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Family Size, Intelligence, and Patterns of Achievement in Preschool Children

H. Jane Reppas

FAMILY SIZE, INTELLIGENCE, AND PATTERNS OF ACHIEVEMENT IN PRESCHOOL CHILDREN

An Abstract of

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ABSTRACT

The purpose of this study was to investigate the relationship of membership in a large or small family to the patterns of achievement as revealed by the results of the subtests of the Iowa Test of Preschool Development (ITPD). Of interest also was the study of the relationship of membership in subgroups based on both race and family size to patterns of achievement.

The subjects of the study were eighty black and white preschool children. There were twenty children in each subgroup (small black family, large black family, small white family, and large white family). The subgroups were similar in respect to age and sex ratio.

The ITPD was used to assess patterns of achievement. This test includes the subtests of Language, Visual-motor, Memory, and Concepts.

A two-dimensional analysis of variance was used to determine the relationship between family size and the means of each subtest. None of the resultant F ratios were significant, indicating that family size is not related to success on the four subtests of the ITPD.

The Duncan Multiple Range Test was calculated to ascertain the significance of the difference between the means of each pair of subgroup means. These subgroups were based on both family size and race. Comparisons between all possible combinations of subgroups allowed for the investigation of the differences between subgroup means based on family size within race, race within family size, and family size between races.

Family size within race was significant in one of the eight possible comparisons. The children in large white families scored significantly higher than the children in small white families on the Visual-motor subtest.

Race within family size was significant in several comparisons. On all four subtests of the ITPD, children in large white families scored significantly higher than children in large black families. The other significant difference was between the small family subgroups in which the white children scored higher than the black children on the Concepts subtest.

Family size between races was also significant in several comparisons. The small white subgroup mean was significantly higher than the large black subgroup mean on the Language, Memory, and Concepts subtests. The other significant differences were between the small black and large white subgroups in which the large white subgroup scored significantly higher than the small black subgroup on both the Visual-motor and Concepts subtests.

These results suggest that family size alone or family size within one race is not as significant in assessing patterns of achievement as is race when family size is held constant or the interaction of family size and race when both family size and race differ.

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Chapter 1

THE PROBLEM

Recently there has been much concern expressed about the rapidly increasing population in the world. A very important factor in this matter is the size of the individual family. This interest in family size is not a new phenomenon, although the reasons for the interest may have changed inasmuch as the "war on poverty" emphasizes methods of helping the poor. Presumedly, preschool education is one of the important areas in alleviating the effects of poverty. Unfortunately, many of the compensatory educational programs designed to benefit the poor, who have more than their proportionate share of large families, are not accomplishing the task for which they were designed.[1]

The failure of compensatory education may have resulted, in part, from an inadequate foundation of research. Included here is the necessity for research with very young children. Present preschool compensatory programs are usually for children of ages four and five. Children of this age, especially disadvantaged children, may be too old to gain the full benefits of compensatory education.[2]

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[1]Office of Economic Opportunity, Project Head Start, Research and Evaluation Office, Review of Research: 1965 to 1969, Office of Economic Opportunity Pamphlet, No. 6108-13 (Washington: Office of Economic Opportunity, 1969), pp. 39-40.

[2]Ralph Scott, "Head Start Before Home Start?," Merrill-Palmer Quarterly of Behavior and Development, XIII (October, 1967), 317-18.

More knowledge is needed about how young children in low socio-economic levels learn so that educational programs can be more effectively developed. The fact that this group contains many minority-group children in large families underscores the need for sharper focus in this area of research.

IMPORTANCE OF THE STUDY

Many studies have indicated the inverse relationship between family size and intelligence. Few of the investigations have been conducted recently as the inverse relationship was rather conclusively established. More recent studies are needed to ascertain if children from large families continue to score lower than children from smaller families. However, the focus of this research needs to be in the direction of achievement rather than intelligence because the relationship between family size and achievement is more likely to provide the type of information necessary for adequate educational programs for children. The relationship between family size and achievement, especially patterns of achievement, might lead to more effective academic programs.

More recent studies have indicated that people of all socio-economic levels are beginning to share more similar patterns in fertility values and practices than were shown in the past.[3] However, this is least true among low income families, especially black families.[4] If

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[3]Frederick S. Jaffe, "Family Planning and Poverty," Journal of Marriage and the Family, XXVI (November, 1964), 457.

[4]Herbert B. Birch and J. D. Gussow, Disadvantaged Children: Health, Nutrition and School Failure (New York: Harcourt, Brace and World, 1970), p. 168; see also Jaffe, p. 467.

this trend persists, there will continue to be more children in the families that are less prepared economically and in more subjective ways to carry the burden of providing for the development of their children. The large number of children from the lower socioeconomic levels will have a great impact on the ability of the schools to provide educationally for these children unless more is known about how they learn.

From an educational standpoint, knowledge about cognitive profiles would be more beneficial than global scores to those charged with providing educational programs for children. This knowledge of cognitive profiles is especially important for preschool programs if Bloom is correct in his statement that one third of the development of achievement is attained by the time a child enters school.[5] Therefore, differences become of paramount importance early in the education of children and need to be more thoroughly investigated.

Schools need to become more concerned about achievement scores than intelligence scores, for it is achievement, rather than intelligence, that is more likely to lead to success in the academic world. Most intelligence tests are highly verbal in nature and adhere, for the most part, to white middle-class values and practices. In this respect, American schools generally tend to follow the same pattern of many of the intelligence tests. In the past, emphasis on intelligence test results as predictors of academic success appeared somewhat justified. There now is a trend away from so much emphasis on intelligence testing. This trend paves the way for more reliance on achievement. Therefore,

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[5]Benjamin B. Bloom, Stability and Change in Human Characteristics (New York: John Wiley and Sons, 1964), p. 110.

children who fall outside the white, middle-class categories and are less successful on intelligence tests, may now have more emphasis placed on achievement test results and the recognition of strengths that previously went unrecognized and untutored.

Another very important reason for an emphasis on achievement rather than intelligence is based on Bloom's statement that two thirds of the development of intelligence as measured at age seventeen has taken place by the age of six.[6] When this percentage is compared to that of the development of achievement, the schools are in a position to make greater progress with children if they choose to emphasize achievement, the area which is less well predetermined by the time a child enters school.

STATEMENT OF THE PROBLEM

Research has revealed that an inverse relationship exists between family size and intelligence. This relationship is well established, but may not be nearly as important from an educational standpoint as the relationship between family size and achievement. If Bloom is correct in his statement that two thirds of the development of intelligence has been attained by age six as compared to one third of the development of achievement, achievement emerges as the area in which schools need to place more emphasis.

A more effective evaluation of the relationship between family size and achievement can be effected if subtest rather than global scores

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[6]Bloom, p. 68.

are reported. This process allows for the investigation of the possibility of different cognitive profiles that may exist for children from families of different sizes.

A study of the relationship between cognitive profiles and only family size may not be sufficient because differences may exist for children from families of different sizes as well as for different racial groups. Research has shown that blacks score lower than whites on IQ tests.[7] However, this research tells little about how cognitive profiles of black and white children may be similar or dissimilar.

Therefore, both family size and racial group membership and their interaction need to be investigated to ascertain if their impact, either separately or jointly, is related to achievement.

Another reason for investigating both family size and race in relation to achievement is that proportionately more blacks than white come from large families.[8] Therefore, the difference in proportion of black children in large families may compound the results of an investigation of achievement and only family size. For this reason, this study has included the relationship of both family size and race to achievement as well as the comparison of only family size and achievement.

DEFINITION OF TERMS

Achievement

Achievement refers to the results obtained from standardized achievement tests.

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[7]Arthur R. Jensen, "How Much Can We Boost IQ and Academic Achievement?," Harvard Educational Review, XXXIX (Winter, 1969), 81.

[8]Jensen, "How Much Can We Boost IQ?," p. 95.

Cognitive Profile

Cognitive profile refers to the pattern of strengths and weaknesses that result from tests of mental ability or achievement.

Concepts

Concepts refers to the understanding of shape, size, and color concepts.

Family Size

Family size refers to the number of living children who have been born into a family, have been adopted into it, or have entered the family by the marriage of the parents.

Intelligence

Intelligence refers to the results of standardized intelligence tests, and, therefore, is used in the same manner as IQ. The writer recognizes the limitations of this definition but prefers to limit this investigation to only measured ability.

IQ

IQ has the same meaning as intelligence in this study.

Language

Language refers to the ability to understand and use common labels for objects, as well as the ability to understand and discuss relationships and classifications.

Large Family

For purposes of this study, a family was considered "large" if it consisted of four or more children.

Memory

Memory is defined as the ability to succeed in tasks involving the repetition of words and numbers (auditory signals) and to remember the position of objects (visual signals).

Patterns of Achievement

Patterns of achievement refer to the different profiles that result from plotting the scores of the four subtests of the ITPD.

Seriation

Seriation refers to the process of arranging pictures or items in rank order according to such criteria as size and color intensity.

Small Family

For purposes of this study, a family was considered "small" if it consisted of two or fewer children.

Socioeconomic Level

Socioeconomic level refers to the socioeconomic level of the family as determined by the occupation of the head of the household which is usually the father, but is the mother if a father is not present in the home.

Visual-motor

Visual-motor refers to the ability to succeed with visual-motor activities such as seriation, copying pencil designs, and manipulation of beads and blocks.

THE HYPOTHESES

1. There is no significant difference in the mean Language scores between preschool children in large and small families.

2. There is no significant difference in the mean Language scores between preschool children in small black families and large black families.

3. There is no significant difference in the mean Language scores between preschool children in small black families and small white families.

4. There is no significant difference in the mean Language scores between preschool children in small black families and large white families.

5. There is no significant difference in the mean Language scores between preschool children in large black families and small white families.

6. There is no significant difference in the mean Language scores between preschool children in large black families and large white families.

7. There is no significant difference in the mean Language scores between preschool children in small white families and large white families.

8. There is no significant difference in the mean Visual-motor scores between preschool children in large and small families.

9. There is no significant difference in the mean Visual-motor scores between preschool children in small black families and large black families.

10. There is no significant difference in the mean Visual-motor scores between preschool children in small black families and small white families.

11. There is no significant difference in the mean Visual-motor scores between preschool children in small black families and large white families.

12. There is no significant difference in the mean Visual-motor scores between preschool children in large black families and small white families.

13. There is no significant difference in the mean Visual-motor scores between preschool children in large black families and large white families.

14. There is no significant difference in the mean Visual-motor scores between preschool children in small white families and large white families.

15. There is no significant difference in the mean Memory scores between preschool children in large and small families.

16. There is no significant difference in the mean Memory scores between preschool children in small black families and large black families.

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20. There is no significant difference in the mean Memory scores between preschool children in large black families and large white families.

21. There is no significant difference in the mean Memory scores between preschool children in small white families and large white families.

22. There is no significant difference in the mean Concepts scores between preschool children in large and small families.

23. There is no significant difference in the mean Concepts scores between preschool children in small black families and large black families.

24. There is no significant difference in the mean Concepts scores between preschool children in small black families and small white families.

25. There is no significant difference in the mean Concepts scores between preschool children in small black families and large white families.

26. There is no significant difference in the mean Concepts scores between preschool children in large black families and small white families.

27. There is no significant difference in the mean Concepts scores between preschool children in large black families and large white families.

28. There is no significant difference in the mean Concepts scores between preschool children in small white families and large white families.

LIMITATIONS

One limitation of the study was that only two and three year old children were included. The validity and reliability of test results can be affected by the very young age of children. Another limitation was that not all of the children were from the same socio-economic levels, but were grouped solely on the basis of family size and race.

ORGANIZATION OF REMAINDER OF THE THESIS

Chapter 2 presents and discusses studies which have examined the relationship between family size and intelligence, the relationship of intelligence to race, and differences in cognitive profiles of children from families of different sizes. Chapter 3 includes a discussion of the procedures used by the investigator. Included in Chapter 4 are the analyses of the data and interpretations of the findings. A summary of the study is found in Chapter 5.

Chapter 2

REVIEW OF RELATED RESEARCH

There has been considerable research conducted on the relationship between family size and intelligence. However, in recent years the emphasis in these studies has switched from size alone to birth order. In fact, Rothbart, in her review of a 1971 book about birth order, indicated that research on birth order has reached fad status in the last ten years.[1] There has been some research, but little emphasis, on cognitive profiles which may differ for children from families of different sizes. In addition, little has been done to investigate cognitive profiles as they relate to racial groups.

INTELLIGENCE AND FAMILY SIZE

An inverse relationship between intelligence and the number of children in a family was evident even during the classical ages of Greece and Rome when laws were enacted to encourage people among the higher classes to have more children. In fact, the Latin word Proletarii which was the unpropertied class meant "the beggars who have children."[2]

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[1]Mary K. Rothbart, "Between Brother and Sister," review of Brian Sutton-Smith and B. G. Rosenberg, The Sibling (New York: Holt, Rinehart and Winston, 1970), Contemporary Psychology, June, 1971, p. 369.

[2]R. A. Fisher, The Genetical Theory of Natural Selection (Oxford: Claredon Press, 1930), p. 222.

More recently, Dawson reviewed the preintelligence-test era with its indirect evidence and concluded that there was an inverse relationship between the amount of intelligence and the number of children in the family.[3] One of the earliest on the spot investigations of the effect of family size on intellectual ability was conducted by Dalton in 1847, and some of the other early studies were carried out in the United States by Haggerty and Nash, and in England by Duff and Thomson.[4] Many of these early investigations supported the view that people of lower intelligence had more children rather than that lower intelligence might have resulted from large family size, a view taken by more recent investigators.

One of the most comprehensive studies conducted in the United States was by Damrin. Her ambitious project sought to determine the effects of family size, family position, sibling sex, and sibling age upon intelligence and academic achievement as well as home, social, and emotional adjustment. The correlation of -.31 between family size and intelligence was the only reliable relationship between the variables studied when other variables were held constant.[5]

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[3]Raymond Cattell, "Effects of Human Fertility Trends Upon the Distribution of Intelligence and Culture," Intelligence: Its Nature and Nuture, Thirty-Ninth Yearbook of the National Society for the Study of Education, Part I (Bloomington, Illinois: Public School Publishing Co., 1940), p. 222.

[4]E. J. G. Bradford, "The Relation of Intelligence to Varying Birth-Rate in Different Social Grades," The British Journal of Educational Psychology, VII (November, 1937), 230.

[5]Dora Damrin, "Family Size and Sibling Age, Sex, and Position as Related to Certain Aspects of Adjustment," Journal of Social Psychology, IXXX (February, 1949), 100.

Other important American studies included those of Chapman and Wiggins, Conrad and Jones, Terman, and Willoughby and Lentz whose investigations showed an approximate correlation of -.30 between family size and intelligence.[6]

Studies conducted in the United Kingdom produced results similar to the American investigations. One of the most comprehensive of these studies was the Scottish Mental Survey in which all eleven year old Scottish children were tested in 1932 and again in 1947. The relationship between family size and intelligence was very similar in both years. In 1947, the correlation between group intelligence test scores and family size was -.28, and between individual intelligence test scores and family size it was -.32. Only slightly lower correlations were found when the father's occupations were held constant.[7]

In another Scottish study, Nisbet and Entwistle obtained evidence that supported the Scottish Mental Survey. They found that the inverse relationship between family size and intelligence existed even when social class was held constant although the relationship was not as great in the upper two social levels of their four-way classification.[8]

Other British investigators also tried to control for father's occupation and/or social class. Sutherland studied a group of 3,096

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[6]Bradford, p. 224.

[7]James Maxwell, "Intelligence, Fertility and the Future," Studies in Individual Differences, eds. James J. Jenkins and Donald Patterson (New York: Appleton-Century Crofts, Inc., 1961), pp. 712-17.

[8]J. D. Nisbet and N. J. Entwistle, "Intelligence and Family Size, 1949-1965," British Journal of Educational Psychology, XXXVII (June, 1967), 188.

children whose fathers were all miners. He agreed with other researchers in indicating that children of higher ability tend to come from smaller families.[9]

Sutherland joined Thomson in studying ten and one half to eleven and one half year old public elementary school children on the Isle of Wight in England. They found a correlation of -.154 between family size and intelligence which was lowered to -.058 when they studied the boys of the Royal Grammar School.[10] In the latter case, the social level was more homogenous and probably of the higher levels.

In supporting the finding of other researchers, Douglas found a substantial drop in average test scores for children who came from families of four or more children and a gradual fall in scores for children in families of eight or more children.[11]

Cattell, an American who conducted a study in England, joined those researchers who were concerned about the dysgenic population trend due to the inverse relationship between family size and intelligence. In 1937, he determined that the mean intelligence score of the population would decline by three points a generation, and predicted that half of the population would be mentally defective in three hundred years.[12]

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[9]H. E. G. Sutherland, "The Relationship Between IQ and Size of Family," The Journal of Educational Psychology, XX (February, 1929), 83.

[10]Fisher, p. 237.

[11]J. W. B. Douglas, The Home and the School (London: MacGibbon and Kee, 1964), p. 93.

[12]Julian Blackburn, "Family Size, Intelligence Score and Social Class," Population Studies, I (September, 1947), 166.

About ten years earlier he had determined that if the intelligence level dropped 1.0 to 1.5 points per decade, the following predictions would come true:

1. A fall of scholastic standards in 'G'-saturated school subjects (Mathematics and English),
2. An increase in delinquency,
3. An increase of unemployment at the unskilled level, and indirectly therefrom, less markedly, at all levels,
4. An increased conservatism, shown, for example, in a reversion to more rigid religious forms; or, at least, in an arrest of the development out of such forms,
5. An increased susceptibility to propaganda,
6. A shift from democratic toward autocratic or bureaucratic government.[13]

Other British studies included those of Bradford, Dawson, and Roberts which yielded an approximate correlation between family size and intelligence of -.20.[14] Moshinsky and Burt joined these investigators with correlations of -.23 and -.19, respectively.[15]

As mentioned previously, most of the studies have been conducted in the United States and the United Kingdom. However, this inverse relationship also appears to exist in other countries. Papavassiliou compared the correlation of the relationship between family size and intelligence in three countries. He found the correlation in the United States to be -.3, whereas it was -.2 in England, and -.46 in Greece.[16]

If the inverse relationship between family size and intelligence has indeed been operating since the beginning of the formal studies of

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[13]Cattell, p. 230.

[14]Bradford, p. 224.

[15]Cyril Burt, "Family Size, Intelligence and Social Class," Population Studies, I (September, 1947), 179.

[16]I. Th. Papavassiliou, "Intelligence and Family Size," Population Studies, VII (March, 1954), 22.

this situation, then the results would be apparent. However, there are studies which refute this stand. One notable example would be the results of the intelligence tests given the army recruits in the World Wars. The army recruits of WWII made higher scores than the recruits of WWI when given the same intelligence test.[17]

Other comprehensive examples included the 1947 Scottish Mental Survey which showed an increase in scores over the scores obtained in 1932, and a survey of intelligence test performance of American high school students over a twenty year period which showed a rise in scores.[18] The latter was true even though there was a large increase in the proportion of young people enrolled in high schools which could have caused a decrease in scores due to a more unselected population.

These studies show that if there was a decline in intellectual functioning, it must have been masked by environmental or other factors and these have not been clearly identified or discussed.

On the other hand, there are reasons for supporting the stand that no dysgenic trend, even a hidden one, is taking place in the population. The reason for the earlier concern may have developed because of the manner in which the subjects for the studies were obtained. In most instances, children were selected and then their intelligence compared on the basis of the number of their siblings. This procedure eliminated the unmarried and the childless. Reed and Reed calculated the percentage of married people within designated IQ ranges. They found

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[17]Douglas, pp. 92-92.

[18]Anne Anastasi, "Tested Intelligence and Family Size," Eugenics Quarterly, I (September, 1954), 157.

that only thirty percent of the subjects with IQ's 55 and below were married. The percentage increased to eighty-six percent for those in the IQ range of 56 to 70. For the rest of the group, the percentages ranged from ninety-seven to one hundred percent. The subjects with IQ's of 131 or above had all married. The Reed data resulted in a mean IQ of 100 for married siblings and a mean IQ of 80 for unmarried siblings.[19]

This type of data reveals that while the dullest people may have the largest families, they also have the lowest proportion of people married. This aspect of the problem had been largely overlooked in many of the studies which investigated only sibling number and intelligence and ignored childless or unmarried people.

Therefore, the reason for many of the studies of family size and intelligence, a fear of a dysgenic trend in the population, is no longer of major concern. However, the inverse relationship between family size and intelligence still does exist.

The studies mentioned in the previous paragraphs have usually been conducted with elementary school children in the general population. Investigations with more specialized groups have produced similar results. In his work with gifted children in California, Terman found a correlation of -.271 between family size and intelligence and this correlation was only slightly reduced when the level of schooling of the parents was held constant.[20] Nearer the other end of the intellectual continuum, Dayton

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[19]I. I. Gottesmann, "Biogentics of Race and Class," Social Class, Race, and Psychological Development, eds. Martin Deutsch, Irwin Katz, and Arthur R. Jensen (New York: Holt, Rinehart and Winston, Inc., 1968), pp. 44-45.

[20]Lewis M. Terman (ed.), Mental and Physical Traits of a Thousand Gifted Children, Vol. I, Genetic Studies of Genius (Stanford University, California: Stanford University Press, 1926), pp. 117-118.

investigated the relationship of family size and intelligence in retarded children. His study included 20,473 retarded children in Massachusetts between 1921 and 1930 and was part of the Survey of Retarded Children in Public Schools in Massachusetts. He found a mean intelligence score of 73.5 in two-child families and one of 68.9 in families with ten or more children.[21] The difference between the two means was not great, but when the size of this homogenous sample is noted, it makes a statistical difference.

Other studies have used ethnic groups for their populations. The Locke and Goldstein study included 1500 children in a Hebrew Orphan Asylum in New York City plus a smaller group of 354 children. They found a correlation of -.24 between intelligence and family size even when birth order and mother's age were held constant.[22]

Over one thousand children in grades six to eight located on the New England coast were studied by Chapman and Wiggins. These children were primarily foreign born. The same type of relationship between family size and intelligence was found with these children as had been indicated in other studies. They found a correlation of -.33 with no indications that, with the same parents, birth order had any significant effect on intelligence.[23]

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[21]Neil A. Dayton, "Influence of Size of Family Upon the Characteristics of the Mentally Deficient," American Journal of Psychiatry, XIC (January, 1935), 805.

[22]Norman M. Locke and Hyman Golstein, "The Relation of Birth Order, Age of Mother, and Size of Family," Journal of Psychology, III (n.d., 1931), 93.

[23]Crosly J. Chapman and D. M. Wiggins, "Relation of Family Size to Intelligence of Off Spring and Socio-Economic Status of Family," Pedagogical Seminary, XXXII (September, 1925), 419.

The research quite conclusively shows that an inverse relationship exists between family size and intelligence, and this situation has been in existence for a considerable number of years. The inverse relationship holds across socioeconomic levels and for different levels of mental ability ranging from the retarded to the gifted. The inverse relationship exists in both the United States and the United Kingdom with some evidence that it is also existent in other countries. However, there is no conclusive evidence that a dysgenic trend is occuring in the population. This lack of evidence may be a result of the sampling methods used in the investigations; few studies included unmarried or childless subjects. Separate data for blacks is seldom included in the research.

INTELLIGENCE AND RACE

Recent investigations have placed more emphasis on the relationship of intelligence and race, especially the black race. Older studies included very little information on the relationship of intelligence and family size among blacks which may or may not be the same as the relationship in white families.

Blacks are disproportionately represented in the lower socioeconomic levels. The reason for this situation are various but are outside the scope of this study. More important is that these children do attend school and need effective educational programs. Blacks also tend to have lower mean scores on intelligence tests than whites. Jensen reported that blacks scored about one standard deviation below the average of whites in intelligence and that this finding was fairly

consistent in eighty-one different studies of intellectual ability which were reviewed by Shuey.[24]

Jensen is one of the leaders in comparing cognitive attainments of different ethnic groups. Using data from the 1966 Armed Forces Qualification Test, he found the overall failure rate for blacks was 68 percent compared to 19 percent for whites. Jensen used Heber's research to show that lower intelligence scores were much more prevalent for blacks than for whites at every socioeconomic level. He felt that this was not due totally to environmental factors, because a more culturally disadvantaged group, the American Indians, had a higher mean score than the blacks.[25]

"Culture free" tests have been used to explain the measured differences between whites and blacks, especially those from lower socio-economic levels. Results of these tests show that blacks scored slightly lower than they do on the more conventional intelligence tests.[26]

Research has shown that blacks tend to score lower than white on commonly used intelligence tests as well as on "culture free" tests. Several reasons for this have been advanced which take into consideration determinants which might affect the scores. Some of these determinants include cultural or genetic influences, the bias of current tests, the results of discrimination, and other factors. The results of these studies are not conclusive, and the question is still under investigation. There is another aspect of this situation which may actually be more

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[24]Jensen, "How Much Can We Boost IQ?," p. 81.

[25]Jensen, "How Much Can We Boost IQ?," pp. 83-87.

[26]Jensen, "How Much Can We Boost IQ?," p. 81.

important and has not been thoroughly researched. Hidden in the reports of total test scores may be different cognitive profiles which are actually of far more importance.

Modern day school practices are changing but are still quite closely related to past school practices. Many of these practices were probably originally formulated with a relatively small upper-class segment of Anglo-European stock and this procedure is reflected in the schools of today. The children from the lower socioeconomic levels, especially if they are black, enter an academic situation which is very likely biased against them. Part of their lack of success might be related to their cognitive profiles which may differ from those of white middle- and upper-class children.

COGNITIVE PROFILES

The possibility also exists that children from families of different size might have unlike patterns of cognitive strengths and weaknesses. Dayton in 1935 conducted a study which still has its impact for today. He suggested that the various sizes of families might be correlated with different types of thinking. He stated that children in small families might do well in language and reading, and children in larger families might do better in arithmetical processes.[27] Thus, the relationship between family size and school achievement or success on intelligence tests would vary with the type of tasks involved.

Douglas tended to support this type of viewpoint. He stated that children from large families were more handicapped in reading and

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[27]Dayton, p. 813.

understanding of words than in tests involving nonverbal intelligence.[28]

In agreement with the Douglas study, Nisbet and Entwistle found in their study of 2,860 Scottish children that tests involving more verbal items resulted in a more pronounced inverse relationship with family size.[29] This inverse relationship may result partially from the lack of effective verbal models in the homes of children from lower socioeconomic levels which would hinder the growth of skills that depend upon language for their development. In addition, many of these children are from large families and so their direct contact with adults would be less than if they were in a family of fewer children.

Jensen takes a stand which is more closely related to ethnic group membership than to socioeconomic status. He stated that there are different patterns of learning ability for various ethnic groups which hold true across different socioeconomic levels.[30] He also stated that the pattern of strengths and weaknesses in the cognitive profiles of black children are different from those of white children. For example, young black children are more advanced in motoric development than white babies, and this is evident even at the age of nine hours.[31] As blacks grow older, they are more successful on verbal than on nonverbal intelligence tests.[32] This may partially explain why blacks do not perform as well on "culture free" and culture fair" tests which are often

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[28]Douglas, p. 93.

[29]Nisbet and Entwistle, p. 190.

[30]Jensen, "How Much Can We Boost IQ?," p. 109.

[31]Jensen, "How Much Can We Boost IQ?," p. 86.

[32]Jensen, "How Much Can We Boost IQ?," p. 81.

less verbal in nature than the more conventional tests such as the Stanford-Binet Intelligence Scale and the Wechsler tests.

In comparison with the test results of white children, blacks perform somewhat lower on subtests involving abstract abilities.[33] This type of performance would put these children at a disadvantage in the present school systems which stress ability in abstract thinking.

The viewpoint concerning different cognitive profiles among ethnic groups was supported in a study of Chinese, Jewish, Negro, and Puerto Rican children. In this study, membership in a particular ethnic group produced differences in both the cognitive profiles and the level of mental ability. Of particular importance was the finding that while social class placement affects the absolute level of different abilities, it does not affect the pattern among these abilities.[34]

The cognitive profiles of children have been largely overlooked in the study of children's learning. A beginning step would be an investigation of the cognitive profiles of children from families of different sizes and different racial groups.

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[33]Jensen, "How Much Can We Boost IQ?," p. 81.

[34]Gerald S. Lesser, Gordon Fifer, and Donald H. Clark, Mental Abilities of Children in Different Social and Cultural Groups, Monographs of the Society for Research in Child Development, No. 102 (Chicago: University of Chicago Press, 1965), pp. 52-62.

Chapter 3

THE DESIGN

This chapter describes the method of selecting subjects for the study and the test used with these children. It also discusses the statistical methods used to compare the subgroups and to analyze the data.

SUBJECTS OF THE STUDY

The subjects for this study were 80 black and white children, two to three years of age. They were part of a group of 177 children who were involved in the initial testing of Home Start, a federally funded preschool program.

The original 177 children were separated according to family size. Children with one or no siblings were placed in the small family category. In the large family category, were children with three or more siblings. Children with two siblings were considered as belonging to neither a large nor a small family and were not included in the study. The remaining 131 children were further categorized according to both family size and race resulting in the subgroups of small black family, large black family, small white family, and large white family. From each of these four categories, twenty children were randomly selected. The resultant eighty children were the subjects of the study.

SOURCE OF THE DATA

The ITPD was used to ascertain the subjects' patterns of achievement. This test was designed specifically to indicate profiles of strengths and weaknesses that exist in the cognitive development of young children. The test contains the four subtests of Language, Visual-motor, Memory, and Concepts. It is intended for use with children from twenty-four to forty-two months of age.

The Verbal subtest measures receptive and expressive labeling, story telling, and receptive classifying. Illustrated items include animals, body parts, clothing, and other common objects.

Included in the Visual-motor subtest are activities which involve seriation toys, bean bags, form boards, blocks, paper and pencil, beads and string, pegs, and paper and scissors.

The Memory subtest requires the child to repeat words and numbers and to remember the position of objects.

Expressive and receptive labeling and matching involving size, color, and number concepts constitute the Concept subtest.

STATISTICAL COMPARISONS OF SUBGROUPS

The original group of 131 subjects contained a disproportionately large number of children in small white families. The fifty-eight children in this category were reduced to twenty by the use of a table of random numbers. A one-dimensional analysis of variance (ANOVA) was used to compare the mean of the randomized sample with the mean of the thirty-eight scores not utilized in the study.[1] As indicated in Table 1,

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[1]John T. Roscoe, Fundamental Research Statistics for the Behavioral Sciences (Chicago: Holt, Rinehart and Winston, Inc., 1969), pp. 230-235.

Table 1

Means and Standard Deviations of Subjects and Nonsubjects in Small White Families after Random Sampling

Subtests		Nonsubjects (n=38)		Subjects (n=20)
Language	Mean	101.47		95.20
	S.D.	39.13		40.76
	F		0.37	
Visual-motor	Mean	77.47		73.30
	S.D.	26.04		26.63
	F		0.38	
Memory	Mean	12.69		12.90
	S.D.	5.67		6.55
	F		0.02	
Concepts	Mean	17.81		17.60
	S.D.	12.34		12.62
	F		0.01	

the differences for all four subtests were not statistically significant.

The differences in the number of children in the other three subgroups before and after the random sampling were small (small black, n=twenty-one; large black, n=twenty-seven; and large white, n=twenty-five) and no statistical comparison was deemed necessary.

The subjects ranged in age from twenty-five to forty-two months. The means and standard deviations for the subgroups are recorded in Table 2. At this young age, even a few months can account for different levels of ability in developmental tasks. For this reason, a one-dimensional ANOVA was used to determine if there was a significant difference among the age means of the subjects in the four subgroups. The F ratio of .91 was not significant. The results of this analysis are reported in Table 3.

Table 2

Means and Standard Deviations of
Subgroup Ages in Months

Subgroups	Mean	S.D.
Small black	33.45	4.74
Large black	33.05	3.28
Small white	34.05	5.84
Large white	35.20	4.51

Table 3

One-dimensional ANOVA of Subgroup
Ages in Months

Variable	df	SS	MS	F
Subgroups and age	3	52.64	17.75	0.91
Individual	76	1464.05	19.26	
Total	79	1516.69		

The proportion of males and females in each subgroup was considered important because some of the subtest means might have been affected by a disproportionate number of one sex.[2] A chi square test was used to determine if the sex ratio of the subjects in the four

[2]Josef E. Garai and Ambram Scheinfeld, "Sexual Differences in Mental and Behavioral Traits," Genetic Psychology Monogram, LXXVII (May, 1968), 196-210.

subgroups differed significantly (small black males, n=ten; large black males, n=fourteen; small white males, n=eight; and large white males, n=ten).[3] The resultant chi square of .03 was not significant. The chi square results are shown in Table 4.

Table 4

Chi Square Test of Sex Ratio of Subgroups

Subgroup	Number	X^2
Small black	10	
Large black	14	
Small white	8	
Large white	10	
		0.03

Socioeconomic level of each subject was determined by the occupation of the father or by the mother if no father was present in the home. A three-way classification was derived by collapsing the seven occupational categories used in New Haven, Connecticut, by Hollingshead and Redlich. Class I contained executives and proprietors of large concerns, and major professionals; managers and proprietors of medium-sized businesses, and lesser professionals; and administrative personnel of large concerns, owners of small independent businesses, and semi-professionals. Class II contained owners of small businesses, clerical and sales workers, and technicians and skilled workers. Class III

[3]George A. Ferguson, Statistical Analysis in Psychology and Education (New York: McGraw-Hill Book Company, Inc., 1959), pp. 165-169.

contained semiskilled and unskilled workers.[4] For analysis, each class was given a score. Class I was scored as one, Class II as two, and Class III as three. The means and standard deviations for the subgroups are listed in Table 5.

Table 5

Means and Standard Deviations of Socioeconomic Levels of Subgroups

Subgroups	Mean	S.D.
Small black	2.70	0.47
Large black	2.75	0.44
Small white	1.80	0.83
Large white	2.20	0.77

A one-dimensional ANOVA was used to determine if there was a significant difference in the socioeconomic levels of the four subgroups. The differences among the means produced an F ratio of 9.51 which was significant at the .01 level. The results of this analysis are recorded in Table 6.

The Duncan Multiple Range Test (DMRT), for which a one-dimensional ANOVA is a requisite, was used to determine if any of the individual pairs of means differed significantly. The DMRT allows for the comparison of each mean with every other mean. It requires a greater difference between means occupying extreme positions in size than is required for

[4]August B. Hollingshead and Fredrick C. Redlich, Social Class and Mental Illness (New York: John Wiley and Sons, Inc., 1958), pp. 390-391.

Table 6

One-dimensional ANOVA of Socioeconomic Levels of Subgroups

Variable	df	SS	MS	F
Subgroups and s-e level	3	12.14	4.05	9.51*
Individual	76	32.35	.43	
Total	79	44.49		

*$p < .01$

means closer in size. If the means are far apart, the amount of separation in standard error units must be relatively large to reach significance. The difference between each pair of means is compared with the shortest significant range (SSR) to determine significance. The SSR is computed by using the standard error of the mean and the tabled values of the Number of Standard Error Units Separation Between Pairs of Means.[5]

In the analysis of socioeconomic levels, both white subgroup means were significantly higher than the two black subgroup means. The small white subgroup differed from the black subgroups at the .01 level, and the large white subgroup differed at the .05 level. Therefore, the differences among the means of the socioeconomic levels of the four subgroups are important in analyzing the results of the study. The analysis of the socioeconomic levels of the subgroups is reported in Table 7.

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[5]R. J. Senter, Analysis of Data (Glenview, Illinois: Scott, Foresman and Co., 1969), pp. 281-291.

Table 7

Intergroup Mean Differences of Socioeconomic Levels of Subgroups

Subgroups	Difference Between Means	SSR .05	SSR .01
SB LB	.05	.412	.548
SB SW	.90**	.434	.572
SB LW	.50*	.412	.548
LB SW	.95**	.448	.588
LB LW	.55*	.434	.572
SW LW	.40	.412	.548

*p < .05
**p < .01

TREATMENT OF THE DATA

The subgroups were similar in reference to age and sex but differed statistically with respect to socioeconomic level. After these comparisons among subgroups were made, the subgroup mean differences on the four subtests of the ITPD were analyzed.

In order to determine the relationship between family size and the ITPD subtest scores, a two-dimensional ANOVA was used. This analysis allowed for the impact of only family size to be assessed within each subtest.

As mentioned in Chapter 2, blacks tend to score lower on standardized tests than do whites. Blacks also are more likely to come from large families. These two factors could possibly mask significant

differences between the means of large and small families of the two racial groups. For this reason, family size within and between races was considered an important factor in the study of the relationship between family size and patterns of achievement.

In order to determine the impact of family size within and between races, a one-dimensional ANOVA, followed by a DMRT was used. In this way, the mean of each subgroup based on both family size and race was compared to the mean of every other subgroup. This analysis was done for the four subtests of Language, Visual-motor, Memory, and Concepts.

In summary, four subgroups based on family size and race were used in this study. These subgroups were statistically similar with respect to age and sex but were not similar on the basis of socioeconomic level. The subgroups were first analyzed to determine the impact of family size within each subtest. Further analyses were used to assess the significance of family size within and between races for each of the four subtests. In all instances the required significance level was .05.

Chapter 4

PRESENTATION AND ANALYSIS OF THE DATA

The purpose of the study was to ascertain if membership in a large or a small family was related to patterns of achievement. As discussed in Chapter 2, research has rather conclusively shown that large family size is related to lower intelligence test scores. However, this inverse relationship between family size and intelligence has usually been linked to global IQ measures, and it is possible that children from large families may actually score higher than their small family counterparts on certain subtests.

This study focused on children in large and small families as well as black and white children in large and small families. Both types of investigations were necessary because some studies suggest that ethnic group membership has an influence on the cognitive profiles of children.

IOWA TEST OF PRESCHOOL DEVELOPMENT

Information concerning the subjects' patterns of achievement was obtained from the ITPD. The test was administered to the children prior to their admission into the Home Start program. Therefore, none of the intergroup differences can be attributed to the Home Start program.

As indicated in Table 8, the grand mean for Language was 81.54, whereas the means of the four subgroups ranged from 55.10 to 95.20. The Visual-motor grand mean was 74.84 with an intergroup range from 72.25 to

91.55. The range for Memory was from 7.80 to 12.90 with a grand mean of 11.19. For Concepts, the range was from 5.45 to 19.55 with a grand mean of 13.04. Table 8 also reveals that subjects from the large black families consistently had the lowest mean scores. The highest mean scores were found either in the large or the small white family subgroups.

Table 8

Means and Standard Deviations of Subgroup Scores on ITPD

Subtests		Small Black	Large Black		Small White	Large White
Language	Mean	77.70	55.10		95.20	92.95
	S.D.	32.27	37.65		40.76	40.63
	G.M.			81.54		
Visual-motor	Mean	72.25	62.25		73.30	91.55
	S.D.	19.72	18.61		26.63	37.62
	G.M.			74.84		
Memory	Mean	11.15	7.80		12.90	12.85
	S.D.	6.10	5.71		6.55	6.14
	G.M.			11.18		
Concepts	Mean	9.55	5.45		17.60	19.55
	S.D.	7.78	6.65		12.62	14.74
	G.M.			13.04		

THE RESULTS

Language

Hypothesis one deals with the relationship between the Language subtest scores and the large and small family subgroups.

A two-dimensional ANOVA was used to determine if family size and the Language means were related. The resultant F ratio of 2.05 was not significant. The full results of this ANOVA are included in Table 9.

Table 9

Two-dimensional ANOVA of Language Scores

Variable	df	SS	MS	F
Race	1	15318.11	15318.11	10.17*
Family size	1	3087.61	3087.61	2.05
Race and family size	1	2070.61	2070.61	1.37
Individual	76	114506.15	1506.66	
Total	79	134982.49		

*$p < .01$

Hypothesis number one is accepted. There is no significant difference in the mean Language scores between preschool children in large and small families.

Hypotheses two through seven deal with the relationship between the Language subtest scores and the four subgroups.

The DMRT was used to determine if any individual pairs of means of the four subgroups differed significantly. This type of analysis allowed for all possible comparisons of the four subgroups, and thus afforded a clearer picture of the relationship between family size and race and patterns of achievement.

A one-dimensional ANOVA and the calculation of the standard error of the mean are both requisites for the DMRT test. The standard error of the mean for the Language subtest was 8.54. The results of the ANOVA produced a F ratio of 4.68 which was significant at the .01 level. The results of this ANOVA are recorded in Table 10.

Table 10

One-dimensional ANOVA of Language Scores

Variable	df	SS	MS	F
Race and family size	3	20354.14	6784.71	4.65*
Individual	76	110907.75	1459.31	
Total	79	131261.89		

*$p < .01$

Both large and small white subgroup means differed significantly from the mean of the large black subgroup. There were no significant differences between the means of the large black and small black subgroups or between either of the white subgroups when compared with the small black subgroup. The difference of 22.60 between the means of the two black subgroups was substantially larger than the 2.25 difference between the means of the two white subgroups. This difference neared significance at the .05 level. The significant intergroup differences on the Language subtest are recorded in Table 11.

Hypothesis number two is accepted. There is no significant difference in the mean Language scores between preschool children in small black families and large black families.

Hypothesis number three is accepted. There is no significant difference in the mean Language scores between preschool children in small black families and small white families.

Hypothesis number four is accepted. There is no significant difference in the mean Language scores between preschool children in small black families and large white families.

Table 11

Intergroup Mean Differences on Language Subtest

Subgroups	Difference Between Means	SSR .05	SSR .01
SB > LB	22.60	24.165	32.135
SB< SW	15.25	24.165	32.135
SB< LW	17.50	25.420	33.506
LB< SW	37.85*	25.420	33.506
LB< LW	40.10*	26.250	26.250
SW< LW	2.25	24.165	32.135

*p< .01

Hypothesis number five is rejected. There is a significant difference in the mean Language scores between preschool children in large black families and small white families.

Hypothesis number six is rejected. There is a significant difference in the mean Language scores between preschool children in large black families and large white families.

Hypothesis number seven is accepted. There is no significant difference in the mean Language scores between preschool children in small white families and large white families.

Visual-motor

Hypothesis eight deals with the relationship between the Visual-motor subtest scores and the large and small family subgroups.

The two-dimensional ANOVA revealed that there was no significant difference between the means of the large and small family subgroups. The results of this analysis are recorded in Table 12.

Table 12

Two-dimensional ANOVA of Visual-motor Scores

Variable	df	SS	MS	F
Race	1	4605.61	4605.61	6.44*
Family size	1	340.31	340.31	0.48
Race and family size	1	3990.31	3990.31	5.58*
Individual	76	54326.65	714.82	
Total	79	63262.89		

*$p > .05$

Hypothesis number eight is accepted. There is no significant difference in the mean Visual-motor scores between preschool children in large and small families.

Hypothesis nine through fourteen deal with the relationship between the Visual-motor subtest scores and the four subgroups.

The results of a one-dimensional ANOVA comparing the scores of the Visual-motor subtest yielded a F score of 4.17 which was significant at the .01 level. The results of this analysis are shown on Table 13. The standard error of the mean was 5.98. Again, the DMRT was used to further analyze the data.

The most significant difference between pairs of means for the Visual-motor scores was between the large black and white families which

Table 13

One-dimensional ANOVA of Visual-motor Scores

Variable	df	SS	MS	F
Race and family size	3	8936.24	2978.75	4.17*
Individual	76	54326.65	714.82	
Total	79	63262.89		

*$p < .01$

was significant at the .01 level. Children from large white families obtained significantly higher Visual-motor scores than children from large and small black families as well as children representing small white families. This difference was significant at the .05 level.

In summary, black children from large families are the most handicapped in Visual-motor tasks, whereas black children in small families do as well as the white children in small families. The children who scored highest in this subtest came from large white families. The full results of this analysis are reported in Table 14.

Hypothesis number nine is accepted. There is no significant difference in the mean Visual-motor scores between preschool children in small black families and large black families.

Hypothesis number ten is accepted. There is no significant difference in the mean Visual-motor scores between preschool children in small black families and small white families.

Hypothesis number eleven is rejected. There is a significant difference in the mean Visual-motor scores between preschool children in small black families and large white families.

Table 14

Intergroup Mean Differences on Visual-motor Subtest

Subgroups	Difference Between Means	SSR .05	SSR .01
SB > LB	10.00	16.912	22.489
SB < SW	1.05	16.912	22.489
SB < LW	19.30*	17.791	23.446
LB < SW	11.05	17.791	23.446
LB < LW	29.30**	18.370	24.097
SW < LW	18.25*	16.912	22.489

*p< .05
**p< .01

Hypothesis number twelve is accepted. There is no significant difference in the mean Visual-motor scores between preschool children in large black families and small white families.

Hypothesis number thirteen is rejected. There is a significant difference in the mean Visual-motor scores between preschool children in large black families and large white families.

Hypothesis number fourteen is rejected. There is a significant difference in the mean Visual-motor scores between preschool children in small white families and large white families.

Memory

Hypothesis fifteen deals with the relationship between the Memory subtest scores and the large and small family subgroups.

The two-dimensional ANOVA showed that family size was not significant in the results of the Memory subtest. The results of this analysis are shown in Table 15.

Table 15

Two-dimensional ANOVA of Memory Scores

Variable	df	SS	MS	F
Race	1	231.20	231.20	6.15*
Family size	1	57.80	57.80	1.54
Race and family size	1	54.45	54.45	1.45
Individual	76	2858.10	37.61	
Total	79			

*$p < .05$

Hypothesis number fifteen is accepted. There is no significant difference in the mean Memory scores between preschool children in large and small families.

Hypotheses sixteen through twenty-one deal with the relationship between the Memory subtest scores and the four subgroups.

A one-dimensional ANOVA of the relationship between the subgroup scores produced a F ratio of 3.04 which was significant at the .05 level. The results of this analysis are given in Table 16. The standard error of the mean was 1.37. The DMRT was again used to further analyze the differences among the means of the subgroups.

Table 16

One-dimensional ANOVA of Memory Scores

Variable	df	SS	MS	F
Race and family size	3	343.45	114.48	3.04*
Individual	76	2858.10	37.61	
Total	79	3201.55		

*$p < .05$

The two white subgroups had very similar means on the Memory subtest. Both of these subgroups differed significantly at the .05 level from the mean of the large black subgroup, but not from the mean of the small black subgroup. A difference which neared the significance at the .05 level was the one between the large and small black subgroups.

In summary, with the exception of the mean score of the children from large black families, the other means were quite similar. The results of the Duncan Test are recorded in Table 17.

Hypothesis number sixteen is accepted. There is no significant difference in the mean Memory scores between preschool children in small black families and large black families.

Hypothesis number seventeen is accepted. There is no significant difference in the mean Memory scores between preschool children in small black families and small white families.

Hypothesis number eighteen is accepted. There is no significant difference in the mean Memory scores between preschool children in small black families and large white families.

Table 17

Intergroup Mean Differences on Memory Subtest

Subgroups	Difference Between Means	SSR .05	SSR .01
SB > LB	3.35	3.879	5.158
SB < SW	1.75	4.080	5.377
SB < LW	1.70	3.879	5.158
LB < SW	5.10*	4.213	5.527
LB < LW	5.05*	4.080	5.377
SW > LW	.05	3.879	5.158

*p< .05

Hypothesis number nineteen is rejected. There is a significant difference in the mean Memory scores between preschool children in large black families and small white families.

Hypothesis number twenty is rejected. There is a significant difference in the mean Memory scores between preschool children in large black families and large white families.

Hypothesis number twenty-one is accepted. There is a significant difference in the mean Memory scores between preschool children in small white families and large white families.

Concepts

Hypothesis twenty-two deals with the relationship between the Concepts subtest scores and the large and small family subgroups.

A two-dimensional ANOVA indicated that there was no significant difference between the Concepts scores of children from large and small families. The results of this analysis are given in Table 18.

Table 18

Two-dimensional ANOVA of Concepts Scores

Variable	df	SS	MS	F
Race	1	2453.11	2453.11	20.38*
Family size	1	23.11	23.11	0.19
Race and family size	1	183.01	183.01	1.52
Individual	76	9147.65	120.36	
Total	79	11806.89		

*$p < .01$

Hypothesis number twenty-two is accepted. There is no significant difference in the mean Concepts scores between preschool children in large and small families.

Hypotheses twenty-three through twenty-eight deal with the relationship between the Concepts subtest scores and the four subgroups.

The one-dimensional ANOVA produced a F ratio of 7.34 which was significant at the .01 level. The results are shown in Table 19. The standard error of the mean was 2.45.

The DMRT showed that significant differences existed between the large white subgroup and the two black subgroups, and between the small white and large black subgroups at the .01 level. The other significant difference, which was at the .05 level, was between the two small family

Table 19

One-dimensional ANOVA of Concepts Scores

Variable	df	SS	MS	F
Race and family size	3	2659.24	886.41	7.36*
Individual	76	9147.65	120.36	
Total	79	11806.89		

*p< .01

subgroups. The only subgroups with no significant differences were those related to family size within one race. The differences between the pairs of means are shown in Table 20.

Table 20

Intergroup Mean Differences on Concepts Subtest

Subgroups	Difference Between Means	SSR .05	SSR .01
SB> LB	4.10	6.940	9.228
SB< SW	8.05*	6.940	9.228
SB< LW	10.00**	7.300	9.621
LB< SW	12.15**	7.300	9.621
LB< LW	14.10**	7.538	9.888
SW< LB	1.95	6.940	9.228

*p< .05
**p< .01

Hypothesis number twenty-three is accepted. There is no significant difference in the mean Concepts scores between preschool children in small black families and large black families.

Hypothesis number twenty-four is rejected. There is a significant difference in the mean Concepts scores between preschool children in small black families and small white families.

Hypothesis number twenty-five is rejected. There is a significant difference in the mean Concepts scores between preschool children in small black families and large white families.

Hypothesis number twenty-six is rejected. There is a significant difference in the mean Concepts scores between preschool children in large black families and small white families.

Hypothesis number twenty-seven is rejected. There is a significant difference in the mean Concepts scores between preschool children in large black families and large white families.

Hypothesis number twenty-eight is accepted. There is no significant difference in the mean Concepts scores between preschool children in small white families and large white families.

CONCLUSIONS AND DISCUSSION

Language

Analysis of the Language subtest scores revealed that family size was significant only when race was also considered. The mean of the large black subgroup was significantly lower than either of the two white subgroups.

The lower Language scores of blacks from large families may partially explain the generally lower intelligence test results of

blacks when compared to whites since, as discussed in Chapter 2, black families are often larger than white families. In addition, verbal ability is one of the most important factors in intelligence testing.[1] Therefore, family size possibly contributes to the lower intelligence test scores for blacks that have been reported nationally.

It might be argued that the variable of socioeconomic level for the large black subgroup contributed heavily to the lower mean score of these subjects. However, there was little, if any, difference in the socioeconomic composition of the large and small black subgroups while the difference between their Language means neared significance at the .05 level. Whatever the reason, educators need to be aware of the likelihood of the greater Language vulnerability of black children from large families.

Visual-motor

Children from large families received the two extreme mean scores in the Visual-motor subtest; black children scored lowest and white children scored highest. The two small family subgroups had very similar means.

It is relevant to note here that Lesser, Fifer, and Clark found that blacks scored highest (in the average range) on verbal tasks and lowest on space and number tasks.[2] This type of relationship appeared

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[1]Gerald S. Lesser, Gordon Fifer, and Donald H. Clark, Mental Abilities of Children from Different Social and Cultural Groups, Monographs of the Society for Research in Child Development, Vo. 30, No. 4, Series No. 102 (Chicago: University of Chicago Press, 1965), p. 51.

[2]Lesser, p. 64.

to be related to ethnic group membership, but is possibly also a function of family size. The factors that affected the space and number scores may also have depressed the Visual-motor subtest scores of black children from large families, but not the black children from small families.

One possible reason for the lower scores on the Visual-motor subtest is the lack of toys and manipulative objects in the homes of the children from large black families. These objects can provide developmental activities which lead to success in the Visual-motor subtest tasks.

The factors that depressed the Visual-Motor subtest scores of the black children from large families did not function in the same manner for white children from large families who received the highest mean score and differed significantly from all of the other subgroups.

A possible reason for this situation is the effect of socioeconomic level; the two large family subgroups differed significantly at the .05 level on this criterion. The higher socioeconomic level of the white families may allow them to provide more toys and games for their children. After the older children in these families are taught to play with toys and games, they may in turn teach their younger siblings.

In contrast, the socioeconomic levels of the black and white small family subgroups differed significantly at the .01 level, but there was no statistically significant difference between the means of their Visual-motor subtests.

These results can provide information necessary to develop more effective preschool programs. As more black children become participants in preschool programs, there may be value in emphasizing Visual-motor tasks, especially for blacks from large families.

This information is also of importance to educators in primary schools. Effective Visual-motor enrichment may deserve higher priority at a young age. If children from large black families do not have the benefit of preschool compensatory enrichment, steps perhaps need be taken within the primary school programs. Otherwise, these children may not successfully compete with children from small families or children from large white families.

Memory

The Memory subgroup means showed more similarity than any of the other subtests. The only differences were that both white subgroups had significantly higher means than the large black subgroup.

These results are not consistent with Jensen's view that there are two types of learning, associative and conceptual. According to this position, disadvantaged children, including many blacks, are more successful with associative learning than with conceptual learning.[3] The results of the present study indicate that black students from large families are more handicapped with tasks involving Memory than are black children from small families who do as well with Memory tasks as the children from the two white subgroups. The similarity of means of the small black subgroup and the white subgroups is more consistent with Jensen's view that black children perform more like white children on associative tasks.

If associative learning is in fact more effective for black children, then educators will need to provide black children from large

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[3]Jensen, "How Much Can We Boost IQ?," pp. 112-115.

families with activities necessary for increasing skills in Memory tasks.

Concepts

The analysis of the Concepts subtest scores showed that all subgroup combinations related to race or the interaction of race and family size were statistically significant.

This subtest, which reflects the mastery of concept formation, is vital to academic success. This type of skill is closely related to Cattell's crystallized intelligence, which is important because it serves as a foundation for further learning.[4] Without a solid grounding in the skills associated with the Concepts subtest, children will probably not succeed academically as well as those who possess these skills.

Black children from both large and small families were severely handicapped in this area when compared to white children. This difference is noted even at the young age of two and three, the ages of the subjects in this study. For this reason, remediation procedures are needed several years before children enter school.

Summary

Several types of analysis were possible in this study. These included the impact of membership in certain subgroups on the scores of the Language, Visual-motor, Memory, and Concepts subtests of the ITPD.

Membership in a large or a small family was investigated to ascertain if this factor had any bearing on the mean scores of the four subtests. There were no significant differences.

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[4]R. B. Cattell, "Theory of Fluid and Crystallized Intelligence," Journal of Educational Psychology, LIV (February, 1963), pp. 1-22.

Family size within one race produced only one significant difference. Children from large white families scored significantly higher than children from small white families on the Visual-motor subtest. There were no significant differences between the means of large and small black subgroups on any of the subtests.

The significant differences between the means of subgroups which involved both race and family size were more numerous. The means of the large white subgroup were significantly higher than the means of the large black subgroup for all four subtests. The small white subgroup mean was significantly higher than the mean of the large black subgroup for Language, Memory, and Concepts. The differences between the small black and large white subgroup means were significant for the Visual-motor and Concepts subtests. In each case, the mean of the large white subgroup was larger. There was only one significant difference between the two small family subgroups. The small white subgroup mean was higher than the mean of the small black subgroup on the Concepts subtest. The significant differences between the means of the subgroups are summarized in Table 21.

It is noteworthy that there were no significant differences between the children from large and small black families, but the large black family subgroup mean was significantly smaller than both white subgroup means in every instance but one. The means of the small black subgroup were always larger than the means for the large black subgroup even though the differences did not reach significance. The differences between the two white subgroups were smaller. The children from small white families scored higher than those from large white families except on the Visual-motor subtest. On this test, the large family subgroup had

Table 21

Summary of Significant Differences
Between Means of Subgroups

Subgroups	Language	Visual-motor	Memory	Concepts
SB--LB				
SB< SW				.05
SB< LW		.05		.01
LB< SW	.01		.05	.01
LB< LW	.01	.01	.05	.01
SW< LW		.05		

a significantly higher mean than the small family subgroup. In summary, it appears that the impact of family size may be quite important for black children from large families, but not for white children, except in Visual-motor skills in which white children from large families score higher than white children from small families.

Chapter 5

SUMMARY

The purpose of this study was to determine whether preschool children's membership in large or small families, or their membership in small black families, large black families, small white families, or large white families was related to their scores on the Language, Visual-motor, Memory, and Concepts subtests of the Iowa Test of Preschool Development.

Research has shown that family size and intelligence are inversely related, but few studies have investigated the possibility that preschool children from large and small families may have different cognitive profiles on an achievement battery. Research has also shown that black children tend to score lower than white children on general tests of intelligence, but the cognitive profiles of racial groups have not been thoroughly investigated. The classification of the children in this study into four categories based on family size and race made possible an assessment of the interaction between race and family size.

A two-dimensional ANOVA allowed for the identification of the relationship between only family size and the subtest scores. These analyses yielded no significant differences among the means of the four subgroups.

A one-dimensional ANOVA, followed by the Duncan Multiple Range Test was used to further analyze the data. This type of procedure

allowed for the analysis of all possible combinations of the means of the four subgroups.

In the Language subtest analysis, there were significant differences between the means of the large black subgroup and each of the two white subgroups. In each case, the mean of the white subgroup was significantly higher than the mean of the large black subgroup.

On the Visual-motor subtest, children from large white families secured significantly higher scores than children in the other three subgroups. The Visual-motor subtest provided the only instance in which a large family subgroup scored higher than a small family subgroup of the same race. This significant difference between means was not revealed when the subjects were categorized according to family size alone, perhaps because the mean of the large black subgroup was the lowest of the four subgroups.

The Memory subtest revealed significant differences between the large black and small white subgroups and the large black and large white subgroups. The large black subgroup means was lower than either of the means of the two white subgroups.

The Concepts subtest analysis showed a significant difference in four comparisons of the means. The two white subgroup means were significantly higher than each of the two black subgroup means.

The large black subgroup mean was consistently lower than at least one other subgroup mean. The children from the small black families were not as handicapped as the black children from the large families as shown in these comparisons of the significant differences among the means of the subgroups:

Language: SW, LW, >LB

Visual-motor: LW, >LB, SB, SW

Memory: SW, LW, >LB

Concepts: SW, LW, >LB, SB

From these results, it is also evident that family size within one race was significant in only one comparison of the means. This difference was between the large and small white subgroups in the Visual-motor subtest. The large white subgroup scored higher.

Race within one family size was significant for the differences between the means of the two large family subgroups in all of the subtests, and also for the differences between the means of the two small family subgroups in the Concepts subtest. The two white subgroups scored higher which illustrates that in some instances, race may be as important as family size in ascertaining patterns of achievement.

The interaction of race and family size played an important role in the differences between the means of the large black and small white subgroups on the Language, Memory, and Concepts subtests. The small white subgroup scored higher in each instance. Other differences significantly influenced by the interaction of family size and race were the differences between the means of the small black and large white subgroups on the Visual-motor and Concepts subtests. The large white subgroup scored higher.

These relationships illustrate that patterns of achievement may best be assessed, not through family size alone, but through studying race or family size within and between races. The findings of this study support the view that more research is needed in the area of cognitive

profiles which includes analysis based on racial group membership. Further investigations may then yield clues as to how environmental means can be used to improve educational procedures.

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