-.12	-.23	-.24	-.05	-.15	.26	.17	.03
	6	.30	.13	.14	-.02	.17	.03	-.02	-.14	.04	-.17	-.54**	.10
Variation Score	1	.26	-.12	-.14	-.05	.27	.07	-.30	.04	-.39*	.00	-.12	-.09
	2	.25	-.03	-.17	-.01	-.06	-.24	-.12	.28	-.06	.01	-.18	.33
	3	.01	-.17	.20	-.02	.40*	.05	.08	-.08	-.39*	.27	-.20	.17
	4	-.06	-.21	.08	-.24	-.10	-.09	-.21	.29	.07	.05	.04	-.10
	5	-.43*	-.16	.00	-.01	.26	.10	.03	.16	-.08	.20	.00	-.05
	6	-.32	.02	.11	.09	.26	.08	.33	.06	.17	.34	-.26	-.14
Puzzle Mean Level	1	1.00	.60**	.48*	.32	.40*	.14	-.12	-.29	-.04	-.23	-.09	.33
	2		1.00	.50**	.66***	.39*	.39*	.08	-.40*	.07	-.19	-.03	.21
	3			1.00	.39*	.52**	.32	.34	-.25	.07	.02	-.02	.12
	4				1.00	.53**	.64***	.10	-.20	.05	.02	.01	.16
	5					1.00	.60***	.26	-.24	-.20	.04	-.16	.18
	6						1.00	.06	-.29	-.19	-.08	.09	.08
Correct Structuring	1							1.00	-.02	.25	.14	-.24	.06
	2								1.00	.21	.21	.14	-.25
	3									1.00	.16	-.12	-.18
	4										1.00	-.03	.09
	5											1.00	.15
	6												1.00

Table 5

Correlations Among Effectance Measures for Comparison Group Children

		Number of Blank Doors						Variation Score					
		1	2	3	4	5	6	1	2	3	4	5	6
Number Blank Doors	1	1.00	.11	.39	.31	.02	.20	.27	.21	.42	.45	.45*	.08
	2		1.00	.50*	.21	-.01	-.04	.04	-.29	-.08	-.19	-.41	-.15
	3			1.00	.63**	.35	.41	-.06	.03	.22	.22	-.05	.07
	4				1.00	.73***	.72***	.38	-.06	.48	.36	.28	.49*
	5					1.00	.81***	.25	-.04	.02	.06	.24	.71***
	6						1.00	.23	-.02	.21	.37	.25	.58**
Variation Score	1							1.00	-.15	.15	-.09	.13	.09
	2								1.00	.36	.49*	.44	.18
	3									1.00	.65**	.10	.18
	4										1.00	.42	.32
	5											1.00	.50*
	6												1.00
Puzzle Mean Level	1												
	2												
	3												
	4												
	5												
	6												
Correct On Structuring	1												
	2												
	3												
	4												
	5												
	6												

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Table 5 (cont.)

Correlations Among Effectance Measures for Comparison Group Children

		Puzzle Mean LOA						Correct on Structuring					
		1	2	3	4	5	6	1	2	3	4	5	6
Number Blank Doors	1	-.14	-.16	.24	.17	.28	-.25	.22	.04	.20	.08	-.02	.36
	2	.00	-.31	.04	-.32	-.46	-.26	-.26	-.29	.04	.02	.00	.20
	3	.14	-.32	-.01	.10	-.29	-.21	.18	.15	-.07	-.29	.14	-.13
	4	.46	.07	.49*	.47*	-.08	-.02	.52*	.18	-.13	-.01	.57*	-.24
	5	.13	.06	.41	.51*	.14	.42	.56*	.24	-.09	.16	.37	-.19
	6	.29	.01	.61**	.70**	.06	.35	.61**	.14	.18	.19	.55*	-.06
Variation Score	1	-.12	.34	.41	.37	-.01	-.09	.14	-.18	.18	.17	.46*	.06
	2	-.18	-.12	-.27	-.15	.35	-.20	.06	.18	-.04	.20	-.11	.20
	3	.31	.20	.36	.21	.18	-.39	.27	.02	-.02	.08	.18	.12
	4	.46	.03	.31	.26	.04	-.14	.31	-.07	-.05	.09	.12	-.12
	5	.15	.13	.22	.34	.52*	.01	.45*	.48*	-.12	.41	.31	-.06
	6	.37	.28	.58*	.64**	.54*	.42	.64**	.12	-.19	.45	.32	.05
Puzzle Mean Level	1	1.00	.39	.57*	.50*	-.00	.27	.29	.12	-.12	-.11	.40	.02
	2		1.00	.54*	.60**	.36	.30	.17	.21	.22	.21	.14	-.15
	3			1.00	.78***	.29	.35	.52*	.02	.16	.31	.45	.13
	4				1.00	.43	.48*	.66**	.24	.29	.15	.50*	.15
	5					1.00	.38	.43	.31	.14	.35	.05	.18
	6						1.00	.50*	.19	.11	-.14	.10	.10
Correct on Structuring	1							1.00	.37	-.15	.09	.47*	.17
	2								1.00	.01	.12	.05	-.16
	3									1.00	.22	.04	.59**
	4										1.00	.29	-.25
	5											1.00	.25
	6												1.00

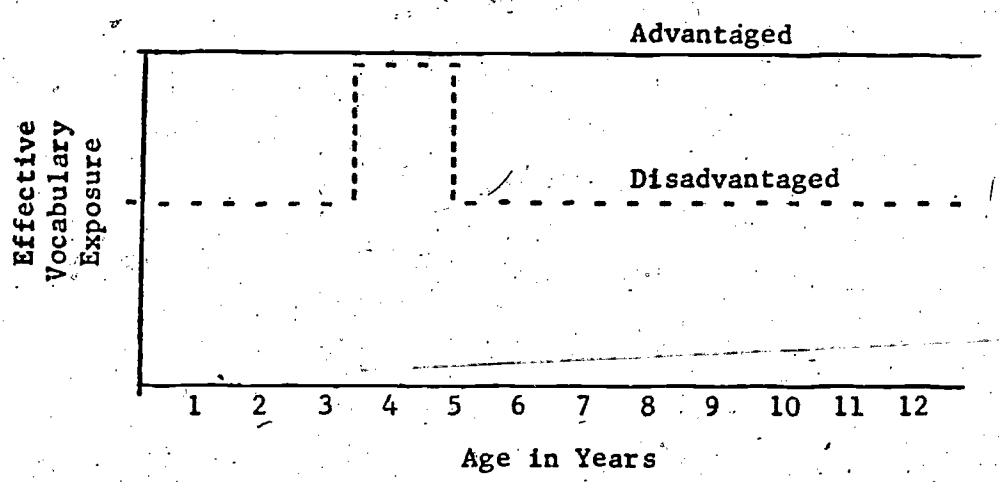

Advantaged
Disadvantaged
Effective Vocabulary Exposure
1 2 3 4 5 6 7 8 9 10 11 12
Age in Years

Figure 1

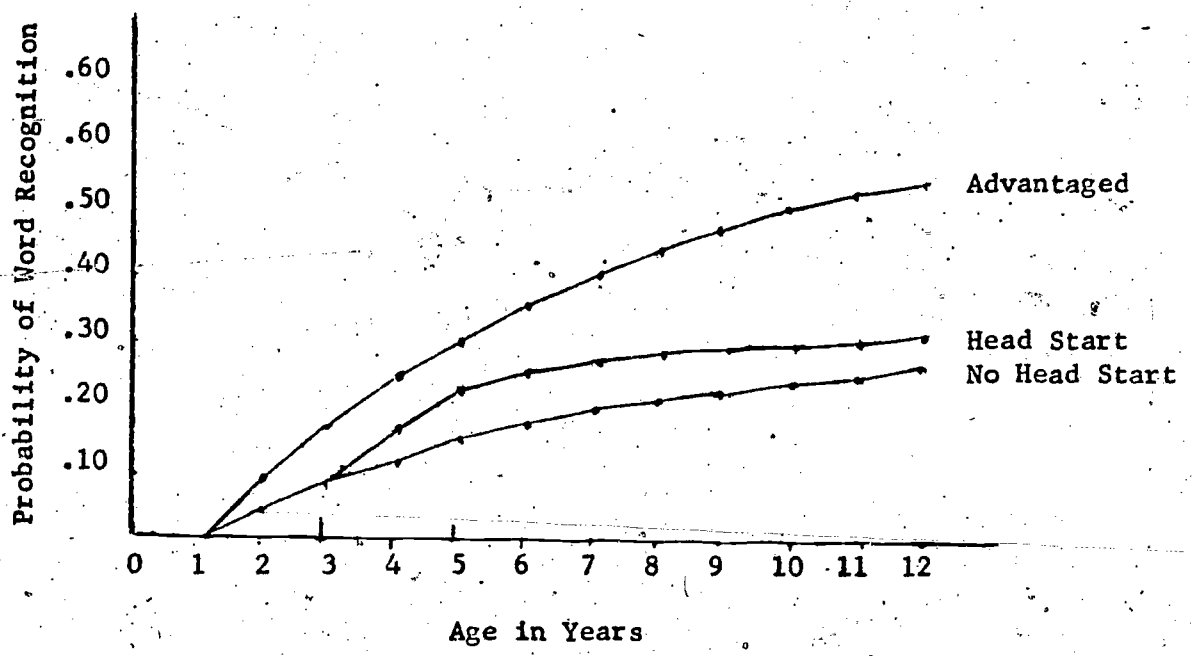
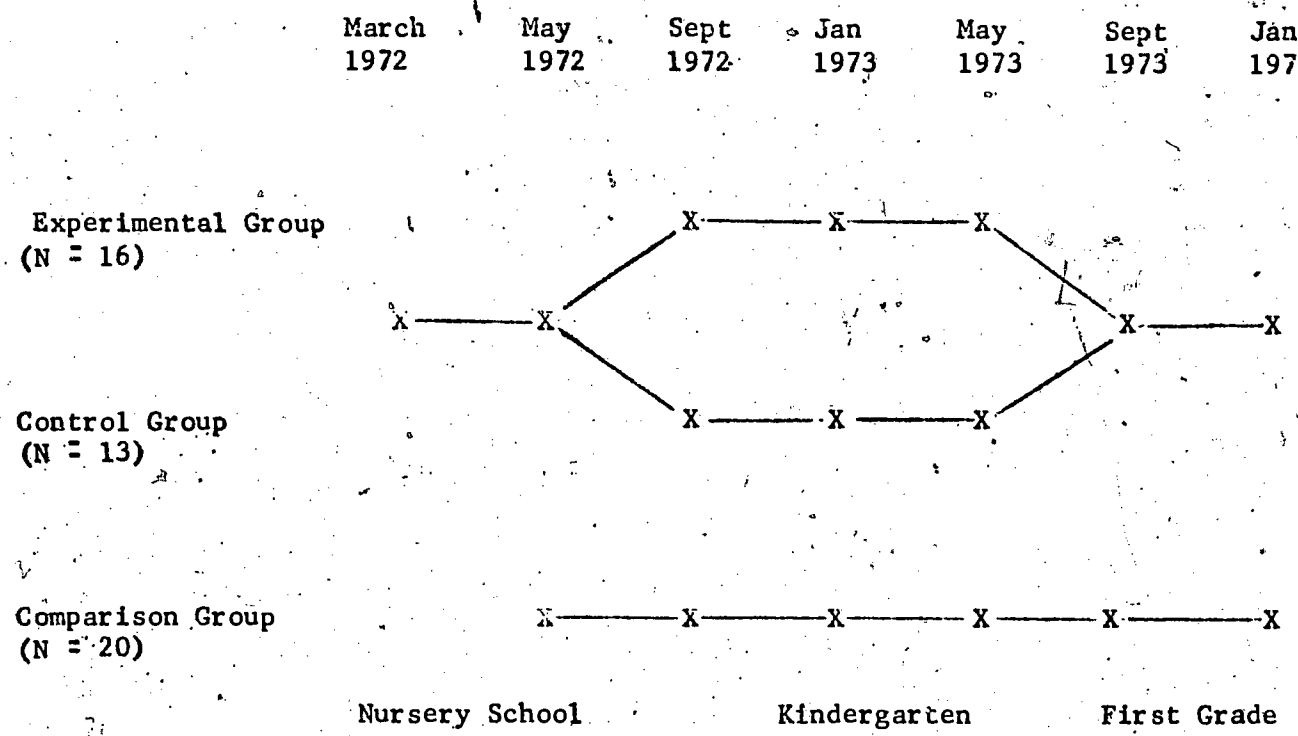

Probability of Word Recognition
.60
.60
.50
.40
.30
.20
.10
0 1 2 3 4 5 6 7 8 9 10 11 12
Age in Years
Advantaged
Head Start
No Head Start

Figure 2.



The Experimental and Control groups were low-income children who attended a full-day Head Start program during their nursery school year. They were treated differentially during the kindergarten year by attending either an experimental full-day, follow-up kindergarten (Experimental Group) or public half-day kindergartens (Control Group). Following the kindergarten year, they again were treated identically by attending public school first grades in their own neighborhoods.

The Comparison group were children from upper-middle to upper income, predominantly professional, homes, who attended a private nursery school. They subsequently attended public and private kindergartens and first grades in their own neighborhoods.

Figure 3

Experimental Design for the Present Study

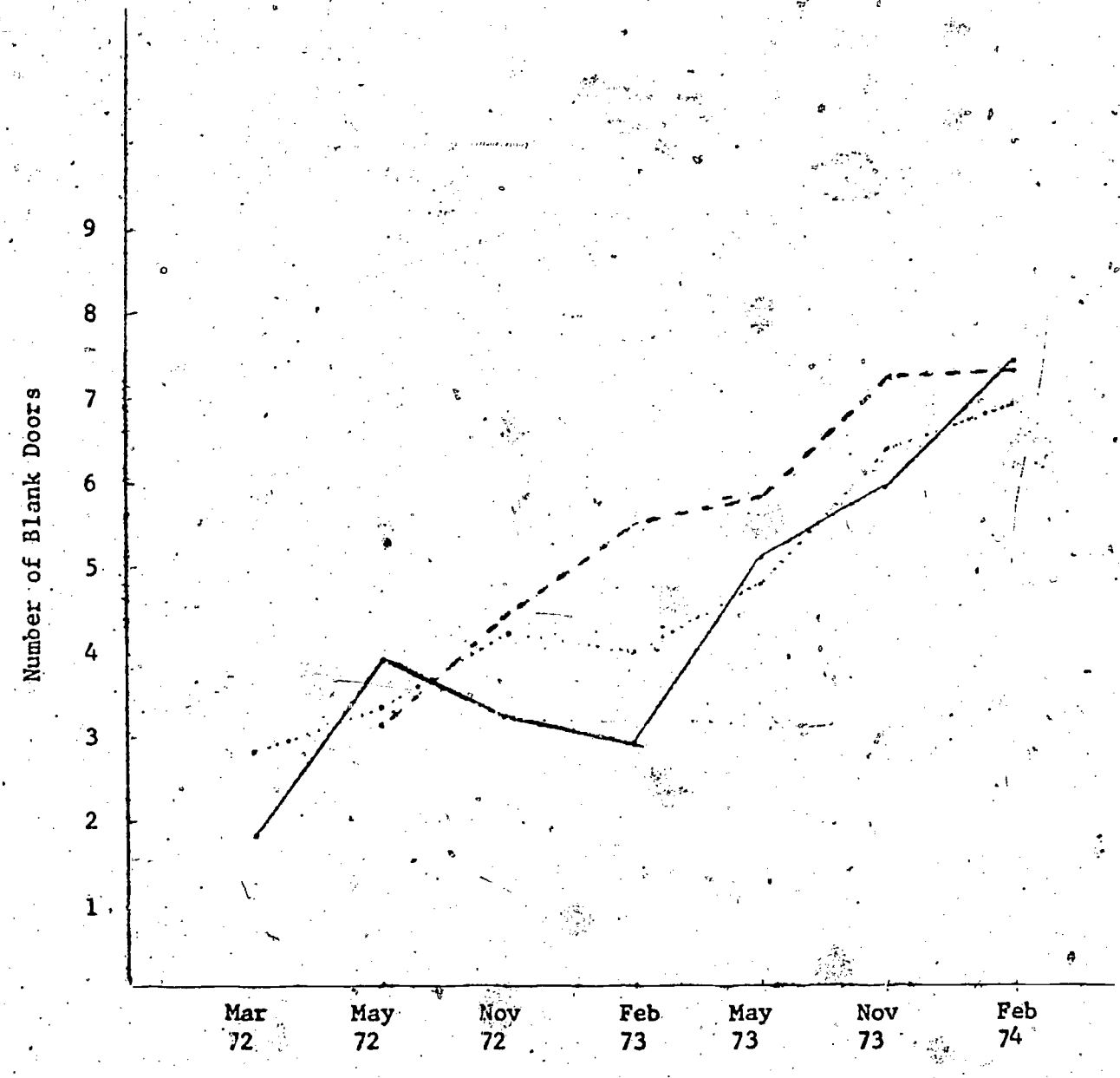


Figure 4

Curiosity Scores

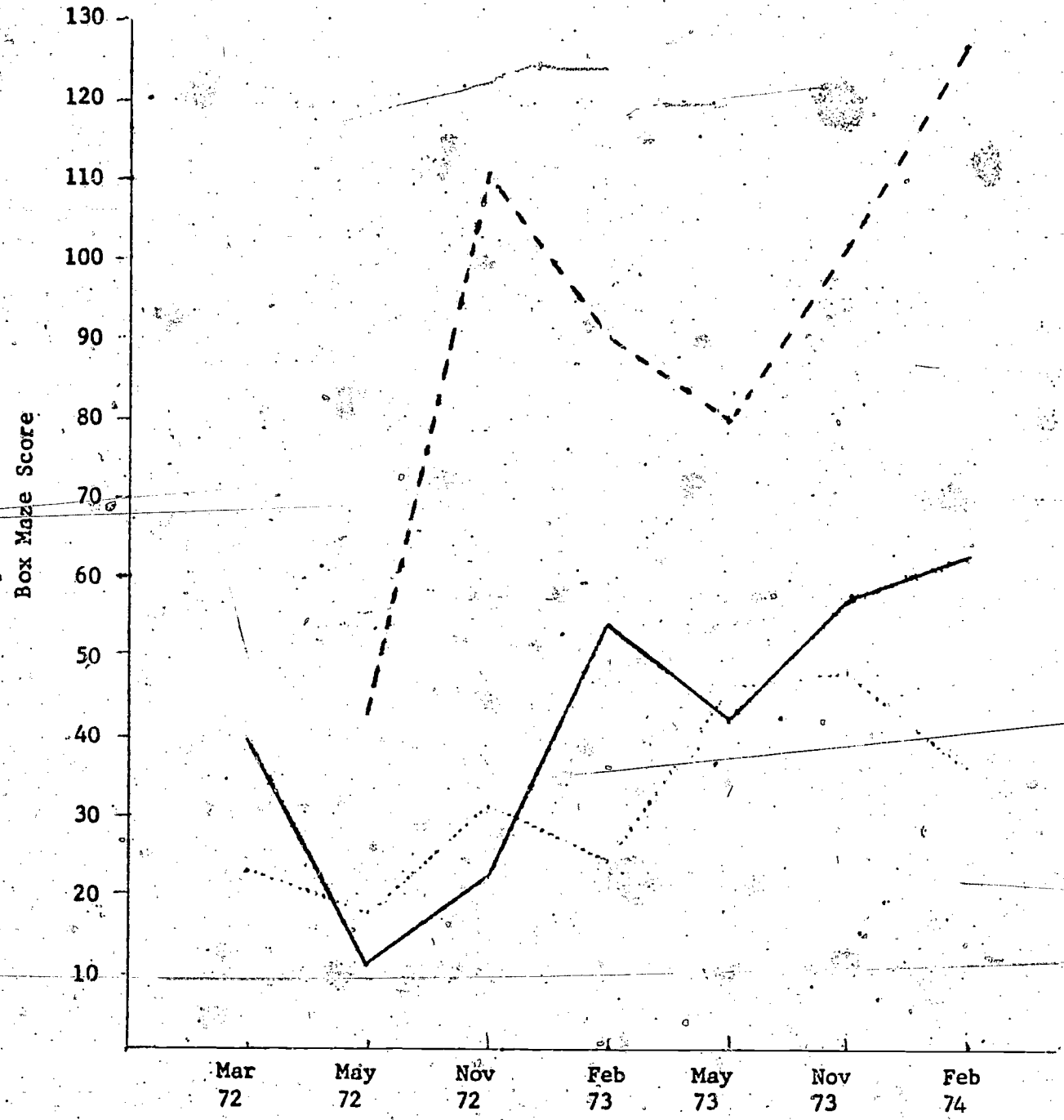


Figure 5

Variation Seeking

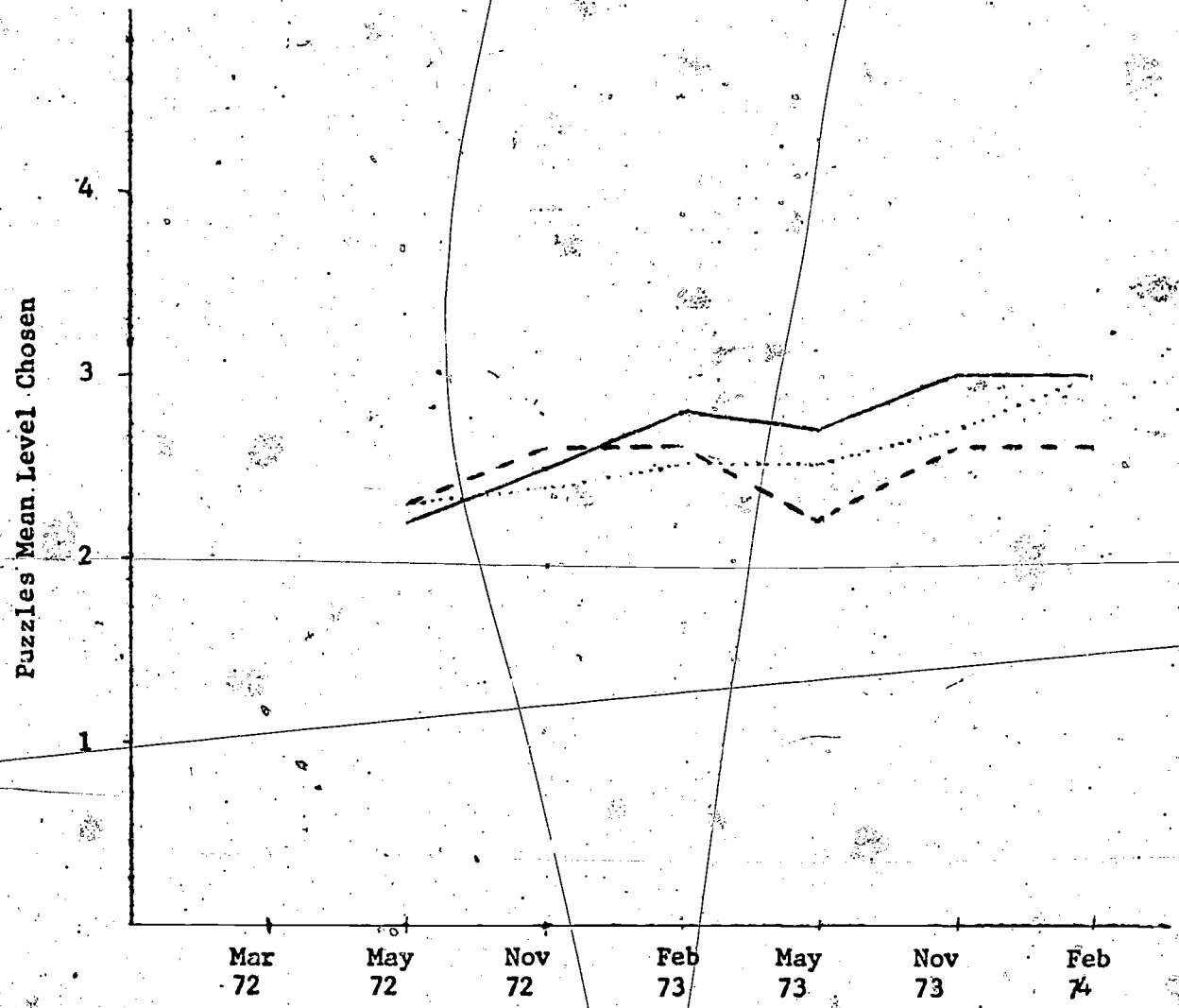


Figure 6

Preference for Challenging Tasks

—— Experimental
..... Control
- - - Comparison

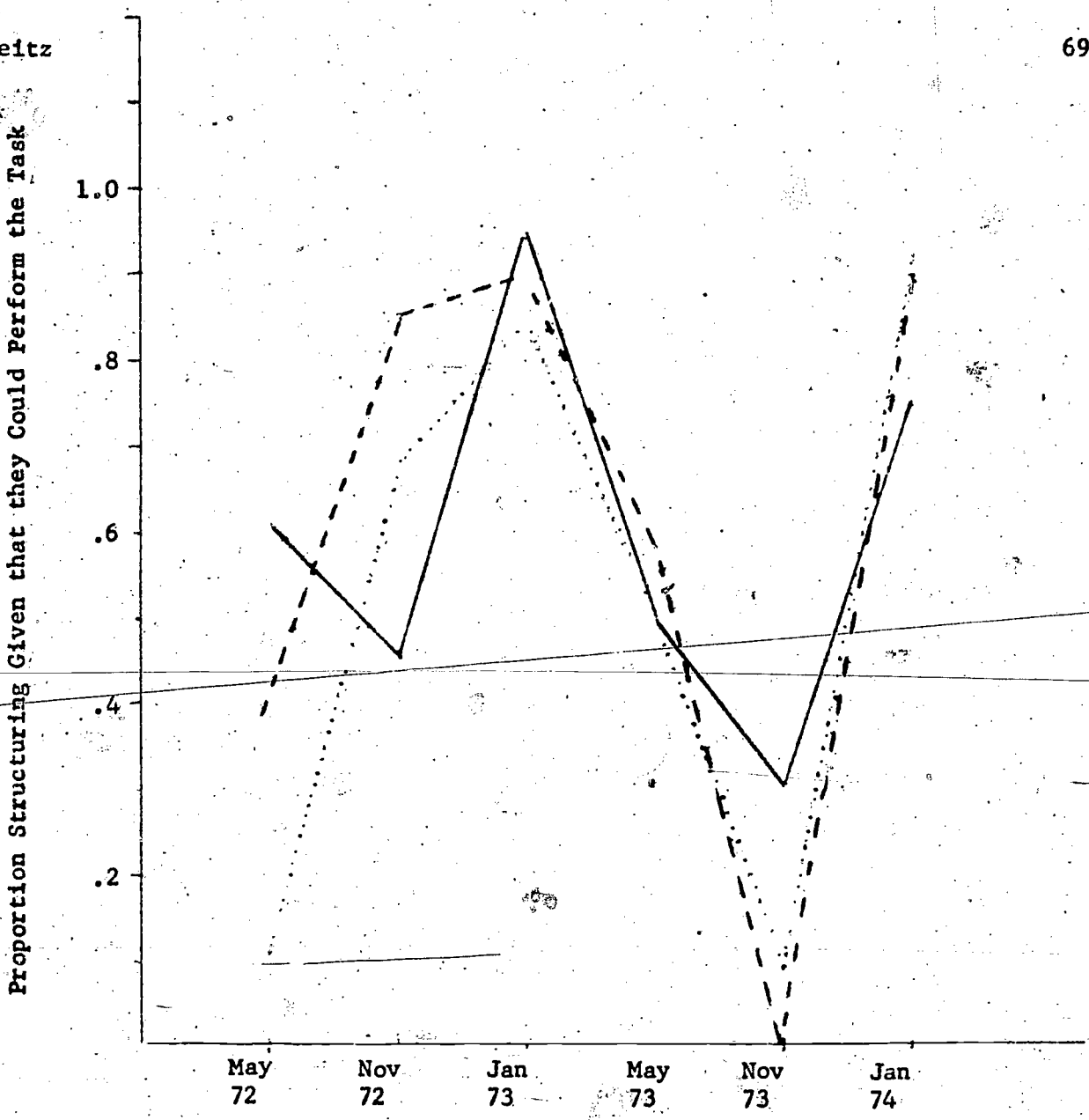


Figure 7

Tendency to Structure Tasks as Problems to be Solved

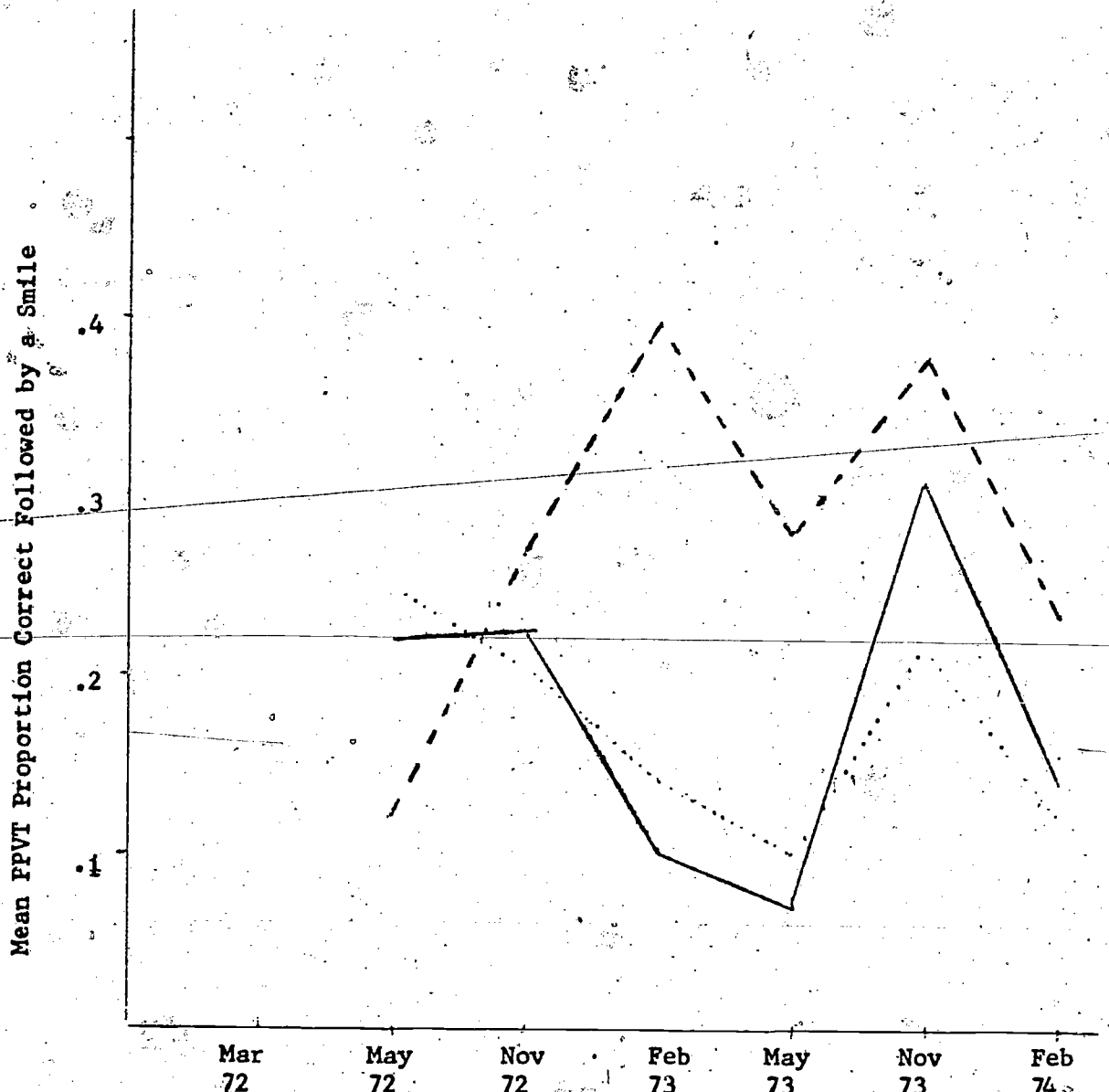


Figure 8

Smiling Following Correct Responses to PPVT

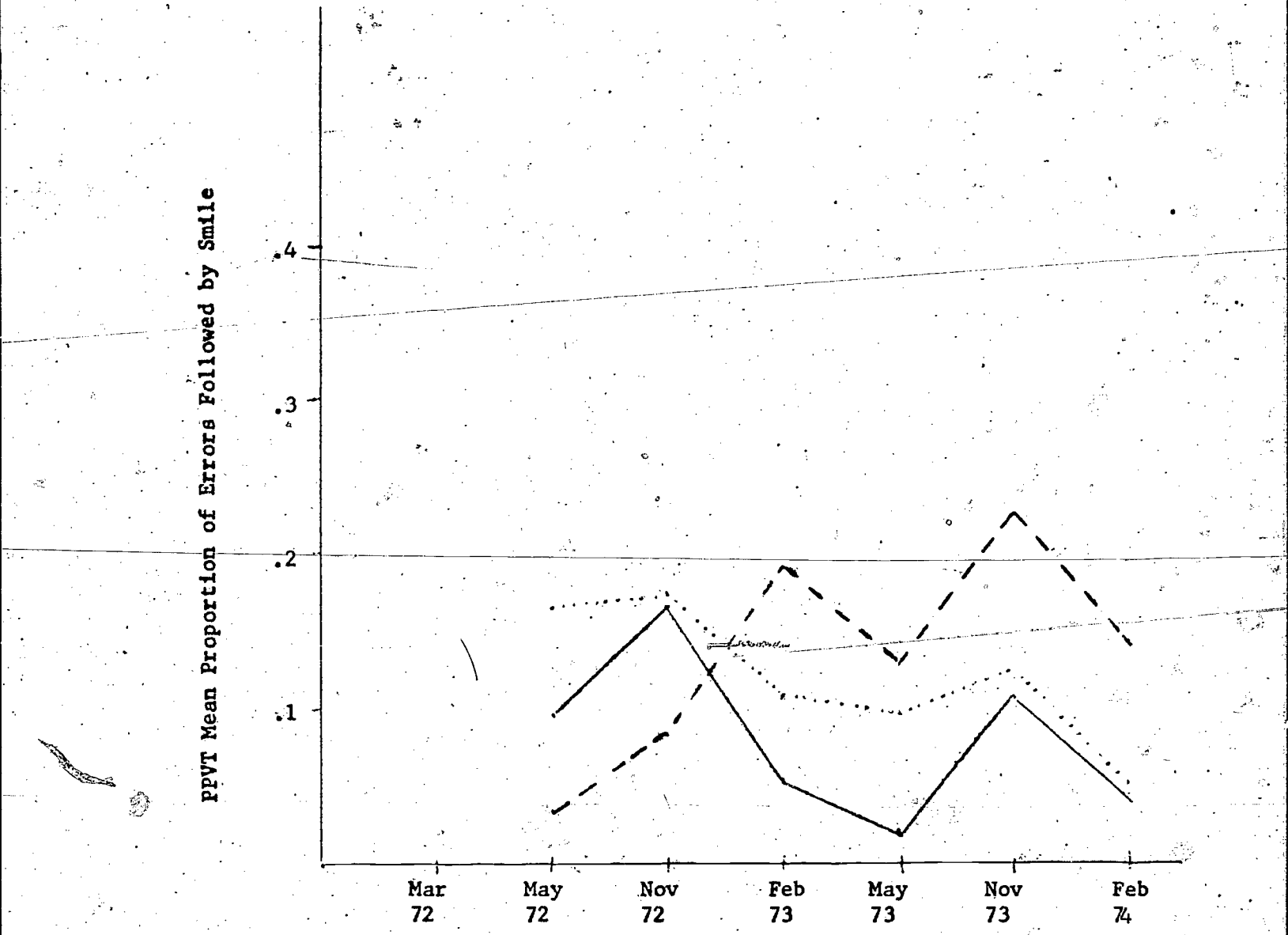


Figure 9

Smiling Following Errors on PPVT

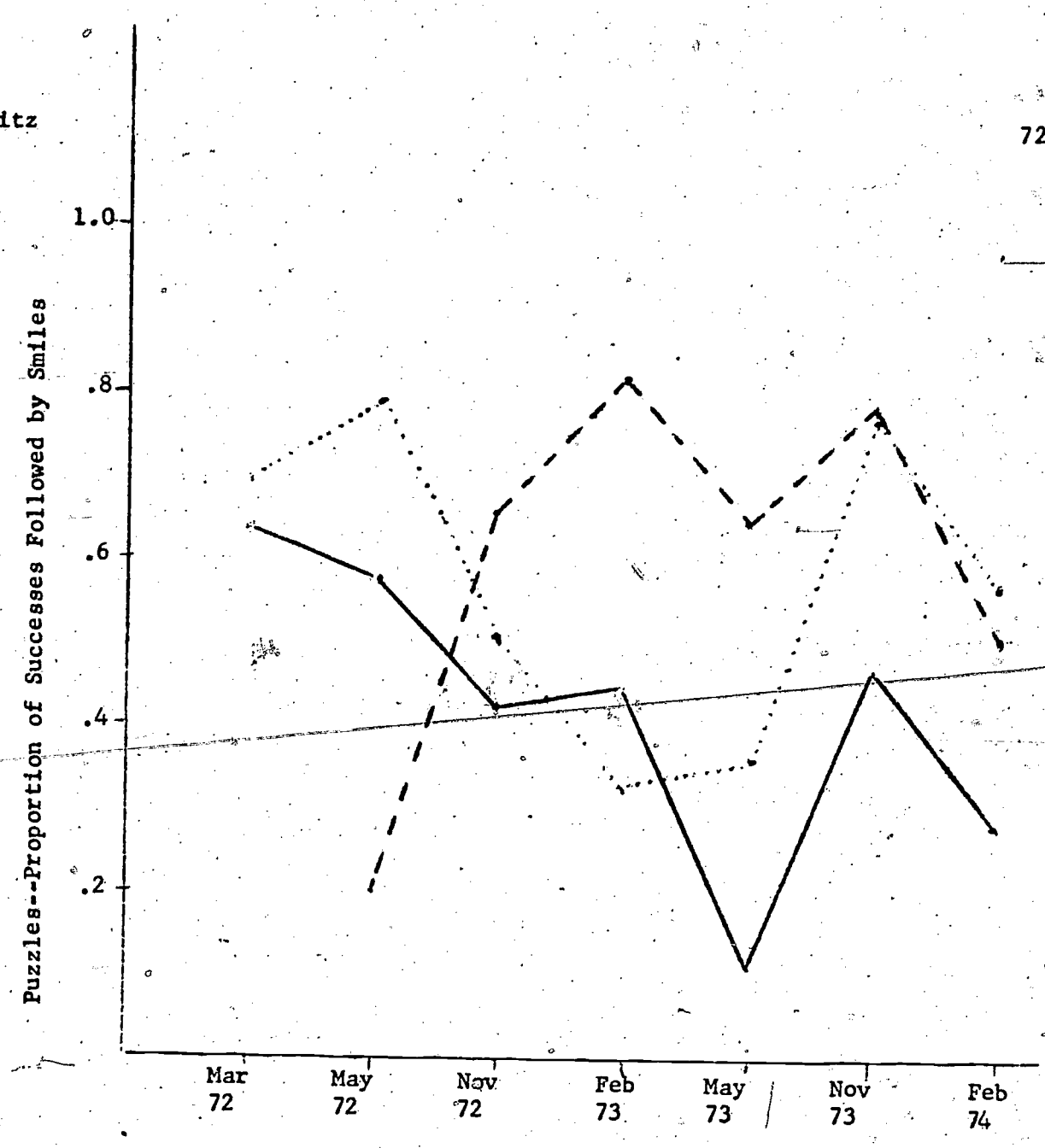


Figure 10

Smiling Following Success on Puzzles

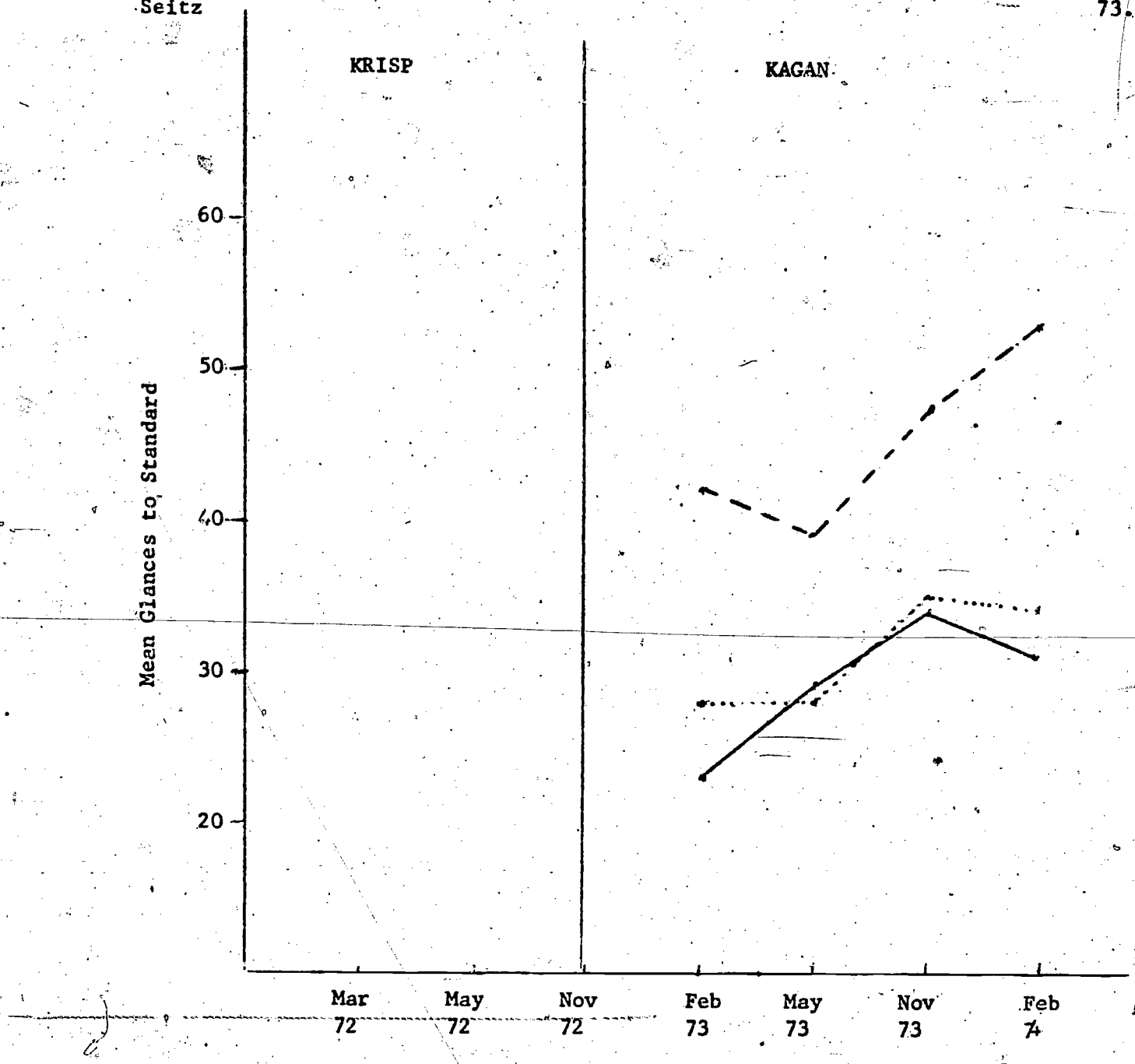


Figure 11

Glances to Standard on Matching Familiar Figures

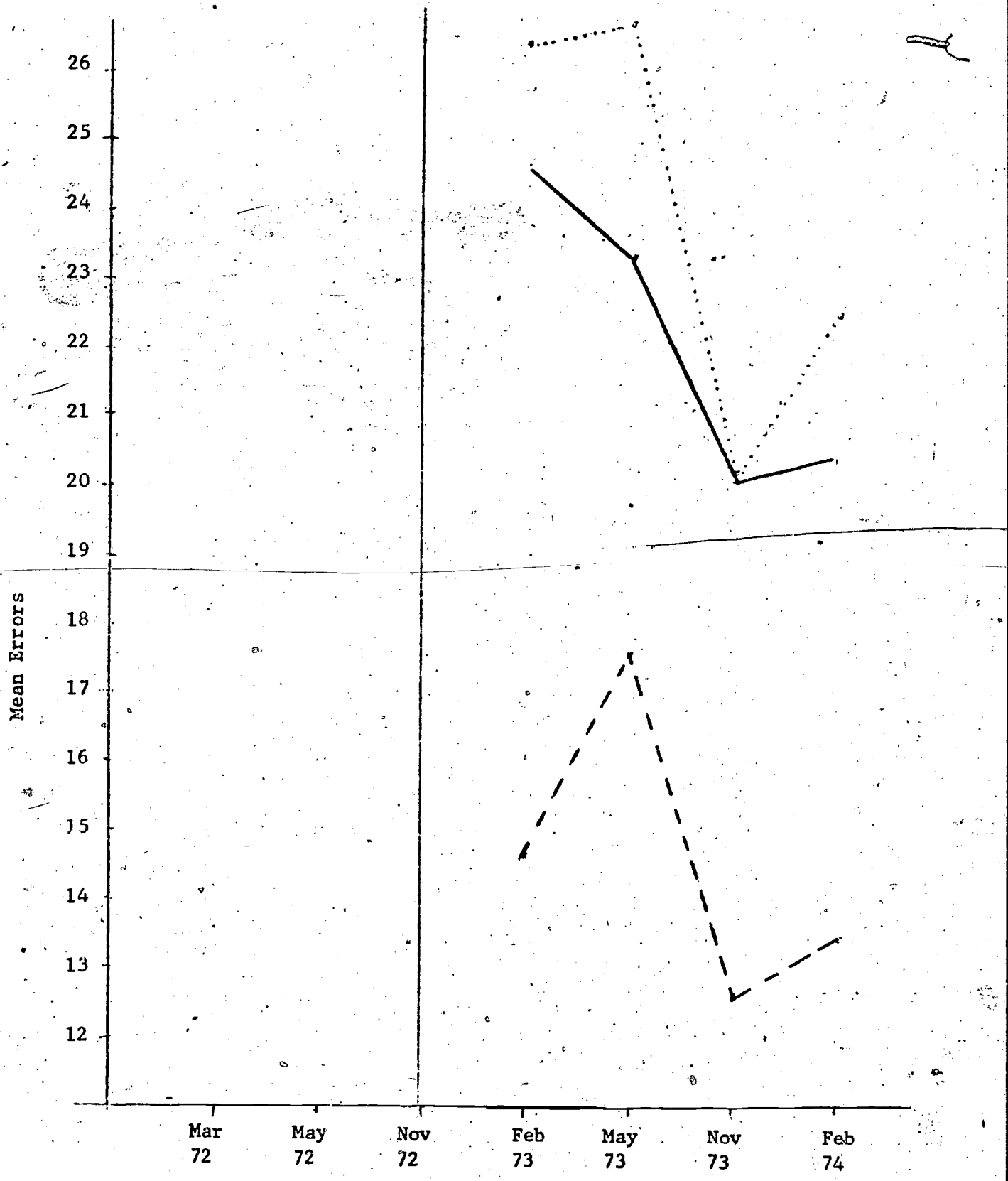


Figure 12

Errors on Matching Familiar Figures

—— Experimental
····· Control
– – – Comparison

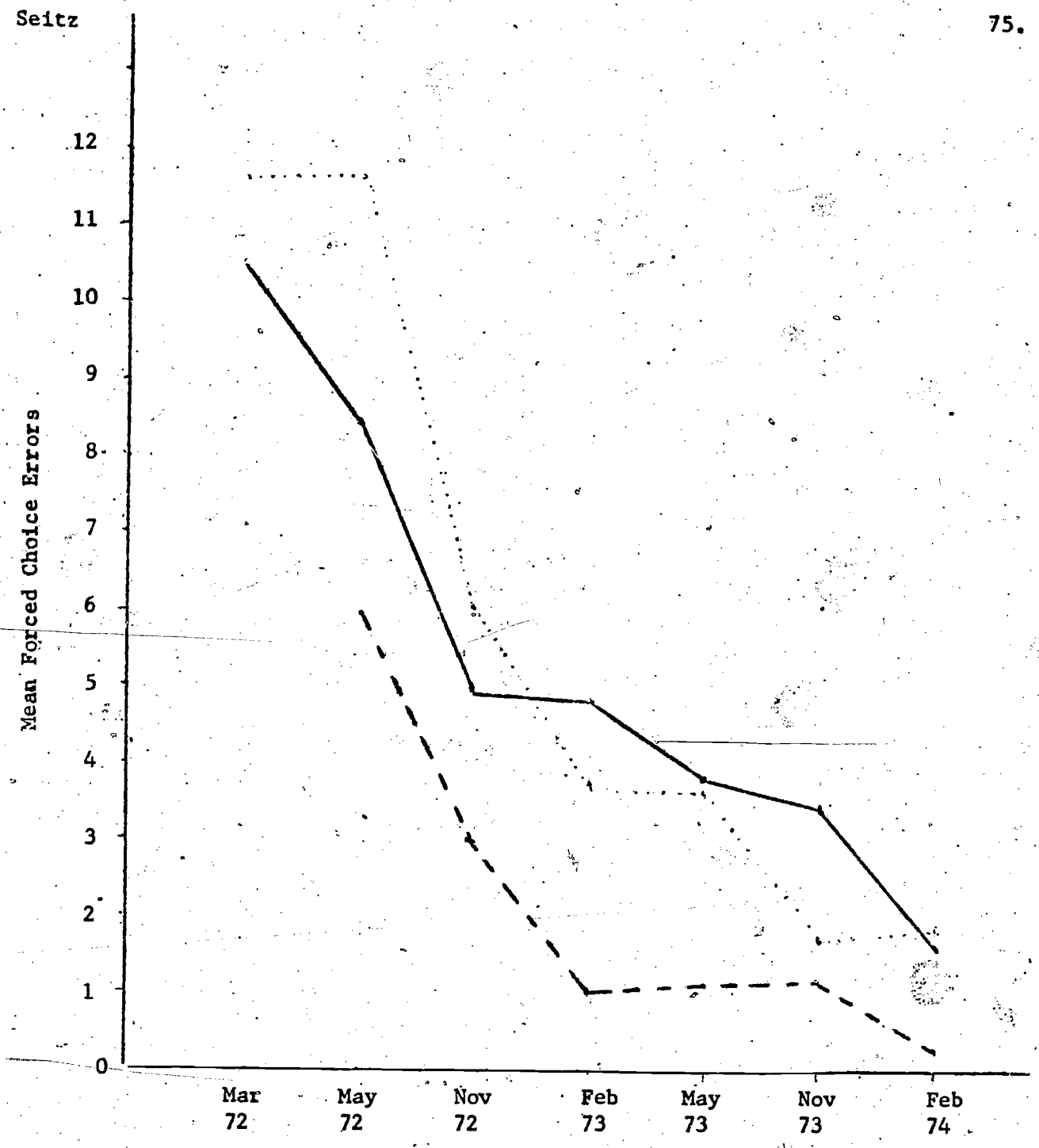


Figure 13

Errors on Color-Form Preference

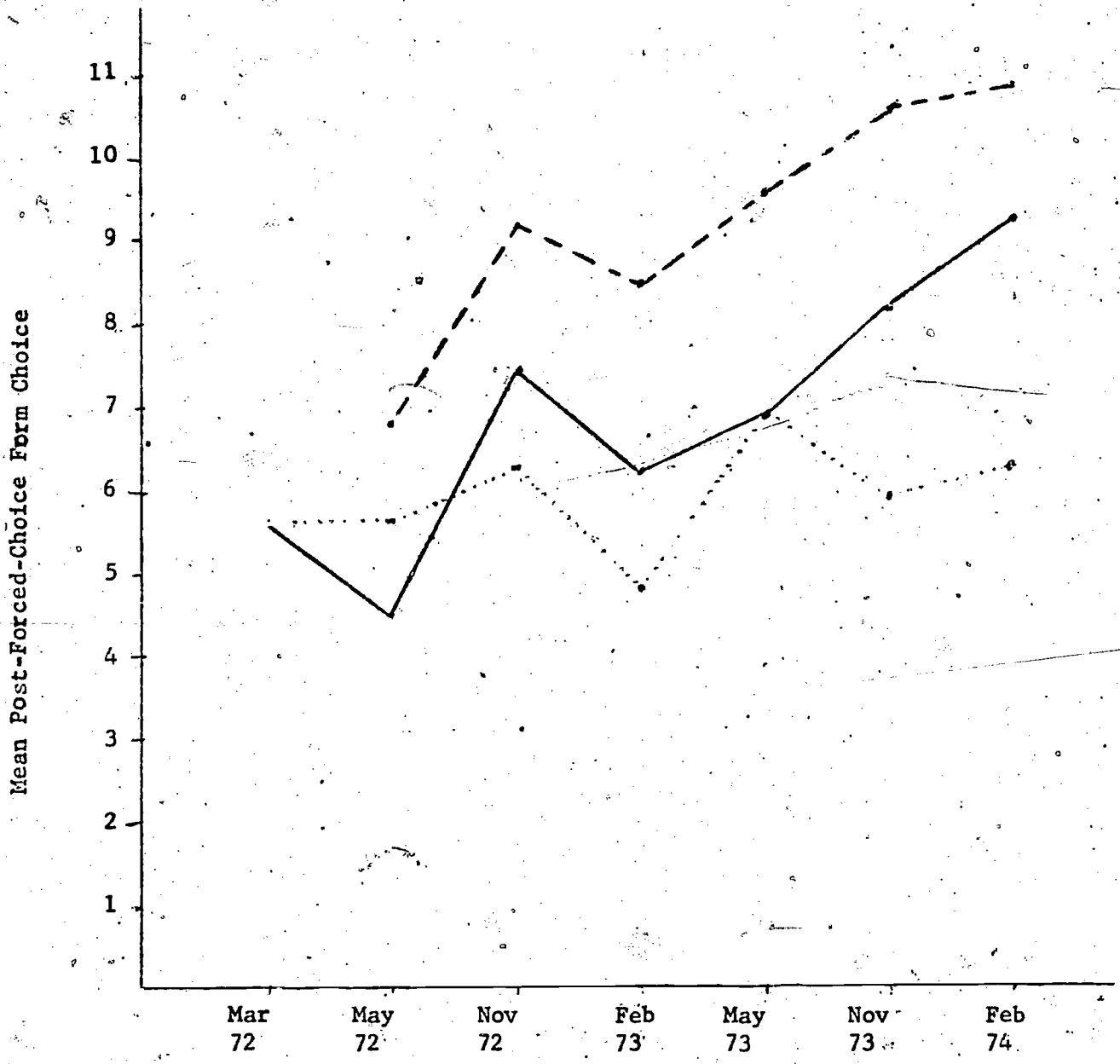


Figure 14

Form Choices on Color-Form Preference

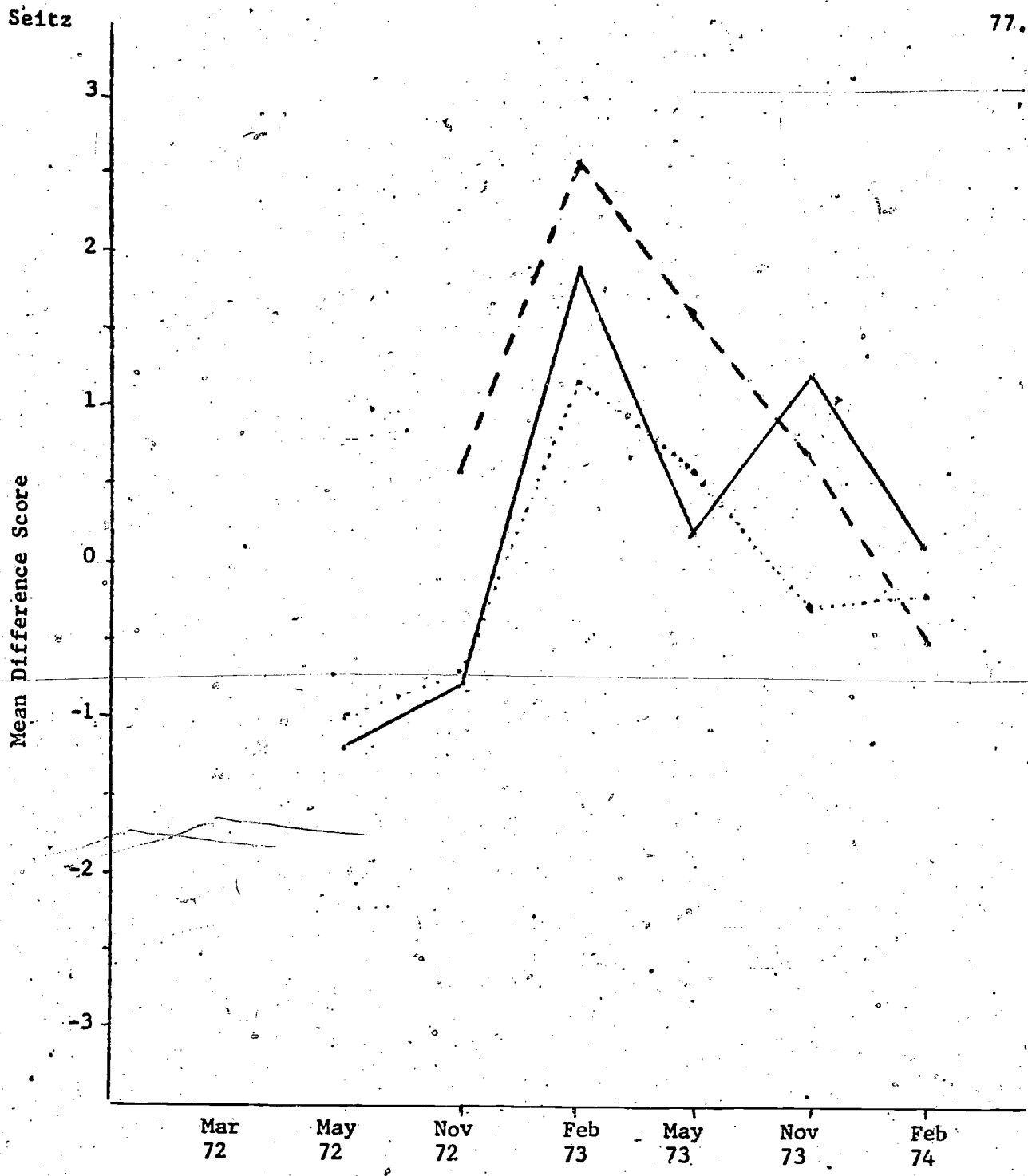


Figure 15

P.P.V.T.-Verbal

— Experimental
.... Control
--- Comparison

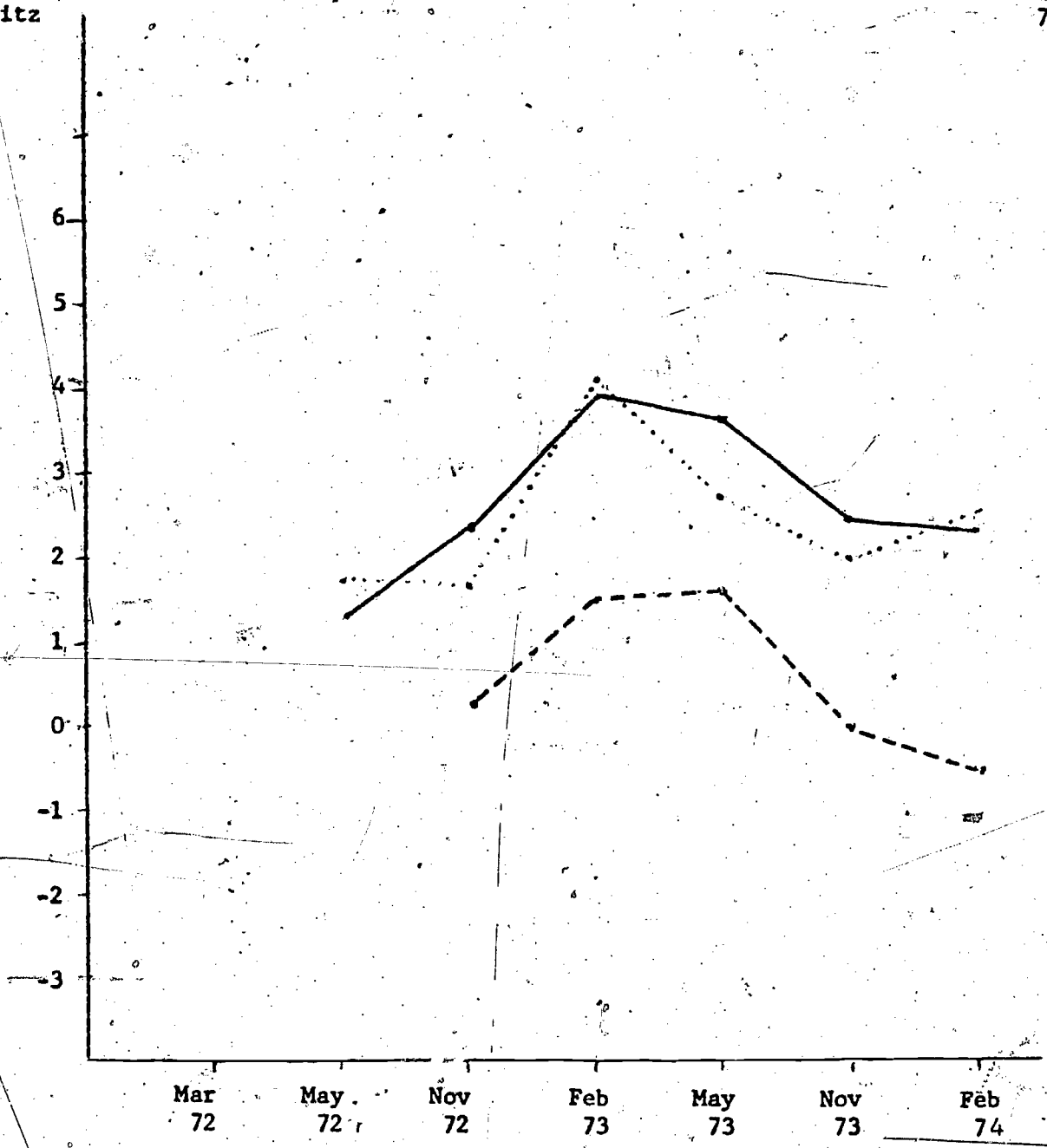


Figure 16

Performance-Verbal

Experimental
Control
Comparison

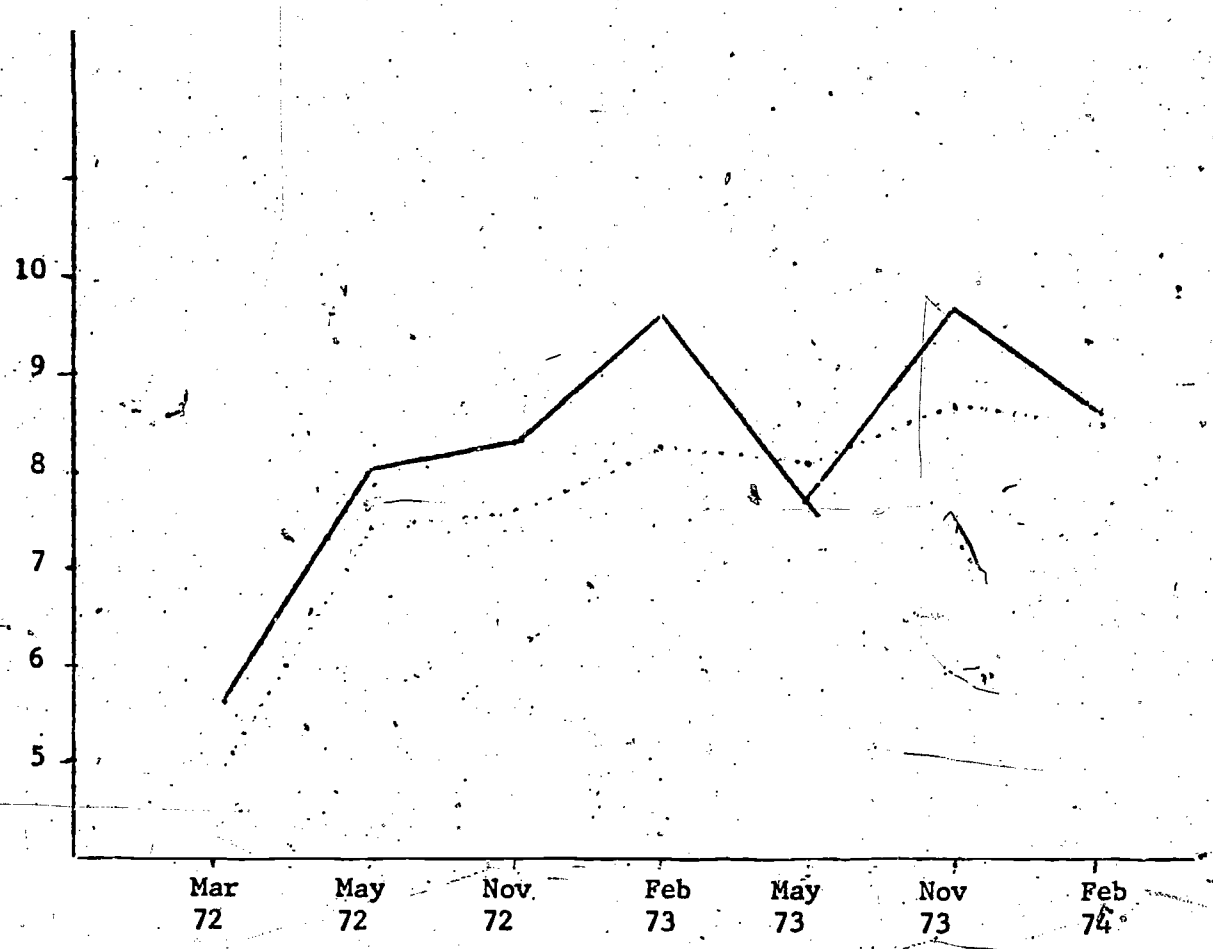


Figure 17

P.P.V.T. I.Q. Scale Score

—— Experimental
..... Control

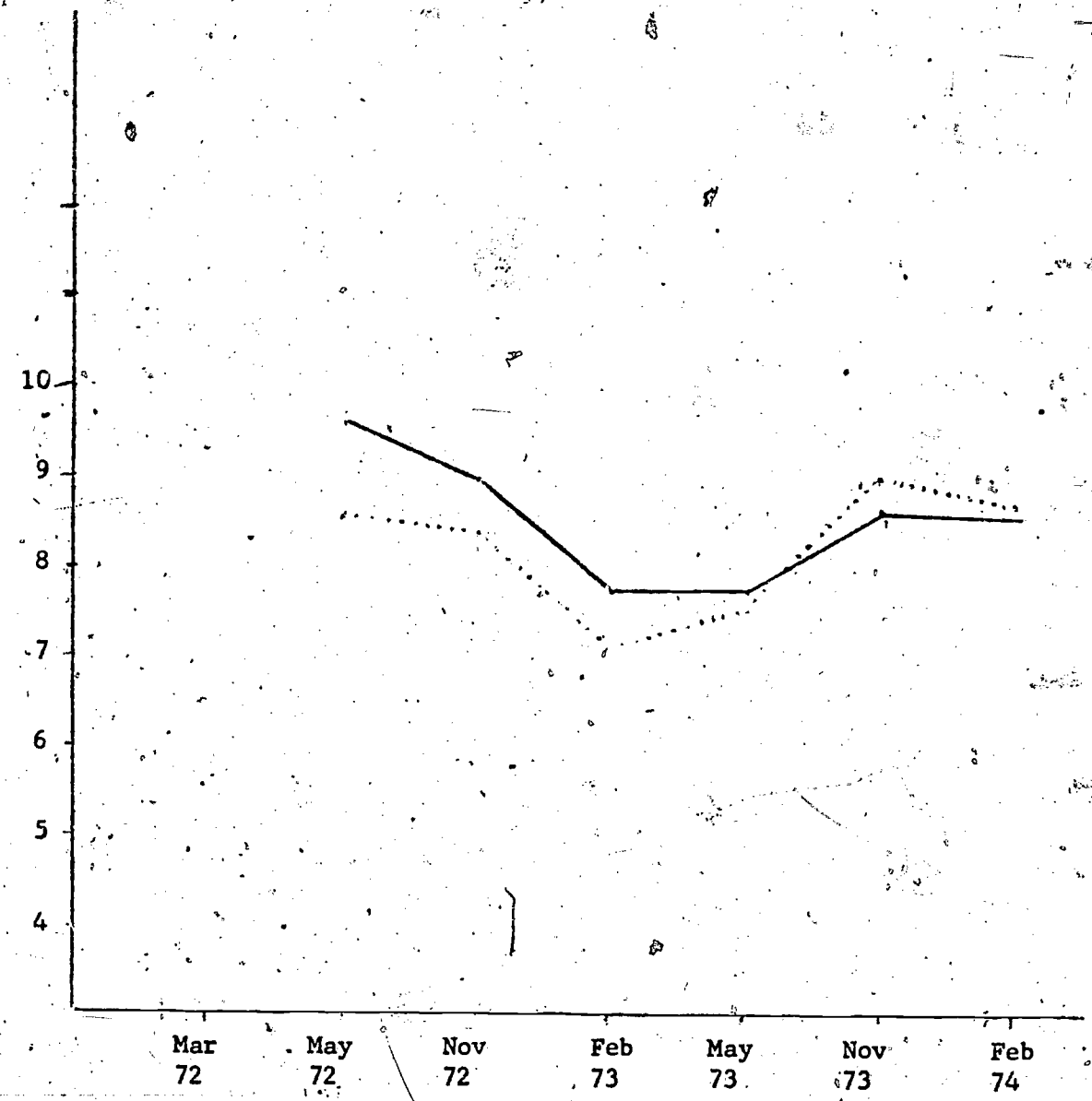


Figure 18

Mean Verbal

— Experimental
····· Control

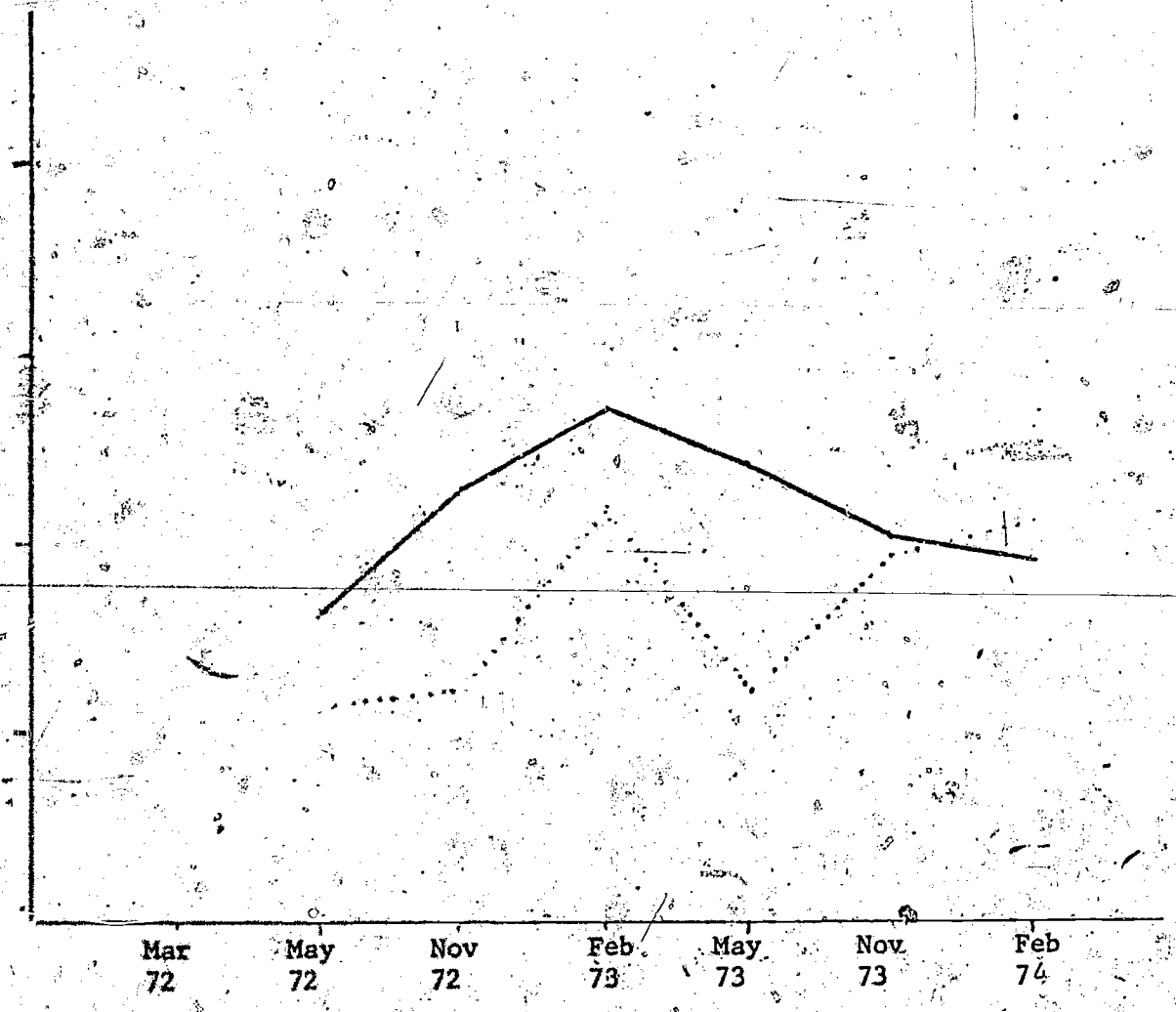


Figure 19

Mean Performance

—— Experimental
···· Control

Appendix A

List of Significant Positive and/or Negative Results

Part I. Comparison of Experimental and Control Groups

Time	Variable	Exp. $\bar{X}$	Cont. $\bar{X}$	prob.
Prior to kindergarten	Structuring Task prop. structuring	.61	.11	.03
During kindergarten	Pre-forced-choice form choices	2.47	.85	.02
	PPVT MA	67.20	59.40	.04
	Box Maze	54.40	24.50	.05
	WISC Block Design	11.60	9.30	.01
	WISC Performance	11.40	10.10	.04
	PPVT vs. Block Des.	-3.95	-1.21	.04
Following kindergarten	Puzzles: prop. of smiling to success	.47	.76	.02
	Post-forced-choice form choices	9.30	6.30	.04

Part II: Developmental Performance on Effectance Measures

Variable	Time	Group	Group X Time
Curiosity	$<.001$	ns	ns
Variation Seeking	$<.01$	$<.001$	ns
Level of Aspiration	$<.01$	ns	ns
Structuring Tendency	ns	ns	ns
Smiling to PPVT	$<.01$	ns	$<.01$
Reflectivity	$<.001$	$<.001$	ns
Form Preference	$<.001$	$<.001$	ns
PPVT vs. Verbal	$<.001$	ns	ns
Performance vs. Verbal	$<.001$	$<.001$	ns

Appendix B

List of Publications

At this date there are not yet any papers or publications which have emanated from this project. The data gathering phase of the study terminated 5 months ago and the scoring processes were completed 2 months ago. The present report prepresents findings from analyses just completed.

Appendix C

Estimates of Costs

The total budget for the two-year project was $25,467. The project required approximately half-time involvement from the Principal Investigator for two years and approximately half-time involvement from the Director of Evaluation and Research for two years, thus resulting in an estimate of approximately two professional man-years on the project.