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ABSTRACT

The Abecedarian Project was one of the most intensive early childhood programs ever offered to children from poor families. This study examined long-term outcomes for 105 of the original 111 participants at age 21. The project was a randomized trial of early childhood educational intervention provided in a full-time child care setting year round for 5 years beginning in infancy for children from low-income families. Treatment also included pediatric care and educational support for the first 3 years in elementary school. This study compares children who received 5 years of treatment with those in the control group that received free formula for 15 months and free disposable diapers. Findings indicated that the preschool treatment group scored higher on cognitive tests at age 21 than the control group. The young adults from the preschool treatment group earned significantly higher mathematics scores on the Woodcock-Johnson Psychoeducational Battery-Revised, were more likely to be in school at age 21, and were more likely to have attended a 4-year college. They were also more than a year older than those in the control group when their first child was born. Rates of high school graduation and employment rates at age 21 were similar for the two groups. There was no reduction in law breaking associated with having been in the Abecedarian preschool program. It was concluded that the trend to extend Head Start downward into infancy is supported strongly by the Abecedarian findings. (Contains 16 references.) (KB)

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High Quality Child Care Has Long-Term Educational Benefits for Poor Children

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High Quality Child Care Has Long-Term Educational Benefits for Poor Children

Many experts have noted that so called "model," University-based early childhood intervention programs differ from Head Start in significant ways and that their findings should not be used to argue for or against the value of Head Start. It can be argued, however, that from the outset of Head Start, there has been a strong link between the two types of programs. University-based model programs provided a rationale for Head Start. Early findings from one of them, Susan Gray's Early Training Project in Tennessee, strongly influenced the original planners of Head Start. This project provided approximately 40 poor African American children with a 10-week educational preschool program during the summer before they started school; the program also included parent visits during the first few school years. At the program's end, the investigators found that treated children had made significant gains in cognitive test scores relative to control children, even though the program was of short duration. This finding so impressed one of Head Start's founders that he urged the provision of comparable programs for other poor children (Zigler & Muenchow, 1992). Thus, the Early Training Project model was very influential in the design of the first Head Start programs, because it showed that, at least in terms of improved cognitive test scores, children definitely benefitted from such experiences.

Today, years later, there have been scientifically controlled evaluations of the benefits of many other early childhood education programs for poor children (e.g., Lazar, et al., 1982), but the value of such programs continues to be questioned by persons who believe the money would be better invested in other ways (e.g., Haskins, 1989). Therefore, the benefits of early childhood programs still need to be demonstrated. It is especially important to try to counter the argument that such benefits as do occur erode so quickly that they are of little ultimate worth to the treated children.

To be confident that children benefitted from any program, there must be a valid way to compare outcomes in treated children with those in similar children who did NOT have the treatment. Otherwise, there is always a question of whether the treated and untreated children were somehow different to begin with. To get around this, one must show either than treated and untreated children were randomly assigned to those conditions, or that a comparison group very similar to the treated group could be

identified and given the same assessments. Many early childhood programs fail this test. The other problem that must be addressed is whether treatment effects last long enough to make any practical difference for the treated children. If they do not, then it can be argued that the program was ultimately ineffective. Most early childhood programs do not have the resources to follow their samples and assess their status in adulthood. Two early childhood programs, mounted years ago, do have control groups that allow for outcomes to be measured in treated and untreated children and also have long-term follow-up data. One is the Early Training Project in Tennessee, the other is the Perry Preschool Project located in Michigan. For the Early Training Project, follow-up studies showed that those who attended the preschool program were less likely to be placed into Special Education while in school. Girls, but not boys, in that project earned higher scores on an English test. In addition, if treated girls became pregnant before high school graduation, they were more likely than control girls to go back and finish school after the birth of their child. The researchers found no significant differences in grade retention or rates of high school graduation (Gray, Ramsey, & Klaus, 1982). No adult data on vocational attainment, home ownership, or lawbreaking were collected for this sample.

More extensive follow-up information is available for participants in the Perry Preschool study. This was a half-day preschool provided for poor children aged 3 and 4. Children attended during the regular school year (about 8 months); most went for two years. Treated families had biweekly home visits. Follow-up evaluations showed that those with early childhood treatment earned significantly higher scores on 8th grade achievement tests, spent less time in special education, and were more likely to graduate from high school. At age 19, the treatment group scored significantly higher than controls on a test of general literacy (Berrueta-Clement, et al., 1984). At age 27, treated individuals earned significantly more money than controls, were more likely to own their own homes, less likely to receive social services, and less likely to have been arrested. Treated females were more likely to be married at age 27 and less likely to have a child out of wedlock. Males were less likely to have 5 or more arrests by that age (Schweinhart, Barnes, & Weikart, 1993). These "real-life" benefits have been quoted extensively in support of the value of early childhood programs.

The program whose long-term outcomes I will describe today, the Abecedarian Project, was quite different from either of these. First, it was not a half-day preschool for 3's and 4's, but an early childhood educational program delivered in a full-time child care setting. The Center operated from early morning to late afternoon, year round, not only during the school year or only during the summers. Children began attending in early infancy. The average age at entry was 4.4 months, with a range from six weeks to just over 6 months.

While the earlier preschool programs in Tennessee and Michigan approximated the Head Start model, few Head Start programs match the model of the Abecedarian study. Nevertheless, the Abecedarian study is relevant to Head Start. Only children from low-income families were admitted, just as, to be eligible for Head Start, children's families must meet low-income guidelines. Moreover, 98% of the Abecedarian participants were from African American families. Thus, the study sample allows its findings to be generalized to Head Start participants who are from similar economic and ethnic backgrounds. It also makes the Abecedarian findings relevant to the present seminar on the development of competencies in African American children.

It is especially important to examine long-term outcomes from the Abecedarian study to learn what long-term benefits can be achieved from a program so intensive and long lasting. However, long-term follow-up studies are difficult to do. Sometimes less than half the original participants can be located. Even if they are located, they may decline to take part in a long-term follow-up. Worse yet, the interests of major funding agencies may have shifted to other areas, so the money to conduct follow-up studies can be hard to find. However, we were lucky. Ultimately we had major support from the Maternal and Child Health Bureau, the Office of Educational Research and Improvement, and the Packard Foundation.

The Abecedarian study (Ramey, Bryant, Campbell, Sparling, & Wasik. 1988) was a randomized trial. Eligibility was determined on the basis of a High Risk Index (Ramey & Smith, 1977) that contained 13 sociodemographic factors including parental education, family income, family composition, and the like. Parents had to agree in advance to the condition of random assignment – that is, they did not choose

to be in the child care group or in the control group. The latter became known as the "Milk and Pampers" group because families not assigned to the child care condition were given free iron-fortified formula for the first 15 months of the child's life and free disposable diapers. The free formula was supplied to control for differences in the quality of nutrition during the first months when brain growth is so rapid; the diapers were an incentive for participation. Treated children were given free full time child care year round for the first five years, until they entered public school kindergarten.

From infancy, members of the caregiving staff were seen as teachers. "Learningames," that is, curriculum activities, were systematically assigned to each infant, toddler, or preschooler. The curriculum was designed especially for this project (Sparling & Lewis, 1982). One of its developers was regularly in the nursery, working with the teachers to assign games and deciding when the babies were ready for new ones. The child care program more and more resembled other high quality preschools as the children turned 2, 3, and 4. In all years, language and preliteracy development were given special emphasis, but the curriculum also included early math concepts, activities for gross and fine motor development, problem solving, and social skills. The model was eclectic, with both child-directed and teacher directed activities included. Child:staff ratios exceeded those required by the state of NC. Importantly, there was virtually no turnover in the teaching staff. In contrast to the average local wages for child care workers, the staff at the Abecedarian preschool was paid at a level comparable to that of teachers in public elementary schools. This probably was a significant factor in maintaining the staff, which in turn contributed to greater stability in the children's lives.

Treated children also had their primary pediatric care on site. Pediatricians and a Family Nurse Practitioner were available to check daily for illnesses, prescribe medicines, and give medicines during the day. They also conducted well-baby and well-child checkups and counseled parents on developmental milestones and child care.

At kindergarten entry, the preschool treatment and control groups were re-randomized to form four treatment groups, two of whom had educational support in the form of a home-school resource teacher for the first three years in elementary school. Treatment thus varied in timing and duration from 8

years in preschool and early elementary school (EE group), to 5 years in preschool only (EC group), to 3 years in early elementary school only (CE group), to none (CC group). When long-range outcomes are discussed they may be examined as a function of either the preschool (2-group) assignment originally made or in terms of the four-group assignment made at kindergarten entry.

Long-term outcomes for the Abecedarian study are especially important because it was one of the most intensive early childhood programs ever offered to children from poor families. Its design was scientifically rigorous. Its sample size is adequate to allow for a reasonable test of the treatment hypotheses (original enrollment was 111 infants) and attrition was minimal. At age 21, 105 of the original sample were living and eligible for study. One-hundred-four of the 105 took part in the follow-up.

Young adult outcomes of interest were possible changes in cognitive development, demonstrated academic skills, reported educational attainment, age at first parenthood, social adjustment, family circumstances and the degree of independent living the young person had attained.

Analytic strategy. For two reasons, outcomes were primarily analyzed as a function of the participants' original preschool group assignment. The first reason was that analyses of outcomes after three years in public school and in early and middle adolescent follow-ups showed that the effects of the preschool program were much stronger than any benefits of the school-age program. In addition, the most conservative way to test the effect of treatment is to use a "once-randomized, always analyzed" approach. It also allows for the inclusion of all adult data in its proper treatment group and thus gives a few more cases. The sample size is such that every case is important to increase the power of the analysis to detect differences.

Cognitive Scores

Figure 1 shows the longitudinal cognitive test scores from age 3 months to 21 years for those assigned to the preschool treatment and control groups. Figure 2 pictures the age-21 distribution of Wechsler Adult Intelligence Test-Revised (Wechsler, 1981) scores. Scores ranged from 65 to 114. As the figure shows, the score distributions for the preschool groups were similar for the treated and control

groups, but individuals in the preschool treatment group were more likely to earn high scores and more young adults in the control group scored in the lower ranges.

Although the absolute mean difference was modest, statistical tests indicated that the preschool treatment and control groups differed significantly on cognitive test scores at age 21, with those in the preschool treatment group, on average, scoring significantly higher than those in the control group ($F(1,100) = 5.71$, $p < .05$).

Academic Scores

Preschool group differences. Figures 3 and 4 illustrate the mean longitudinal Woodcock-Johnson Broad Reading and Broad Mathematics scores (Woodcock & Johnson, 1989) as a function of preschool treatment. Were these two figures superimposed, it could be seen that the children at age 8 were performing relatively higher in math than in reading, but math scores declined rapidly between ages 8 and 12 and showed no recovery thereafter, even though the effects of preschool treatment remained evident. In contrast, reading scores showed some initial decline after all treatment ended at age 8 but gained at age 12 in both the treated and control groups and remained relatively stable thereafter through age 21. Again, the effect of early treatment is always seen.

School-age group differences. A second analysis was done to determine whether lasting effects of the school-age treatment on academic test scores could be seen. There were detectable effects of school-age treatment on reading. An analysis that allowed a test of the linear pattern (EE>EC>CE>CC) was tested across 4 time points (ages 8, 12, 15, and 21) showed that, overall, the linear pattern was found for reading ($F(1,179) = 7.01$, $p < .01$. That is, collapsed across time, reading scores consistently showed a perfectly linear increase as a function of the number of years of early childhood treatment, ranging from none to eight. In contrast, the linear pattern approached, but did not attain significance for mathematics ($F(1,179) = 3.77$, $p < .06$). Mathematics scores were virtually identical for the two groups with preschool experience (EE and EC) whereas the group treated in the primary grades (CE) slightly outscored the untreated control group (CC).

One way to illustrate the effects of all four treatment conditions, that is of the extent to which the effects of the preschool program may have been sustained by the school-age program, and how much the latter could accomplish on its own, is to examine effect sizes for the four treatment conditions. Figures 5 and 6 show effect sizes (Cohen, 1988) for the Reading and Math scores of the three treatment groups contrasted with the scores of the untreated controls (CC) at four ages: 8, 12, 15, and 21 years. Effect sizes were calculated by subtracting the mean of the CC group from that of each of the other groups and dividing the remainder in each instance by the SD of the CC group. According to Cohen (1988), an effect size of .20 is considered "small", but may be meaningful, an effect size of .50 is "medium", whereas one of .80 is "large" (p. 40). By this measure, the Abecedarian treatment appeared to influence reading achievement more strongly than mathematics achievement. Through age 21, large to medium effect sizes for the full 8 years of treatment were found for reading; the effect size for preschool alone remained large through age 12, but was reduced to .28 by age 21. Mathematics test scores showed a medium effect size for the EE group at age 8, but the effect of preschool treatment alone (EC) equaled or surpassed that for the full 8 years by age 12 and thereafter. The effect size for school-age treatment alone (CE group) on mathematics was small at best, but fell above .20 at ages 12 and 21 years.

Real Life Benefits

Educational attainments. Individuals treated in preschool completed significantly more years of education by age 21 than did preschool controls. For individuals with preschool treatment, $M = 12.2$ years, $SD = 1.5$ years. For those in the preschool control group, $M = 11.6$ years of education, $SD = 1.4$ years, ($F(1,99) = 5.00$ $p < .05$). It is noteworthy that, for this measure, the interaction of treatment x gender was significant ($F(1,99) = 4.19$, $p < .05$). As can be seen in Figure 7, females with preschool treatment earned 1.3 more years of education ($M = 12.6$ years, $SD = 1.6$ years) than females without ($M = 11.3$ years, $SD = 1.4$ years). Males, in contrast, earned almost identical amounts of education irrespective of early childhood treatment: $M = 12.0$ years, $SD = 1.3$ years for those with early treatment compared with $M = 11.9$ years, $SD = 1.5$ years for those without. Individuals with preschool treatment were also significantly more likely still to be in school at age 21. Twice as many, 40.4 %, of those with preschool

treatment were currently in school compared with 19.6 % of those in the control group, X^2 (1, N = 103) = 5.28, p < .05. Moreover, almost three times as many individuals, 34.5 %, had attended, or were still attending a 4-year college compared to 13.7 % for the control group, X^2 (1, N = 103) = 6.11, p < .05. These precentages are illustrated in Figure 8.

Skilled employment. Many of the young adults were employed, either in full-time or part-time work. Forty-seven percent of the preschool treated group compared with 27% of the controls had jobs rated four or higher on the Hollingshead Index of Social Class (Hollingshead, undated). According to this classification system, jobs rated four qualify as skilled level employment. This difference was statistically significant (X^2 (1, N = 100) = 4.5, p = .05).

Self-Sufficiency. The treated and control groups did not differ significantly in the degree to which the members reported being economically self-sufficient, maintaining a home of their own, having their own means of transportation, or having medical coverage. Descriptively, young adults who experienced the early childhood program were somewhat less likely to be living in homes of their own at age 21 (40% compared to 60% of preschool controls), but were slightly more likely to have medical coverage than those in the preschool control group (60% compared with 40%). About half of each preschool group had cars of their own by age 21.

Parenthood. An important difference found at age 21 was that, on average, the individuals treated in preschool delayed having a first child by more than a year. The mean reported age at the birth of a first child was 19.1 years, SD = 2.1 years for the preschool treatment group compared with 17.7 years, SD = 1.5 years for preschool controls (F (1, 42) = 6.83, p < .05). The youngest parent in both groups was 15 years old when she or he reported having a child. Females were more likely than males to have a child by age 21 (F (1,93) = 4.54, p < .05). (See Figure 9.)

Self-reported substance abuse, violence and crime. Based on self-reports, early treatment appeared to have no significant impact on heavy drinking and/or the use of illegal drugs. Seventy-six percent of the preschool controls and 70% of those treated said they had either engaged in heavy drinking

or used an illegal drug. The percentages of treated and control participants who admitted to carrying a weapon or violent behavior during the past month were virtually identical: 33% of the control participants and 35% of those treated in preschool responded "yes" to any instance of either kind of behavior. Similarly, summing across self-reports of misdemeanor and felony convictions showed no significant differences related to early childhood treatment. For the preschool treatment group, 9.8% admitted to either a misdemeanor or a felony conviction while 3.8% (2 individuals) declined to respond to this question. For the control group, 23.5% responded "Yes" to one or the other; none declined to answer.

In sum, at age 21, those in the preschool treatment group earned significantly higher scores on tests of cognitive development. The mean difference was modest, but unlike the findings from most other early childhood programs, it persisted from early childhood to adulthood. Similarly, the young adults earned significantly higher scores on the mathematics subtest of the Woodcock-Johnson Psychoeducational Battery-Revised. More importantly, they were significantly more likely to be in school at age 21, and more likely to have attended a 4-year college. They were, on average, more than one year older than those in the control group when their first child was born.

It is interesting to note that the rates of high school graduation were similar for those in the preschool treatment and control groups. Rates of employment at age 21 were similar. There was not a reduction in law breaking associated with having been in the Abecedarian preschool program (Clarke & Campbell, 1998). Although it is of concern that the reduction in lawbreaking that the Perry Preschool investigators found did not replicate in the Abecedarian study, there is no evidence that being in full-time child care from infancy increased it (Clarke & Campbell, 1999).

Developmental Competencies

With respect to developmental competencies in African American children from low-income families, the Abecedarian young adult findings indicate that, if such children experience early education in a high quality child care setting, their chances of succeeding in school are significantly enhanced. Their chances of going beyond high school are significantly enhanced. Their chances of attending a 4-

year college or University are significantly enhanced. They are more likely to delay having their own first child, thereby giving themselves a better chance for self-development.

The early childhood program alone could not claim credit for these good outcomes. What the family provided by way of meeting basic needs, and giving love, encouragement, and emotional support was very important. However, under the logic of random assignment, group differences in these factors should have been randomly distributed across both groups, and thereby controlled in this study.

In their book, Head Start: The Inside Story of America's Most Successful Educational Experiment, Edward Zigler and Susan Muenchow (1992) conclude with several recommendations for the future of Head Start. Among these are:

(1) Provide full quality Head Start. Zigler and Muenchow suggest several ways to provide full quality for Head Start. Among them was to upgrade staff salaries and benefits. The Abecedarian study did this. They also urge that health services be strengthened. The Abecedarian treatment children had good primary pediatric care on site. These two authors also suggest making sure that the needs of multi-problem families are met. The Abecedarian study had social services on an "as needed" basis for families in both groups.

(2) Recognize Head Start as a full partner in welfare reform. Data not presented here showed that those Abecedarian mothers who were teenagers when their child was born benefitted differentially from the provision of 5 years of quality child care (Campbell, Breitmayer, & Ramey, 1986; Pungello, Campbell, & Miller-Johnson, 2000). Zigler and Muenchow urge that Head Start offer full-day, full-year services. If mothers have this benefit at a time when they themselves are free to pursue education and job training, they can attain more years of education be more likely to be employed later (Ramey, Campbell, Burchinal, Skinner, Gardner, & Ramey, 2000). The low-income mothers in our sample had many strengths. They wanted to better themselves, to find good jobs, and to take care of themselves and their families. Our findings indicate that child care is a part of the solution of getting mothers into

the work force. If it is high quality as the Abecedarian child care was, the children benefit significantly as well.

(3) Allow Head Start to service infants and toddlers. If it cannot be said with certainty that the Abecedarian benefits were as positive as they were because the treatment began in infancy, neither can that possibility be ruled out. What we do know, however, is that high quality infant care is seriously lacking in our society (Cost, Quality, & Child Outcomes Study Team, 1995). The Abecedarian study shows that children's cognitive development and academic progress need not suffer if they are in a quality child care setting from infancy. We cannot expect the same benefits from low quality care.

The trend to extend Head Start downward into infancy is supported strongly by the Abecedarian findings. Providing poor children with an educational environment from infancy forward is affirmed by these data. Early Head Start practitioners can be assured that their efforts would make an important difference.

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Figure 1

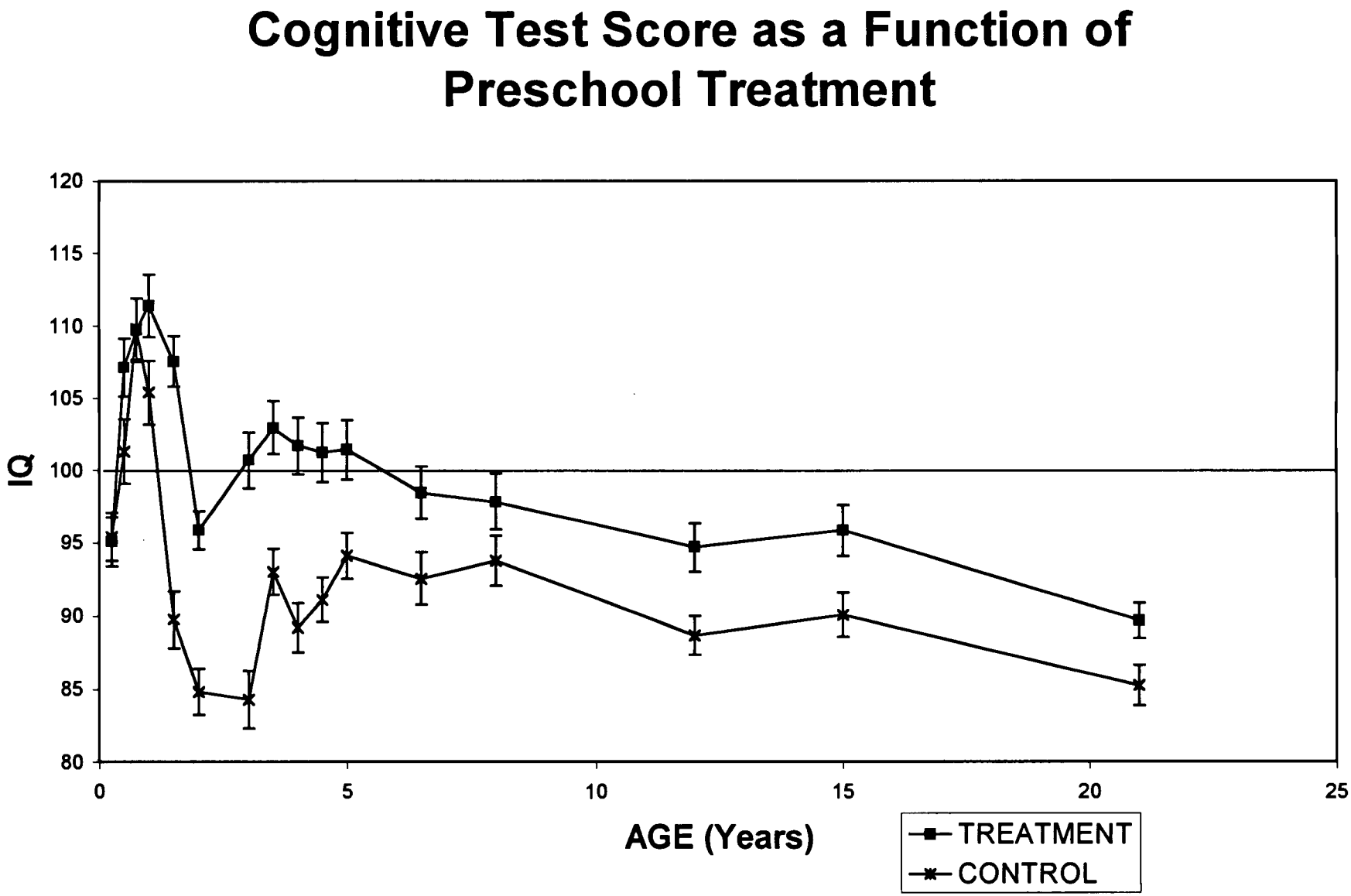
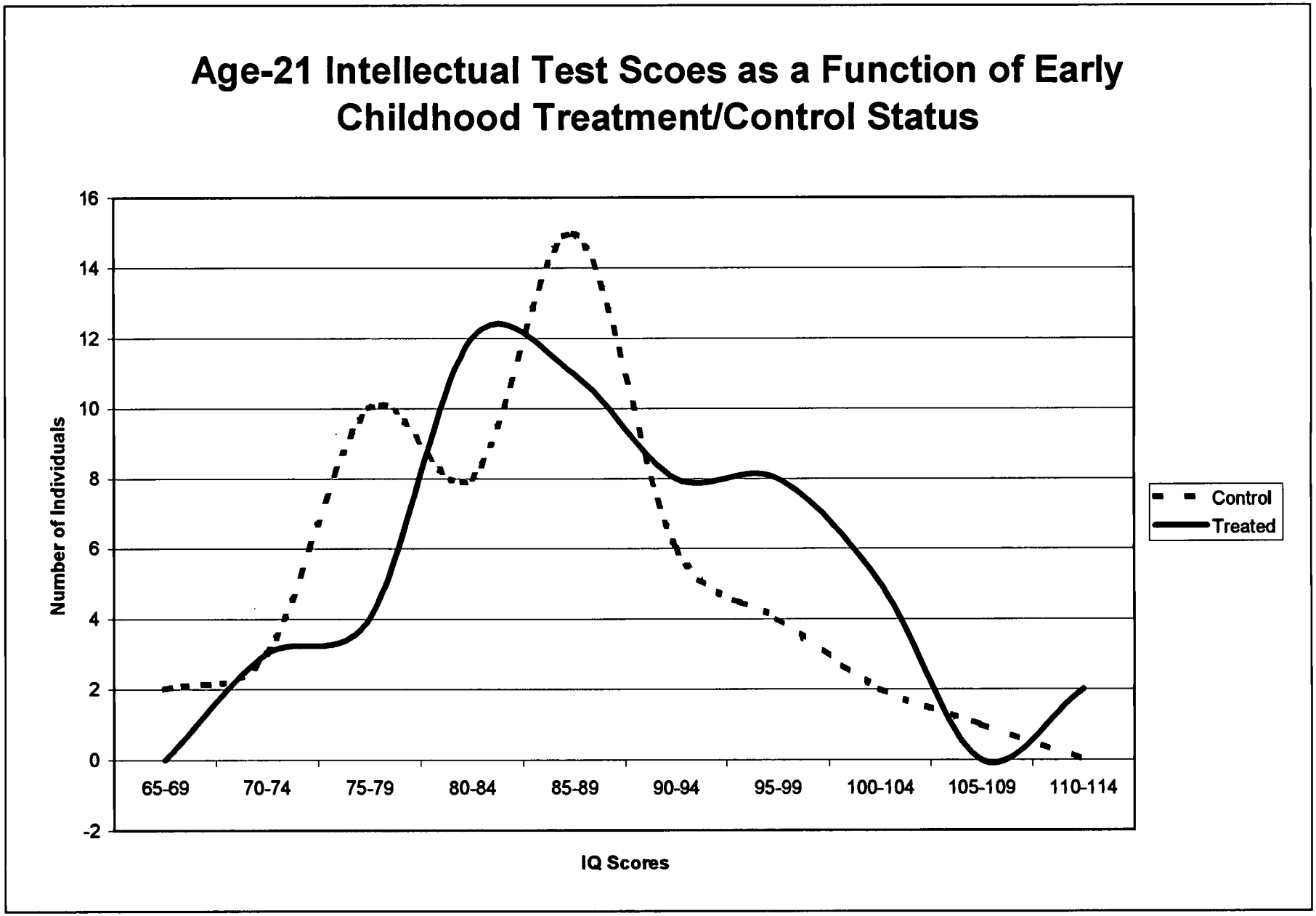
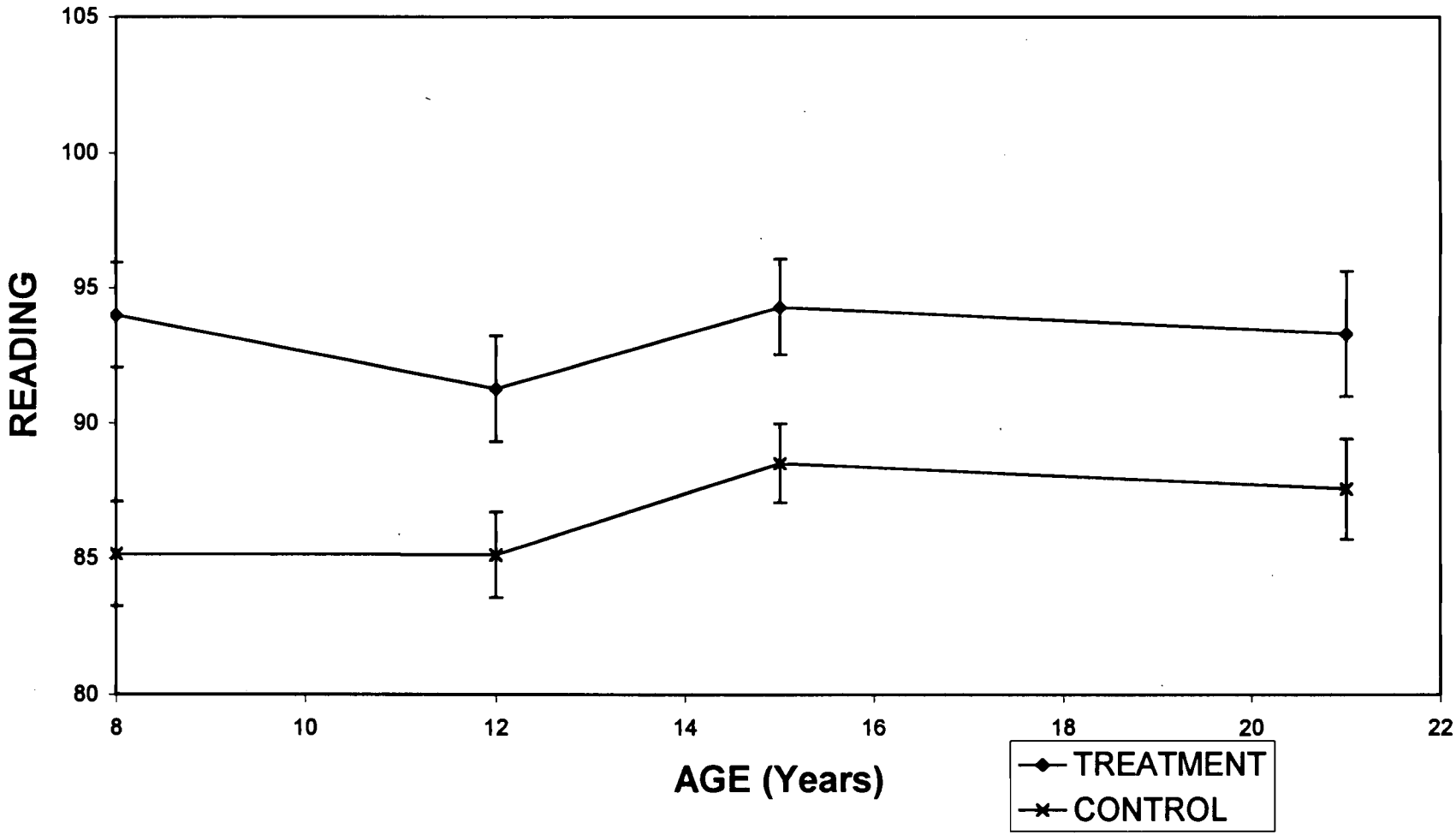

Cognitive Test Score as a Function of Preschool Treatment
IQ
120
115
110
105
100
95
90
85
80
0
5
10
15
20
25
AGE (Years)
TREATMENT
CONTROL

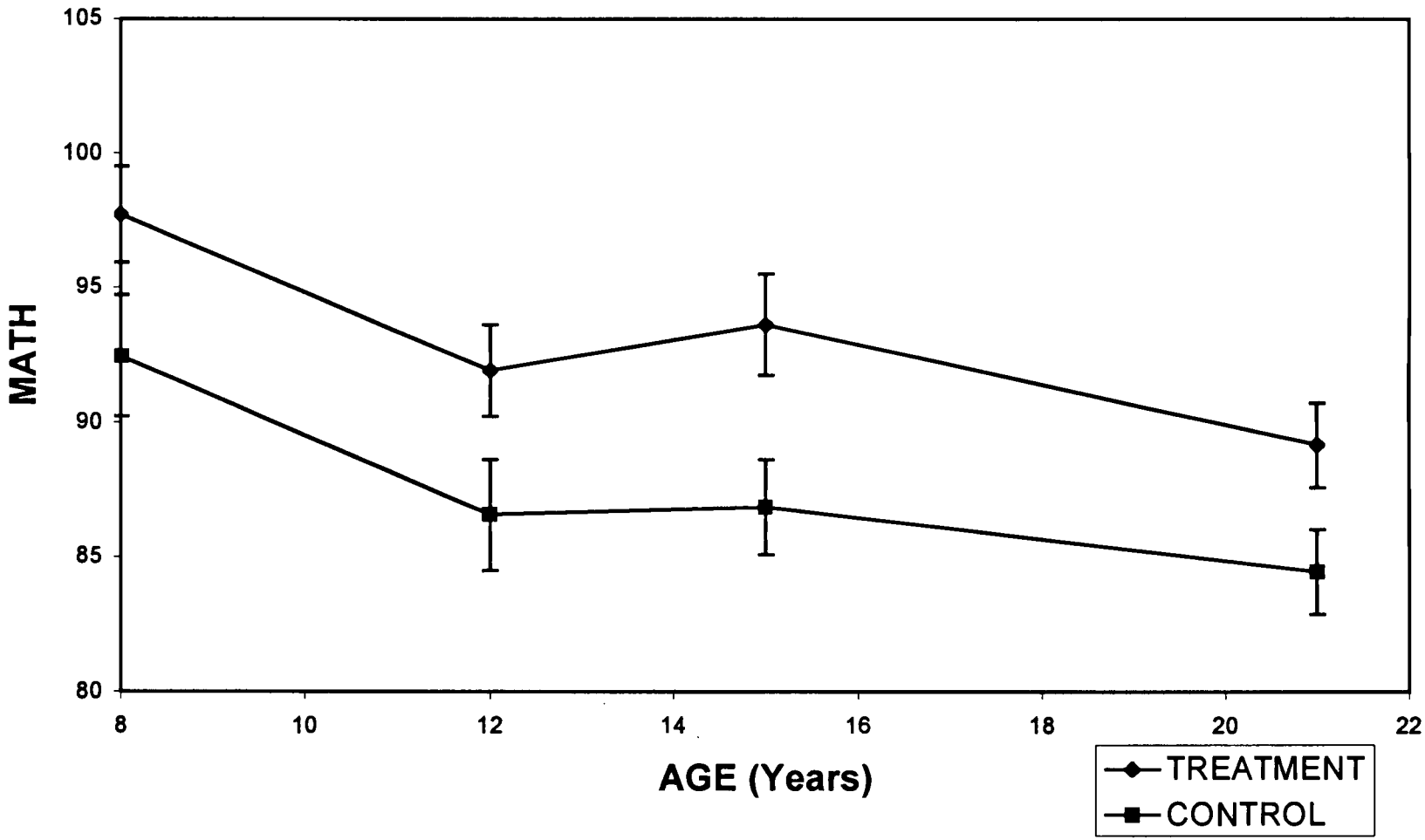
Figure 2


Age-21 Intellectual Test Scoes as a Function of Early Childhood Treatment/Control Status
Number of Individuals
16
14
12
10
8
6
4
2
0
-2
65-69
70-74
75-79
80-84
85-89
90-94
95-99
100-104
105-109
110-114
IQ Scores
Control
Treated

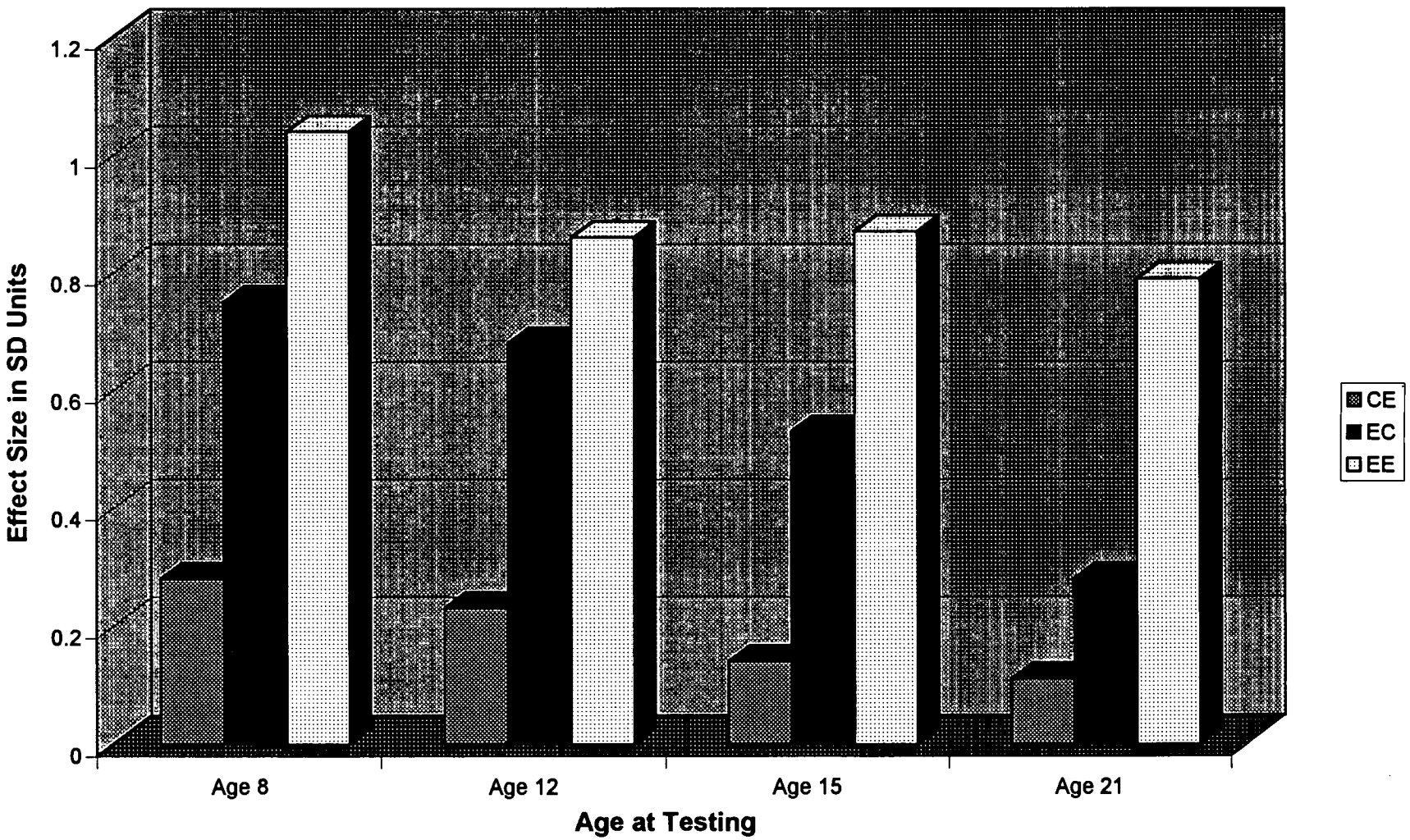
W-J Reading Achievement as a Function of Preschool Treatment



W-J MATH ACHIEVEMENT AS A FUNCTION OF PRESCHOOL TREATMENT



Effect Size for Three Treatment Intensities: Woodcock-Johnson Reading Score at Age 8, 12, 15, and 21 Years



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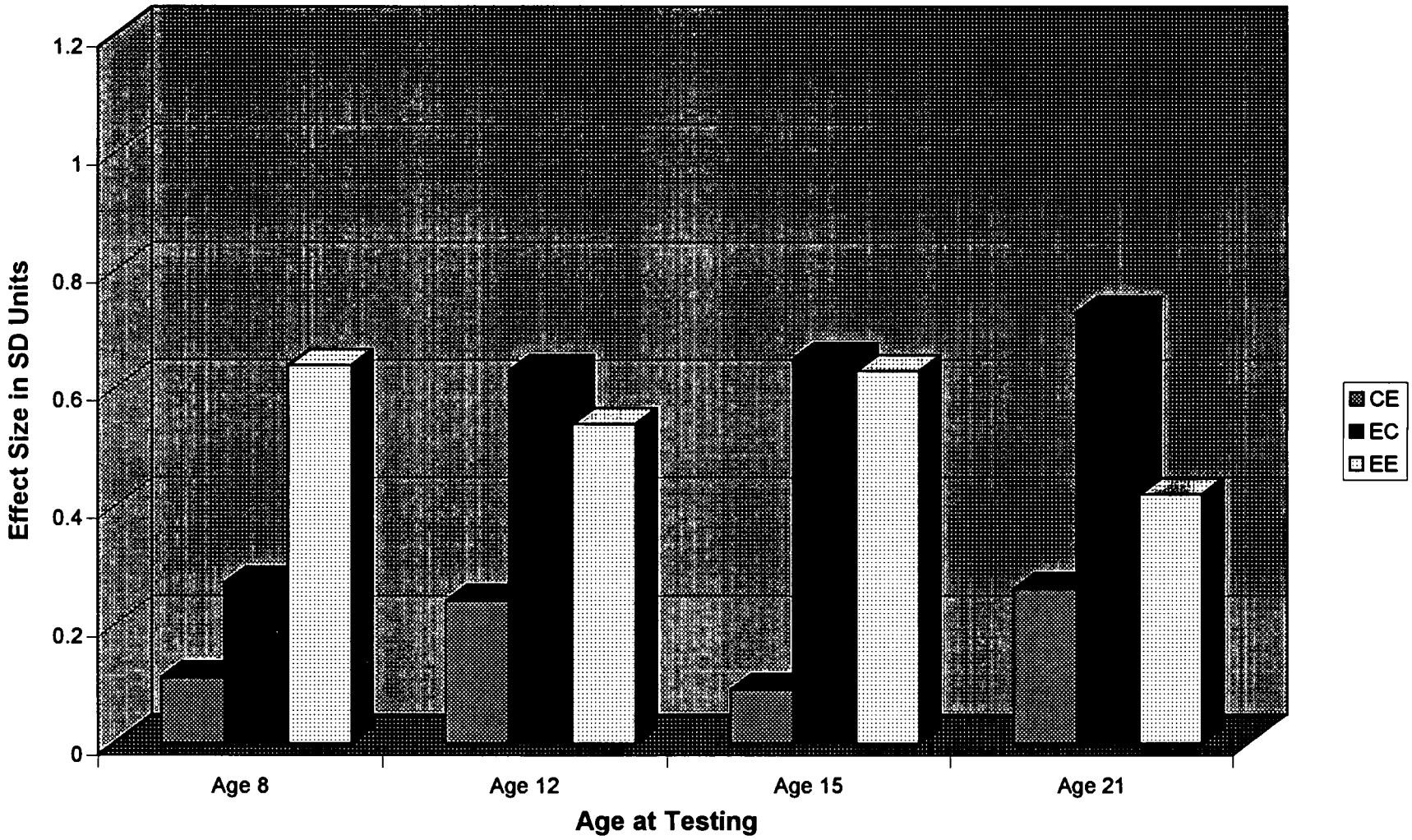
Effect Size for Three Treatment Intensities: Woodcock-Johnson Mathematics Score at Age 8, 12, 15, and 21 Years



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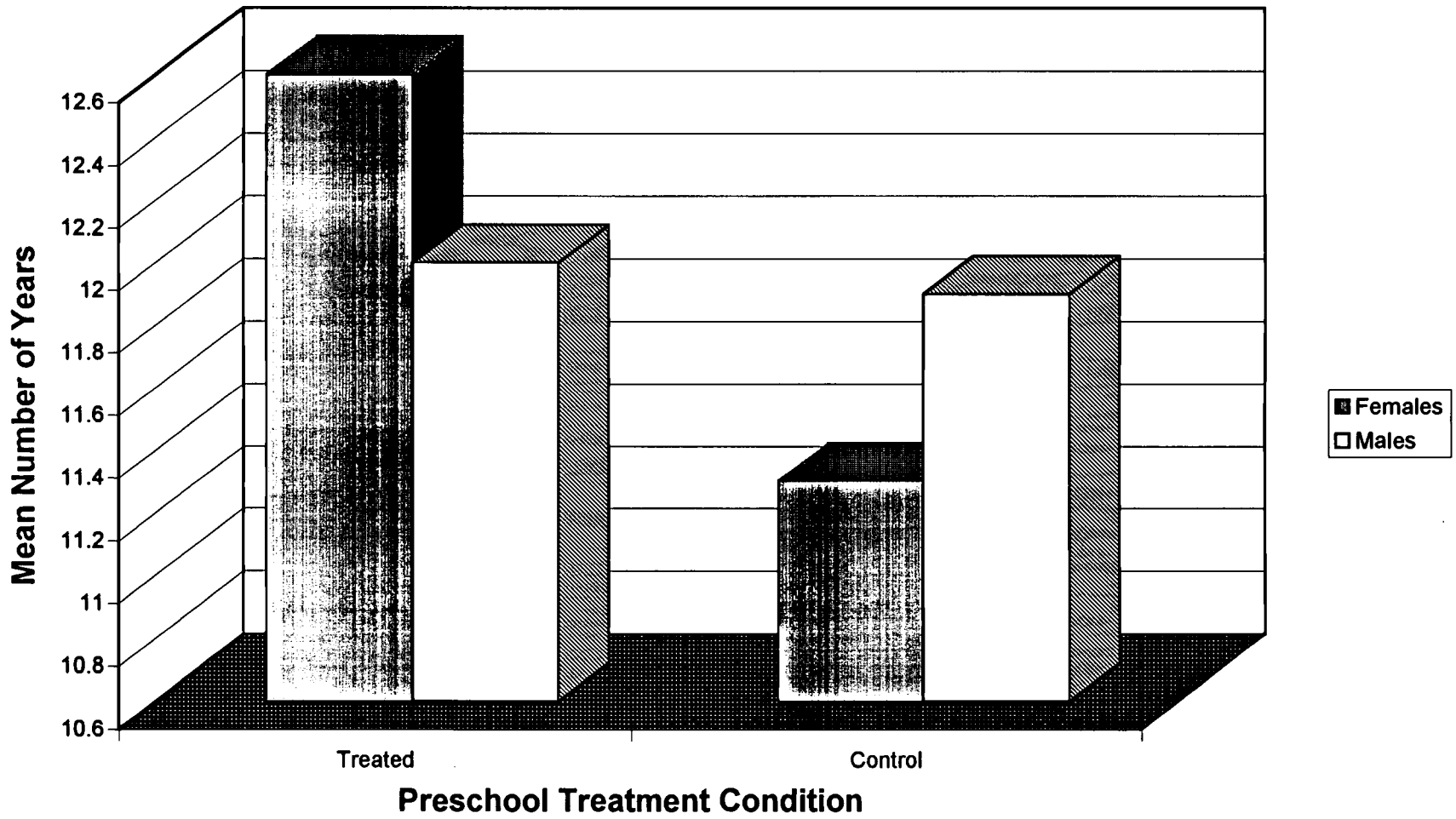
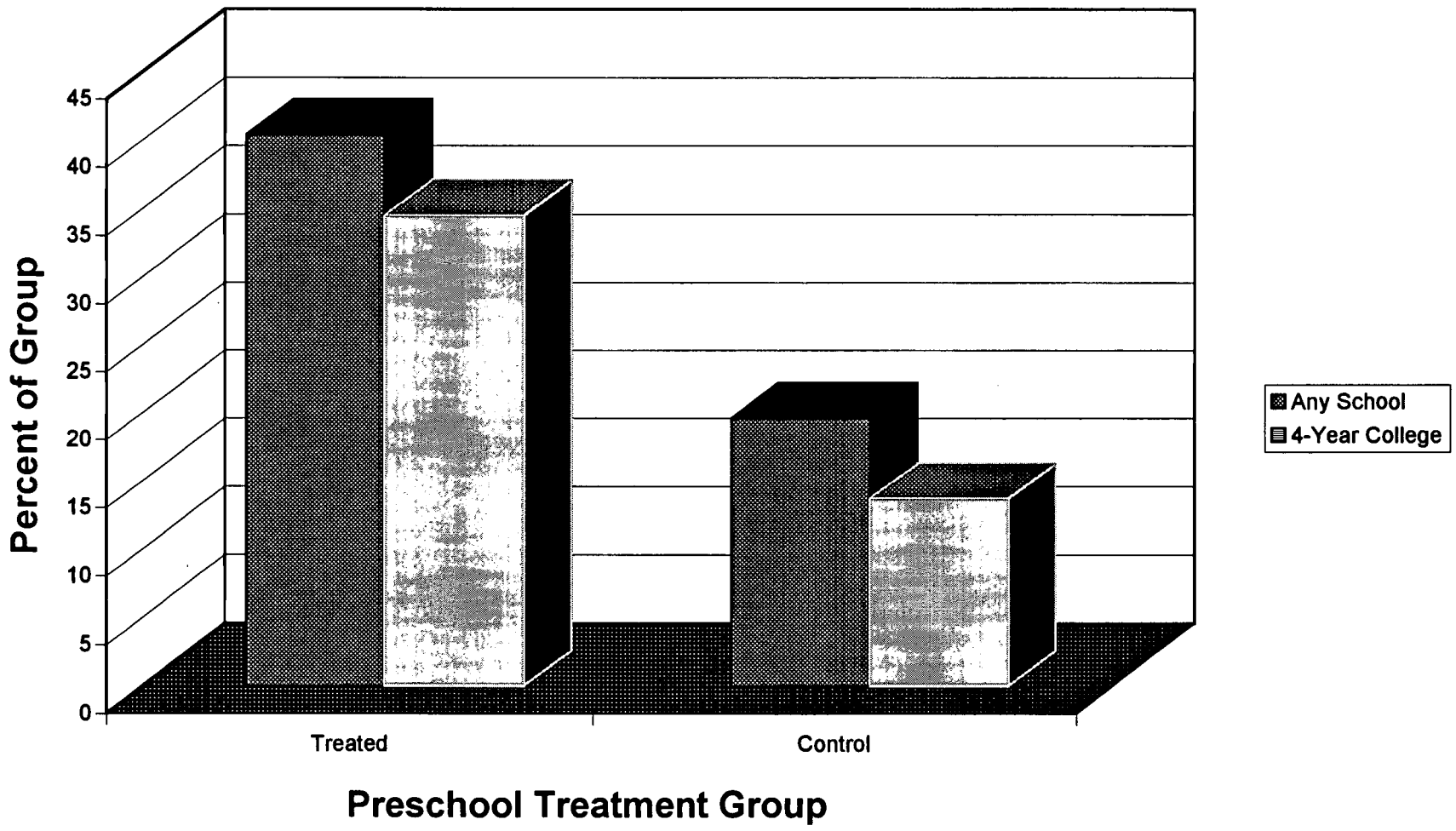
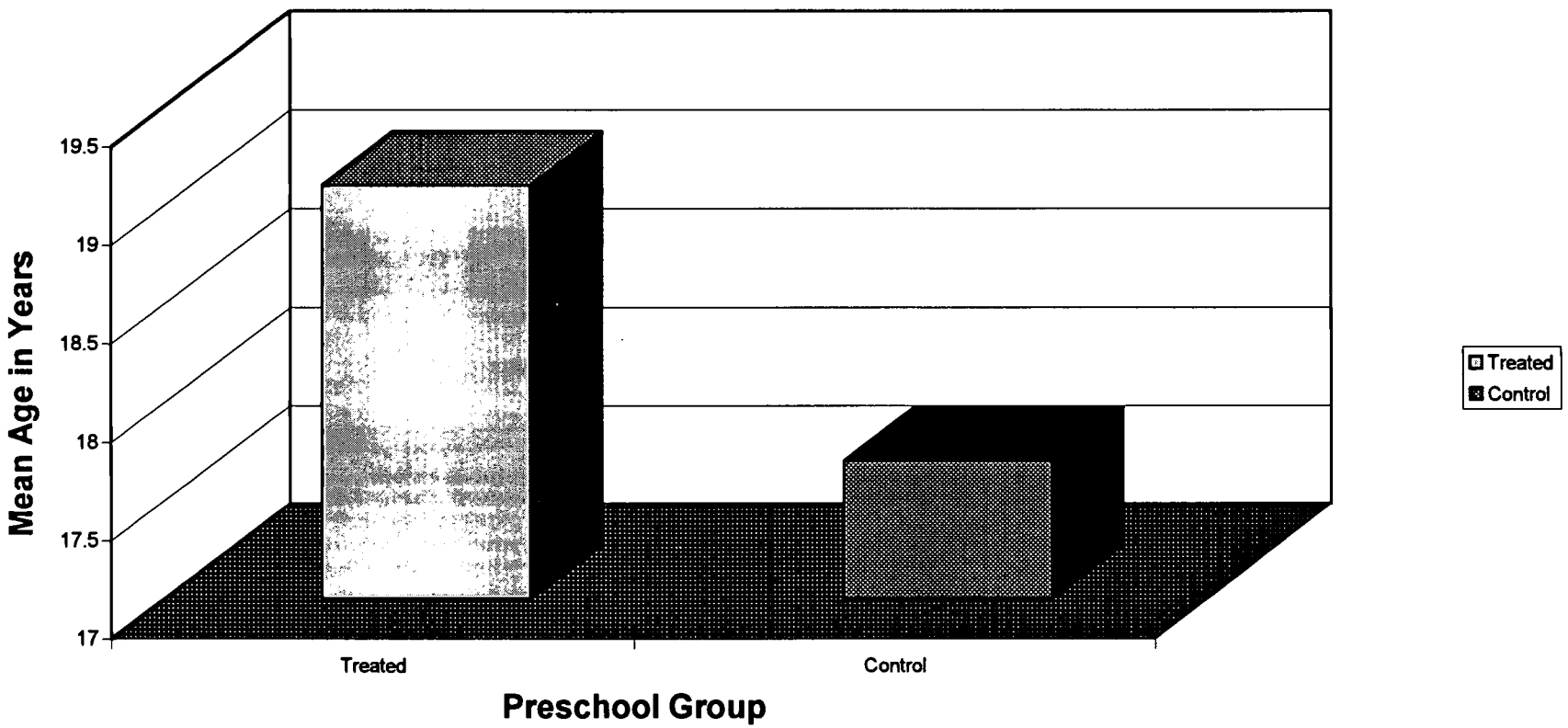
Mean Years of Education by Preschool Group and Gender



Percent of Preschool Treated and Control Groups Still in School at Age 21



Mean Reported Age at Birth of First Child in Preschool Treated and Control Groups



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