THE RELATIONSHIP OF PARTICIPATION IN HEAD START AND KINDERGARTEN READINESS

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Date

ABSTRACT OF APPLIED PROJECT

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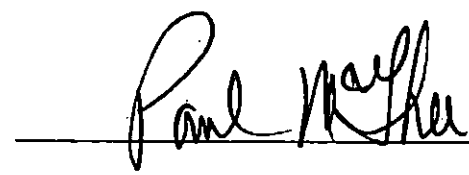
Morehead State University, 1990

Director of Thesis: 

Those who oppose preschool education programs believe that the home, not the school, is the most desirable learning environment for young children. Supporters of the programs argue that a child will be more successful in school if he or she has attended a preschool education program. Furthermore, supporters are of the opinion that a child with preschool educational experience is less likely to be retained or placed in a special education class.

The purpose of this study was to determine if there was a relationship between participation in early education programs and higher achievement in

kindergarten. The treatment for the experimental group in this study was the Community Action Head Start Program on Georgetown Street in Lexington, Kentucky. Subjects were kindergarten students at the Booker T. Washington Elementary School near the Head Start Center. Booker T. Washington is an inner-city elementary school with three hundred fifty-eight students.

For this study eighty subjects were randomly selected from a total of one hundred thirty-six kindergarten students enrolled during the 1987-88 and the 1988-89 school years. Subjects were assigned to two groups which were comprised of forty subjects each. The group referred to as the control group had not attended Head Start. The group referred to as the experimental group had attended the Head Start Program.

The two groups were measured for readiness skills at the beginning of kindergarten with the Ready Steps Language Survey. Both groups were instructed by the same teacher using the same materials, techniques and kindergarten experiences. Readiness skills for both groups were measured again at the end of kindergarten with the Metropolitan Readiness Test. Testing data used in this study was compared and evaluated.

Procedures of the study involved application of the t-test. A two-tailed test at the probability level of .05 was used to determine if test results of the two groups were significantly different. The t-test scores exceed the significance level for a two-tailed test and indicate that measurable differences did occur.

From the findings, it was concluded that participation in Head Start had significantly improved learning readiness prior to and throughout kindergarten. This research study lends support to those who contend that children with pre-school education have a higher academic achievement.

This study was designed to measure only the effect of pre-school experiences on kindergarten achievement. A follow-up analysis of the academic achievement of these subjects should be conducted at the end of their elementary school program. This data could be useful to determine if there was a significant carry over value from the Head Start program that has not been tested or measured in this study.

Accepted by: _____,Chairman

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I. INTRODUCTION

Statement of Problem

There is much talk these days, stimulated partly by accident and partly by design, that a young child cannot normally be fulfilled and optimally developed unless he goes to a good preschool. It is commonly inferred that a parent who does not give his child such an experience is depriving him (Moore, 1973).

Those who oppose preschool education programs believe that the home, not the school, is the most desirable learning environment for young children.

Supporters of the programs say even the poorest child will be more successful in school if he attends a high quality early education program (Lazar, 1981). Furthermore, supporters of the programs have no doubt that children with early education experiences are far less likely to be retained or assigned to special education classes. The difference in assignment to special education held up even after controlling for pre-and post intervention, IQ, and for a variety of background and family variables.

The following study will investigate the question: Will the children from the Community Action Head Start

Program score significantly higher on reading readiness tests at the end of their kindergarten year at Booker T. Washington Elementary School than children who did not participate in Head Start?

Hypothesis

There is no significant difference in the level of reading readiness as measured by the Metropolitan Readiness Test at the end of kindergarten of children at Booker T. Washington who had Head Start classroom experiences and those who did not attend Head Start.

RELATED LITERATURE

Preschool Education

During the 1980's, a great deal of public attention was focused on the quality of our nation's educational system. Early childhood education programs for four and five-year-old children became the focus of controversy.

Various issues were debated, including length of the program day for four and five-year olds, the effect of various forms of public and private sponsorship, and the nature of the curriculum. Morado (1986) credits interest in these issues to well-publicized research (Lazar and Darlington, 1982) documenting the long-term effects of preschool programs.

It is commonly inferred that a young child cannot normally be fulfilled and optimally developed unless he goes to a good preschool, and a parent who does not give his child a preschool education is depriving him. Those who oppose early education programs, however, believe the home, not the school, is the most desirable environment for young children.

Furthermore, reviews by the Hewitt Research Foundation of more than 8,000 studies have failed

to turn up any replicable research suggesting that normal children should be schooled before age 8 (Parsons, 1985).

Moore (1979) concluded that preschool care should be provided only when parents are physically, emotionally or financially unable to care for their children. Assuming that early education schooling is the most advanced of educational programs, with optimal freedom for children, Moore's research overwhelmingly points to the home, not the school, as the desirable environment for most young children. Moore further emphasized that it is undesirable to place children younger than eight in programs of cognitive emphasis that require consistent reasoning of which they are not capable.

While research stresses the rapid early growth of the child's intellect, it does not support the so-called stimulation of children in general. Dr. Moore compared the early stimulation theory to "rushing a thoroughbred colt onto the track as soon as he can run, in order to make greater use of his heritage of speed. Or like forcing open a rosebud, beautiful as its potential and perfect in its immaturity, but not yet ready to fully bloom. No matter how

delicately you open it, you end up with a damaged rose."

Many mothers are pressuring their preschool children to learn numbers, letters, shapes, and so on. Unfortunately, this parental concern for children's intellectual development often seems greater than their concern for children's feelings, interests, and attitudes. What many parents fail to understand is that attempting to force young children to learn specific content may produce an aversive attitude toward academic learning in general. This attitude of distaste may have such serious long-range effects on young children's academic achievement that it completely outweighs the advantages of being familiar with letters, forms, and numbers (Elkind, 1979).

This example from Elkind illustrates one of several common misunderstandings about the thinking and learning of young children. Because young children are often so capable linguistically, Elkind concludes that adults often overestimate their capacity to think. The young child is, however, not capable of mental activity or thinking in the same way as an adult. He learns through engaging in real actions involving tangible objects, such as blocks or dolls.

Therefore, however convenient it may be for grownups to think that children learn while sitting still, what they learn in this way is likely to have little lasting value. In contrast, what children acquire through active manipulation of their environment is the ability to think.

Elkind noted another widespread misunderstanding about young children is that acceleration is preferable to elaboration. Many parents, for example, spend a great deal of time trying to teach their young children to read or do mathematics. These parents seem to believe that if children have a head start in these special skills they will have a head start generally. The opposite is more likely to be true.

Dr. Elkind found that a child who elaborates the skills that he does have, such as the ability to arrange a wide range of materials according to size (blocks, sticks, dolls, dogs, and so on), is likely to be better prepared for future learning than a child who has learned a great deal in a short time but who has not had the chance to assimilate and practice what he has learned.

Parents who try to teach their young children

special skills and content are, in effect, teaching a cram course, and the results may be as short-lived for the preschooler as for the college student who crams.

Further concern for curriculum issues was expressed by The National Association for the Education of Young Children due to increasingly wide-spread demands to use inappropriate teaching techniques for young children, over-emphasis on achievement of narrowly defined academic skills, and increased reliance on psychometric tests to determine admission and retention in programs. These trends are primarily the result of misconceptions about how young children learn (Elkind, 1986).

In many cases, Elkind found that concerned adults who want children to succeed would apply adult educational standards to the curriculum for young children, and pressure early childhood programs to demonstrate that children are "really learning."

Many programs respond by emphasizing academic skill development with paper-and-pencil activities that are developmentally inappropriate for young children. Elkind suggests that we are fostering "burnout" by rushing youngsters into school too early. This is one of the main issues for those who oppose early

education programs.

Hammond (1986) points out that one-third of all chronologically 5-year-olds are "not ready" for school. Nevertheless, Morado (1986) found that one third of the states now provide state education funds for four year old children.

Dr. Elkind (1986) noted that another common misunderstanding about the learning of young children is the belief that parents and teachers can raise children's IQ. While IQ is affected by environment, he notes that most middle-class children have probably grown intellectually about as rapidly as their endowment permits. Further enrichment is not likely to have marked effects upon their intellectual ability, although it may affect how they make use of this ability.

Children who have been intellectually deprived can, however, make significant gains in intellectual performance as a consequence of intellectual enrichment. Dr. Elkins found that many problems in child rearing and education could be avoided if concern for a child's achievement as a student were balanced by an equally strong concern for his feelings of self-worth as a person.

Reading and Writing

Children today are also being encouraged to write at a much younger age than ever before since research shows that children's early print experiences contribute to their reading readiness (Gordon and Anderson, 1986). Both Montessori and Fernald have also pointed out the importance of writing and printing letters for later reading.

Researchers agree that children should be excited about writing and reading. They also need to be encouraged to work problems out for themselves. Children should develop a proud, risk-taking, "I can do it" attitude toward writing and reading. As they grow closer to entering the world of conventional literacy, children need to be encouraged to follow their own lead (Marzollo and Sulzby, 1988).

Nearly all nursery schools and kindergartens today emphasize the idea of self-help and the development of independence. In most schools children are encouraged to use learning materials in as many ways as their creative mind can suggest. Aldridge (1989)

Aldridge also advised educators to encourage independence to build self esteem, one of the

strongest motives for successful behavior, which has a positive effect on academic achievement.

Academic Achievement

Many complications, including the development of a poor self concept, have been attributed to early failure in school. Once a child falls behind in our lock-step system of public education, he continues to stay behind and becomes a potential dropout. The problem is further compounded for the socially/educationally deprived child who is behind before he begins public school because he lacks discrimination and response skills collectively referred to as "reading readiness" (Vincent, 1976).

Shepard (1988) stressed that academic demands in kindergarten and first grade are considerably higher today than twenty years ago. For example, formal reading instruction is provided in a growing number of kindergartens, and 85% of elementary principals say that academic achievement in kindergarten has high to medium priority in their school (Educational Research, 1986).

The basic point of a study by Osterlind (1981) was to determine the sustaining effects of preschool programs. Kindergarten children were studied, comparing

pupils previously attending preschool with those who had no preschool experiences. An important finding was the significant relationship between preschool experiences and reading achievement or reading readiness. Additionally, higher achievement was sustained on the Metropolitan Readiness Tests throughout kindergarten and elementary school.

Head Start

The most comprehensive preschool program is Head Start, serving three hundred sixty thousand children from disadvantaged homes (Glazer, 1985).

The primary goal of Head Start was to provide compensatory education for low-income and ethnic minority preschool children whose projected rate of failure in our middle-class schools was alarmingly high due to inadequate school readiness, insufficient vocabulary and concept development, lack of exposure to books and reading, and poor motivation to learn in school (Purkey, 1970). According to Goodenough (1965) some culturally disadvantaged Head Starters entered the program with a vocabulary of less than one hundred words as compared to an average five year old vocabulary of two thousand one hundred twenty-seven words.

As an educational intervention, Head Start was a popular program that proved to be a viable concept. Moore (1979) points out that Head Start will probably never solve the massive problems of debilitating poverty or social isolation, but it can help prepare young children for school.

Glazer (1985) reported that a longitudinal study which followed the progress of one hundred twenty three Head Start "graduates" for sixteen years was able to show marked differences in academic and work achievement by age nineteen between those who had the advantage of the high quality education from age three compared to a control group of their peers (Clement et.al., 1984). The authors did observe that while early intervention offered a basis on which to improve opportunities for disadvantaged children, program quality was a critical variable to their long-range success as adults.

Bereiter (1976) also conducted a study based on the assumption that a child who achieves well on an intelligence test or a more specific academic test has been taught the skills being tested. In his study, subjects were four years old by December 1, in keeping with public school's entrance policies, and this was

their first preschool experience. Subjects received one year of traditional preschool education. The experimental group achieved significantly greater gains on the Stanford Binet IQ test than their peers who did not participate in a preschool program. The experimental group had an IQ gain of 17.14 after one year of preschool.

A similar discovery by Lazar (1981) was that children who attended early education programs surpassed their peers on Stanford Binet IQ tests for up to three years after the preschool programs ended. At the fourth grade level these children also had increased scores on mathematics and reading achievemment tests. Approximately ten to fifteen years after the program ended, preschool participants maintained higher IQ scores. In his study, Lazar found that early education programs reduced the number of children assigned to special education classes and also reduced the number of children retained.

Longitudinal studies of the Perry Preschool Project showed that preshchool children rated significantly higher on cognitive ability, motivation, classroom behavior, and social relations. Preschool students scored an average of twelve points higher

on the Stanford-Binet test. Preschool students, who were interviewed at age fifteen, valued education more than their non-preschool peers. In 1985, a long-range study of the Perry Preschool Project provided current data to supplement what researchers had found a decade ago (Lewis, 1986).

Schweinhart and Weikart (1988) stated that the Perry Preschool Study demonstrates the potential benefits of early childhood development programs for poor children.

Furthermore, an economic cost-benefit analysis of the Perry Preschool Program and its long-term effects revealed that such a program can be an excellent investment for taxpayers, returning six dollars for every dollar invested in a one-year program and three dollars for every dollar invested in a two-year program, based on constant dollars discounted at 3% annually (Schweinhart and Weikart, 1988).

Twenty one of the fifty one states in the United States have increased spending for educational prekindergarten programs, since 1980, and five states have even begun making contributions to state Head Start programs (Kagan, 1989).

Parent Participation

Brown (1985) agreed with a study by Hess that programs combining home visits and parent participation with preschool classes are the most effective. If parents will continue the Head Start center work at home, the effect will be greatly enhanced. Secondly, there should be continuity between the Head Start program, parent involvement, subsequent kindergarten and elementary schooling.

Recommendations

Murphy (1978) recommended that longitudinal studies be conducted by parents and staff of early education programs. He suggested that the data collected would not only be useful to prove the success of early intervention programs, but could also be used to justify continuing or even expanding them. Over the years, Head Start funding has been provided as a result of longitudinal studies.

Recommendations from previous research also provide the rationale for this study to determine if there is a relationship between participation in Head Start and achievement of kindergarten students at Booker T. Washington. This study may be useful to parents and staff of the local Head Start Program.

II. METHOD

Sample Selection

The eighty students involved in this study were selected from a total population of one hundred thirty-six kindergarten students enrolled at the Booker T. Washington Elementary School in Lexington, Kentucky during the 1987-88 and 1988-89 school years. Booker T. Washington is located near the Community Action Head Start Center where forty of the eighty students, the experimental group, had attended the Head Start Pre-School Program prior to entry into kindergarten. Assignments to the appropriate group were determined on the basis of information regarding attendance in the Head Start Preschool Program.

Characteristics of total student population did not include stratified sampling such as IQ or sex. No biases were expected as a result of this random procedure, and all participants remained anonymous.

Design

In this casual-comparative study eighty subjects from a kindergarten population of one hundred thirty-six students were selected to test the null hypothesis. Forty subjects were randomly selected from the

sixty-four students who had attended the Community Action Head Start Center to comprise the experimental group. Forty subjects were randomly selected from the remaining seventy-two students who had not attended Head Start to comprise the control group.

Both groups were tested for reading readiness at the beginning of the kindergarten year, and both groups were tested at the end of the kindergarten year.

Reading Readiness of kindergarten students was the variable tested in this study.

Procedure

Subjects for this study were randomly selected by selecting every other student in alphabetical order. Random selection is usually accomplished with a table of random numbers. However, this type of selection was deemed acceptable with a limited number of subjects in the control and experimental groups. The forty students who had not attended Head Start were identified as the control group. The forty students who had attended Head Start were identified as the experimental group.

The two groups were tested for reading readiness

in September of their kindergarten year. The Ready Steps Language Survey was used to measure readiness upon entrance into the kindergarten program. Scores are reported on Tables I and II.

The two groups were instructed by the same teacher using identical materials, and normal kindergarten experiences. Both groups had the same kindergarten aide, and were taught in the same classroom.

Both groups were tested for first grade reading readiness at the end of the kindergarten year. The instrument used to measure their achievement was the Metropolitan Readiness Test. Scores are represented on Tables III and IV. Results of these tests are also reported on Normal Curve Distribution Tables V-VIII. Results used to determine if there is a significant difference in the means of the two groups is represented on t-Tables IX-XII in Appendix B.

Instrumentation

Most behaviors occur without systematic observation and evaluation. A test is an exception. A test is a structured situation in which standarized materials are presented to an individual in order to evaluate that individual's responses. The assumption is that a

student's performance can be accurately inferred from responses on the test (Salvia and Ysseldyke, 1988).

Because past research has shown that reading readiness is important for success in school, a language survey was chosen for this study. The instrument used to assess reading readiness at the beginning of the kindergarten year was the Ready Steps Language Survey. This is also the instrument used to assess readiness for kindergarten at Booker T. Washington. Tables I and II indicate scores that were obtained on the Ready Steps Language Survey.

Since Osterlind's study (1981) found a significant relationship between preschool experiences and reading achievement sustained on the Metropolitan Readiness Test, that was the test chosen for this study. The Metropolitan Readiness Test was also the instrument used at Booker T. Washington to assess readiness for the first grade.

According to The Seventh Mental Measurement Yearbook, the Metropolitan Readiness Test is designed to measure readiness for first grade instruction and to provide teachers with information helpful in classifying pupils. Emphasis is placed on pupil performance on the

total battery.

The yearbook review stated that test authors do a convincing job of describing the validity of the test by discussing the relevance of the content, by demonstrating the test's relationship with other measures of school readiness, and by relating success of the test with success in later achievement.

Reliability data, reported for first grade and kindergarten children, was computed using both split-half and alternate-form techniques. Reliabilities for the total test are generally above .90 for pupils tested at the end of kindergarten or early in the first grade. The yearbook review further noted that the test itself appears to be well constructed and to measure abilities commonly believed to be associated with success in early school learning.

Tables III and IV indicate scores obtained on the Metropolitan Readiness Tests. The following graph shows the difference of the mean for the control group and the experimental group on both tests.

TABLE I

READY STEPS LANGUAGE SURVEY

CONTROL GROUP

Student Number	Achievement Score 94 Possible	Student Number	Achievement Score 94 Possible
1	64	21	75
2	77	22	64
3	76	23	68
4	78	24	83
5	62	25	84
6	62	26	77
7	82	27	55
8	84	28	84
9	92	29	68
10	83	30	53
11	38	31	79
12	89	32	67
13	61	33	75
14	81	34	86
15	89	35	78
16	79	36	89
17	77	37	80
18	79	38	89
19	75	39	73
20	75	40	72
	1503		1499

Total Students 40

Total Score 3002

S.D. 11.13 = 11

Range 64 - 86

$\bar{X}$ 75.05 = 75

TABLE II

READY STEPS LANGUAGE SURVEY

EXPERIMENTAL GROUP

Student Number	Achievement Score 94 Possible	Student Number	Achievement Score 94 Possible
1	91	21	79
2	82	22	68
3	87	23	82
4	83	24	64
5	89	25	80
6	89	26	77
7	78	27	74
8	62	28	68
9	93	29	68
10	78	30	85
11	82	31	85
12	69	32	67
13	78	33	80
14	81	34	70
15	91	35	88
16	82	36	71
17	67	37	69
18	68	38	75
19	84	39	69
20	76	40	82
	1610		1501

Total Students	40	Total Score	3111
S.D.	8		
Range	70 - 86	$\bar{X}$	78

TABLE III

METROPOLITAN READINESS TEST

CONTROL GROUP

Student Number	Achievement Score 73 Possible	Student Number	Achievement Score 73 Possible
1	66	21	46
2	54	22	50
3	58	23	52
4	58	24	60
5	45	25	60
6	62	26	49
7	53	27	51
8	31	28	57
9	70	29	43
10	65	30	27
11	66	31	54
12	64	32	59
13	52	33	38
14	35	34	69
15	41	35	64
16	69	36	41
17	69	37	51
18	72	38	36
19	54	39	70
20	69	40	49
	1153		1026

Total Students 40

Total Score 2179

S.D. 11.66 = 12

Range 42 - 66

$\bar{X}$ 54.48 = 54

TABLE IV

METROPOLITAN READINESS TEST

EXPERIMENTAL GROUP

Student Number	Achievement Score 73 Possible	Student Number	Achievement Score 73 Possible
1	73	21	64
2	70	22	59
3	51	23	58
4	62	24	55
5	71	25	50
6	71	26	56
7	69	27	55
8	62	28	36
9	72	29	38
10	66	30	42
11	69	31	59
12	57	32	41
13	52	33	51
14	72	34	65
15	61	35	49
16	71	36	54
17	56	37	57
18	49	38	54
19	58	39	65
20	65	40	44
	1277		1052

Total Students 40

Total Score 2329

S.D. 9.80 = 10

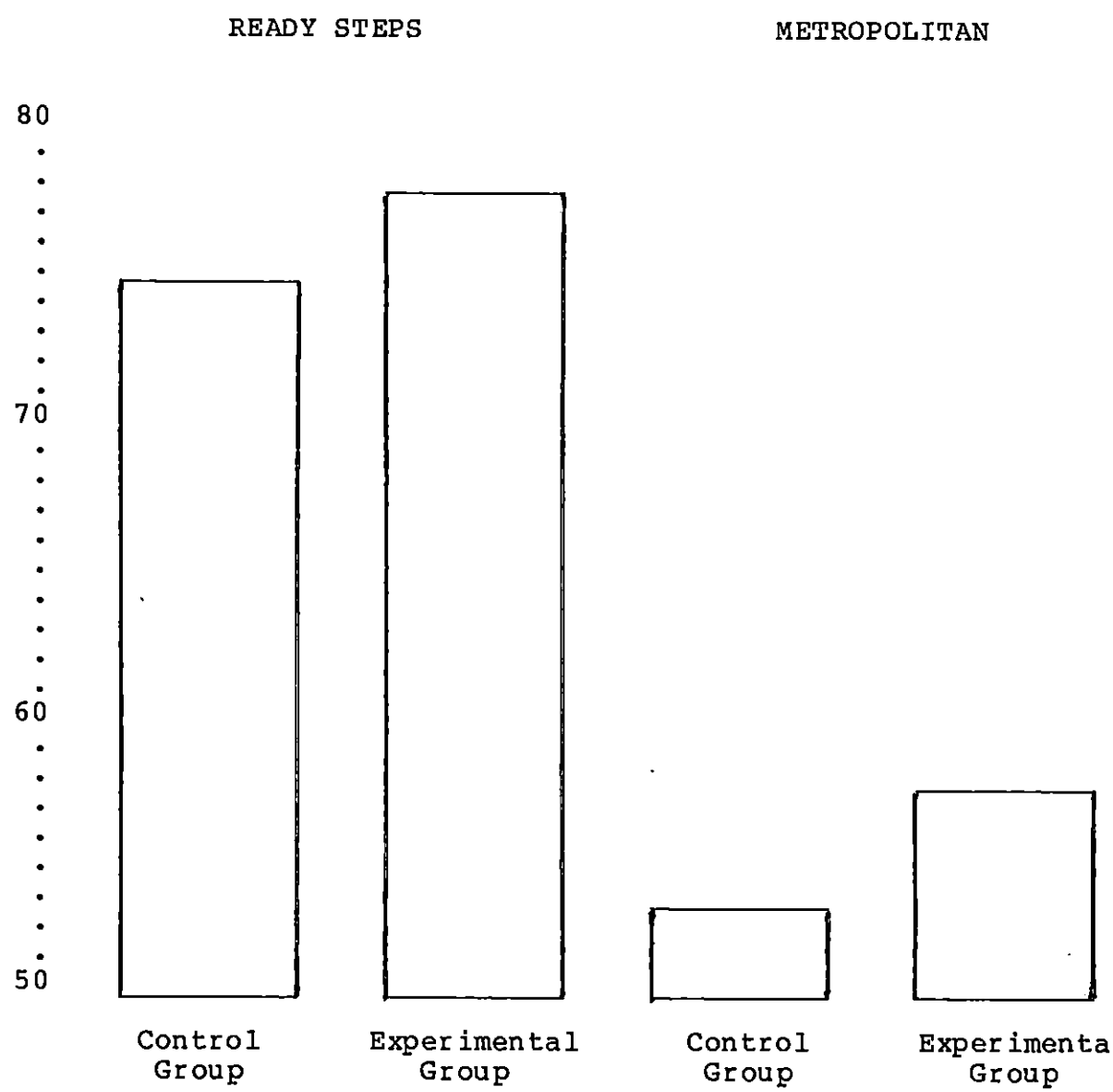
Range 48 - 68

$\bar{X}$ 58.23 = 58

Diagram 1

READY STEPS LANGUAGE SURVEY
and
METROPOLITAN READINESS TEST

MEAN GRAPH



III. DATA ANALYSIS

A raw score that samples reading readiness is difficult to interpret. However, derived scores put raw scores into comparable units. Therefore, a test performance is typically interpreted by comparing the performance or results of the test to the performance of a group of subjects. Derived scores are useful when scores earned by several individuals are comparerd (Salvia and Yssldyke, 1988). For this reason, several tables are included in this report.

TABLE V

READY STEPS LANGUAGE SURVEY

DISTRIBUTION OF SCORES for CONTROL GROUP

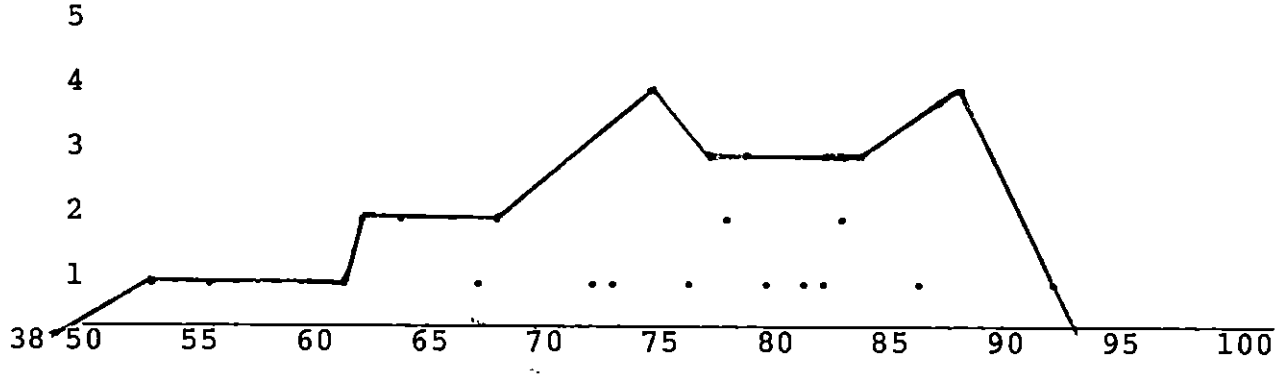


TABLE VI

READY STEPS LANGUAGE SURVEY

DISTRIBUTION OF SCORES for EXPERIMENTAL GROUP

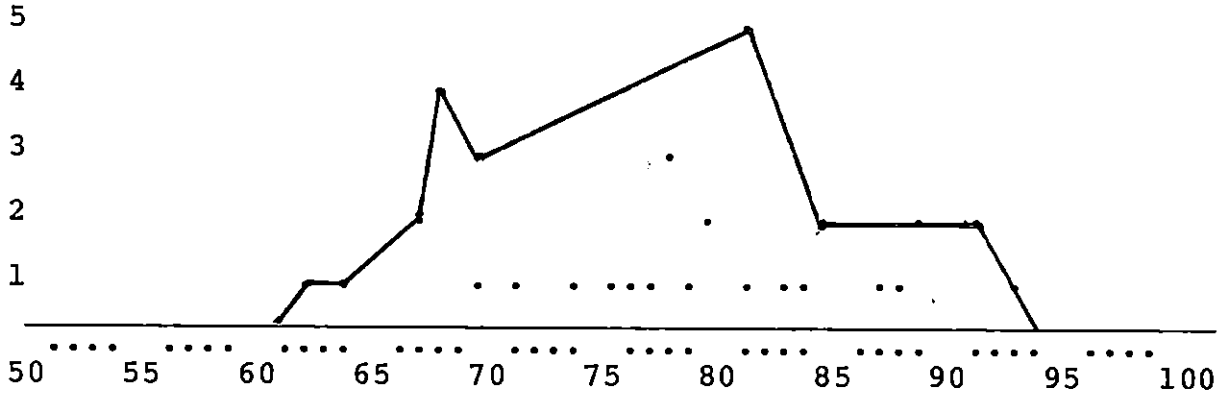


TABLE VII

METROPOLITAN READINESS TEST

DISTRIBUTION OF SCORES for CONTROL GROUP

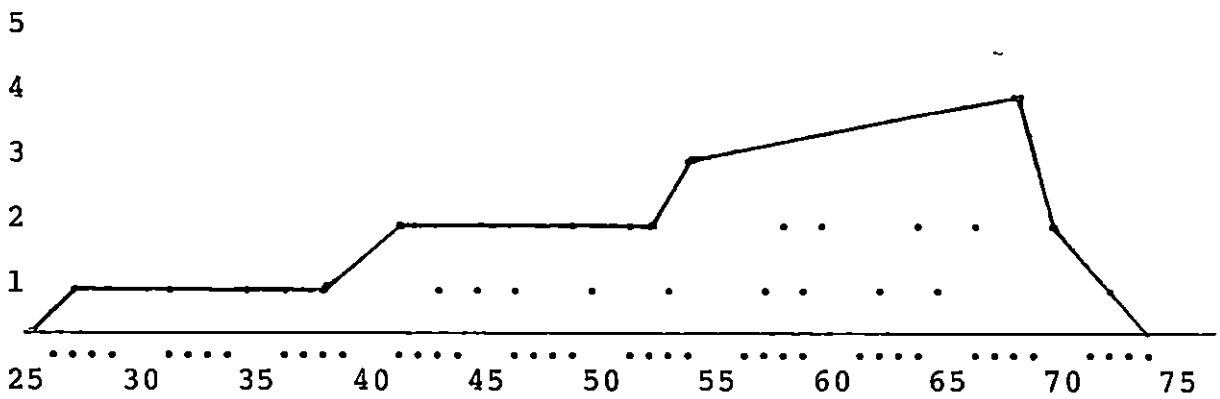
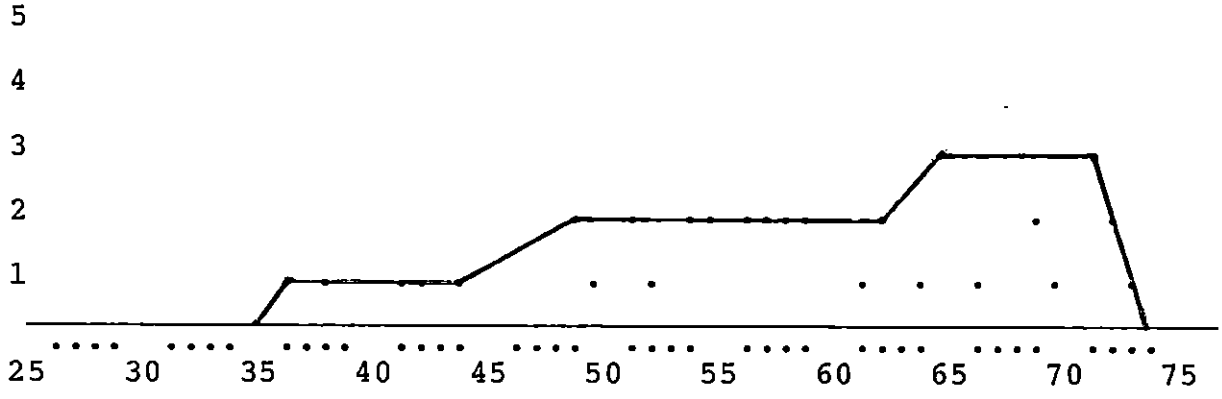


TABLE VIII

METROPOLITAN READINESS TEST

DISTRIBUTION OF SCORES for EXPERIMENTAL GROUP



The most commonly used descriptive statistics in a causal-comparative study are the mean, which indicates the average performance of a group on a measure of some variable, and the standard deviation, which indicates the spread of a set of scores; that is, whether the scores are relatively close together and clustered around the mean or spread out covering a wide range of scores (Gay, 1987). Data from the previous tables indicates that there is a relationship between the mean of the two groups.

The most commonly used inferential statistics are measured with the t-test. The t-test is used to determine if there is a significant difference between the mean of two groups (Tuckman, 1972). The two-tailed t-test formula used in this study was:

$$t = \frac{\bar{X}_1 - \bar{X}_2}{\sqrt{\left(\frac{SS_1 + SS_2}{N_1 + N_2 - 2}\right)\left(\frac{1}{N_1} + \frac{1}{N_2}\right)}}$$

T-test results of the Ready Steps Language Survey and the Metropolitan Readiness Tests used for this study are reported in Appendix B.

IV. MAJOR FINDINGS

There was a significant difference between the control group and the experimental group on the Ready Steps Language Survey at the beginning of the kindergarten year; there was also a significant difference between the control group and the experimental group on the Metropolitan Readiness Test at the end of the kindergarten year.

The degree of significance not only rejects the hypothesis for this study; it also indicates that carry-over effects from Head Start continued through the year.

Previous studies have established that early education programs help prepare young children for school. Their lasting effects significantly reduce the number of children retained in grade or assigned to special education classes. Savings from reduced need for remedial classes could be diverted to pay the cost for early education programs.

Conclusions

In summary, the data supports the theory that attendance in a pre-school program such as Head Start is important for achievement in kindergarten. Statistical results derived from treatment of the data exceeded the critical value of t at the .05 level. This significant difference between the means of the groups is a real difference rather than a chance difference and also supports the conclusion that there is a significant difference in children who attend Head Start and those who do not. Therefore, the hypothesis of this study must be rejected.

Recommendations

The results and conclusions which were drawn from this study appear to warrant further study of these subjects. Longitudinal studies should be made to determine whether there are measurable carry-over benefits from Head Start that may emerge in a higher grade level of elementary school. Furthermore, there may have been carry-over values from Head Start that were not measured in this study, because this study was not designed to measure all values conceivably inherent with Head Start Programs.

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VII. APPENDIX A

DEFINITION OF TERMS

Control Group. A group of subjects whose selection and experiences are identical to the experimental group except that they do not receive the treatment.

Correlation. A measure of the extent to which two sets of scores are related

Experimental Group. A group of subjects whose selection and experiences are identical to the control group except that they receive the treatment.

Head Start. The opportunity given to disadvantaged pre-school children and their families to participate in a comprehensive child development program. This program is designed to give them a "head start" in warding off the damaging effects of poverty, whether it be poverty of health, food, human relationships, material necessities, or opportunities for rich learning experiences.

Hypothesis. A tentative, reasonable, testable explanation for the occurrence of certain behaviors, phenomena or events.

Intrafamilial. Within the family

Level of Significance. When the obtained score reflects a true and not a chance relationship

Normal Curve. When the scores are normally distributed they form a normal, or bell-shaped curve.

Mean or $\bar{X}$. The arithmetic average of a set of scores

Probability Level. A level of confidence that the sample is distributed in the same way as the population

Random selection. Selection of a sample in such a way that all individuals in the defined population have an equal chance of being selected.

t-test. A statistical test that allows you to compare two means to determine the probability that the difference between the means is a real difference rather than a chance difference.

Treatment. Subjection to some agent or action

Two-tailed Test. A test of significance that allows for the possibility that a difference may occur in either direction; either group mean may be higher than the other (A > B or B > A).

VIII. APPENDIX B

TABLE IX

t-test

READY STEPS LANGUAGE SURVEY

t-test of Ready Steps Language Survey Scores

Group	df	Mean	t-score	Significant Value
Control	78	75		
			2.00 *	1.99
Experimental	78	78		

* Significant at the .05 level

TABLE X

t-test

METROPOLITAN READINESS TEST

t-test of Metropolitan Readiness Test Scores

Group	df	Mean	t-score	Significant Value
Control	78	54	2.35 *	1.99
Experimental	78	58		

* Significant at the .05 level

Diagram 2

READY STEPS LANGUAGE SURVEY

t-test

$$t = \frac{\bar{X}_1 - \bar{X}_2}{\sqrt{\left(\frac{SS_1 + SS_2}{N_1 + N_2 - 2}\right)\left(\frac{1}{N_1} + \frac{1}{N_2}\right)}}$$

$$t = \frac{78-75}{\sqrt{\left(\frac{2721 + 4958}{40 + 40 - 2}\right)\left(\frac{1}{40} + \frac{1}{40}\right)}} = \frac{\bar{3}}{\sqrt{\left(\frac{7679}{78}\right)\left(\frac{2}{80}\right)}}$$

$$\frac{\bar{3}}{\sqrt{(98.45)(0.025)}} = \frac{\bar{3}}{\sqrt{(2.46)}} = \frac{\bar{3}}{\sqrt{(1.5)}} = 2.00$$

t = 2.00

a level of probability = .05, df = 78

The value 1.99 is the t value required for rejection of the null hypothesis with a = .05 and df = 78.

Diagram 3

METROPOLITAN READINESS TEST

t-test

$$t = \frac{\bar{X}_1 - \bar{X}_2}{\sqrt{\left(\frac{SS_1 + SS_2}{N_1 + N_2 - 2}\right)\left(\frac{1}{N_1} + \frac{1}{N_2}\right)}}$$

$$t = \frac{58-54}{\sqrt{\left(\frac{3843 + 5434}{40 + 40 - 2}\right)\left(\frac{1}{40} + \frac{1}{40}\right)}} = \frac{\bar{4}}{\sqrt{\left(\frac{9277}{78}\right)\left(\frac{2}{80}\right)}}$$

$$\frac{\bar{4}}{\sqrt{(118.9)(0.025)}} = \frac{\bar{4}}{\sqrt{(2.97)}} = \frac{\bar{4}}{\sqrt{(1.7)}} = 2.35$$

t = 2.35

a level of probability = .05, df = 78

The value 1.99 is the t value required for rejection of the null hypothesis with a = .05 and df = 78.