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ABSTRACT

Part of the Effective Programs for Students At Risk project, this study examines research findings concerning program effects on students attending either full-day or half-day kindergartens. Through use of the best-evidence synthesis technique, the study categorizes existing studies in terms of their methodological rigor and assigns most importance to the studies which are more rigorous. Findings indicate that under-achieving and disadvantaged students benefit from the additional instruction provided in full-day programs, but the benefits are found only on short-term measures. Disadvantaged students receiving additional instruction were the primary source of positive effects. No long-term effects were demonstrated. The synthesis suggests that the added time gained in a full-day program may be valuable to disadvantaged students, but the type of instructional program provided may be even more important. It is concluded that future research should examine what types of kindergarten instructional programs are most effective for disadvantaged students. (Author/RH)

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Report No. 11

April, 1987

FULL OR HALF DAY KINDERGARTEN— DOES IT MATTER?

Nancy L. Karweit

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The Center

The mission of the Center for Research on Elementary and Middle Schools is to produce useful knowledge about how elementary and middle schools can foster growth in students' learning and development, to develop and evaluate practical methods for improving the effectiveness of elementary and middle schools based on existing and new research findings, and to develop and evaluate specific strategies to help schools implement effective research-based school and classroom practices.

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This program focuses on improving the organizational performance of schools in adopting and adapting innovations and developing school capacity for change.

This report, prepared by the Elementary School Program, uses the "best evidence" synthesis technique to examine the comparable effects on students of attending full-day or half-day kindergarten. The synthesis is part of the Effective Programs for Students At Risk project.

Abstract

This study synthesizes research examining the effects on students of attending full-day vs. half-day kindergarten. Using the best-evidence synthesis technique, this study categorizes existing research studies by their methodological rigor and assigns more importance to studies that are more rigorous. This synthesis finds that under-achieving and disadvantaged students benefit from receiving additional instruction provided by full-day kindergarten, but the benefits are found on short-term measures -- no long-term effects are demonstrated. The synthesis suggests that the added time gained in a full-day kindergarten program may be valuable to disadvantaged students, but the type of instructional program provided may be even more important. Future research should examine what types of kindergarten instructional programs are most effective for disadvantaged students.

Introduction

Kindergarten attendance is nearly universal in the United States today <1>. About 93 percent of all five-year-olds are presently enrolled in school, primarily in kindergarten programs (Chorvinsky, 1982).

Although most five-year-olds attend some sort of kindergarten, the kindergarten experience itself is far from uniform. Kindergartens may be operated by public or private schools, may be academic or developmental in focus, may be in session for a full day every day or a half day every day, or more rarely, for a full day every other day. Kindergarten, as the introduction to formal schooling for many children, is an important experience, but one which clearly takes on different meaning for different children (ERS, 1986).

Are these differences in kindergarten experience important for children's social, emotional and cognitive development? What does the available research tell us about the short- and long-term effects of participation in kindergarten programs of different schedule, duration and emphasis?

At present, many states are considering extending the traditional half day kindergarten program to a full day. As more and more states and locales consider extending half-day programs to full-day programs, it is essential to understand what the likely impact of such changes will be. Is full-day kindergarten attendance

beneficial for children?

The current movement to extend the kindergarten day takes place within the context of a broader debate over what constitutes an appropriate learning environment for five-year-olds. Because the most common reason for shifting to a full-day program is to have time to incorporate an academic program into the kindergarten, the debate about the full day and half day is primarily one about the suitability of full-scale formal academic programs for five-year-olds. For many years, kindergarten education has been viewed mainly as a means to develop childrens' social and emotional lives, with little formal emphasis on academics. The kindergarten year was viewed as a year in which students matured to the stage at which they could benefit from formal schooling (Oliver, 1986). Questions about the academic effects of different features of kindergartens were largely irrelevant.

This orientation toward kindergarten as a socialization/ developmental year has given way to a view of kindergarten as an academic/preparatory year (ERS, 1986). Most of the programs in the public schools are currently focused either on academic preparation (63 percent) or on academics (22 percent) (ERS, 1986). As the program focus has changed, so has the length of the day. The 1961 ERS report on the status of kindergarten found that almost 90 percent of the kindergarten programs were half-day programs. Today,

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<1> At present, kindergarten attendance is mandatory in Florida, Delaware, Kentucky, South Carolina and Virginia while legislation is pending in Arizona, Connecticut, Georgia, Louisiana, New Hampshire, Oklahoma and Texas. (ERS, 1986).

as full-day programs have increased, about 67 percent of all public school programs are half-day.

Historically, the kindergarten began as a full-day enterprise. It was shortened to a half-day during World War II due to a shortage of teachers and building space and a burgeoning birth rate (Oelerich, 1984). The 1960's and 1970's saw an increased interest in full-day kindergarten, growing in part from an interest in compensatory programs for disadvantaged students. Consequently, the extension to a full-day program is not really new, but a return to the typical original kindergarten schedule. Of course, how the time is used -- in particular the shift toward an increasingly academic orientation -- is different.

Many childhood educators criticize the increasing focus on academics in the preschool and kindergarten, believing that early academics are harmful to children (Elkind, 1986). The stress created by the demands of the formal learning situation, rather than benefitting students, may well place them at risk of future academic failure. Those in favor of early academic programs argue that to wait until children are six or seven is to deny them services during a critical prime time for learning. Especially important are concerns over the future of disadvantaged students, for whom academic failure is an all-too-common beginning of a familiar pattern of school dropout, unemployment, and poverty. The full-day academic kindergarten is one current strategy aimed at the prevention of school failure.

Although there is no general agreement about the wisdom or even the benefits of the academic kindergarten, several recent events make it unlikely that the trend toward early academics will be reversed. One factor is simply the surge in enrollment in kindergarten. In 1901, only about five percent of five-year-olds were enrolled in kindergarten. By the late 1950's, the figure was about 53 percent. Today, around 93 percent of five-year-olds are in school (Chorvinsky, 1982). Most of these programs are in public schools (84 percent) (ERS, 1986). With the near universality of kindergarten attendance and the preponderance of public school programs, accountability questions are inevitable. Given that accountability in public schooling usually implies assessment of academic goals, the pressures for accountability have produced more emphasis on the academic outcomes of the kindergarten year.

The prevalence of kindergarten attendance and the acceptance of academic goals have blurred the former distinctions between kindergarten and elementary programs. Although kindergarten children may still occupy a particular part of the school building, they and their teachers are being incorporated into the elementary school proper. If children need to be ready to read in the first grade, then the kindergarten is called upon to prepare them with prereading skills programs. With the dovetailing of objectives, the kindergarten has become the lower end of the first grade curriculum in many places - clearly a change from a program which was focused primarily on social and emotional development.

Another factor shaping the nature of the preschool and kindergarten is the research evidence that early programs have both immediate and long term cognitive effects - especially for disadvantaged students. Successful programs, such as the Perry Preschool Program, have lent support to the entire area of preschool education. This support has often been or is being translated into additional funding to create new programs or to enhance existing ones - such as expanding the kindergarten from a half-day to a full-day program.

Yet, despite the present momentum behind providing more and longer preschool programs, it is reasonable to ask what the evidence says about the effects of such changes. Extending the kindergarten day increases staff and building costs appreciably. It is important to document the likely gains from such a change.

Existing reviews of the effect of extending the school day are not numerous, broad-based, consistent in their findings, or of uniform quality. In general, the reviews tend to find positive effects for full-day programs (Herman, 1984: Stinard, 1982; Hills, 1985). However, in looking at the studies upon which these reviews are based, it is clear that the studies themselves are of uneven quality. Because the reviews fail to control for the quality of the studies, poorly designed studies of dubious value are given the same weight as carefully designed studies. In the review conducted here, the results from studies which used random assignment or matched control groups are accorded greater weight than those which did not.

This review also examines the results by the type of population studied. Many of the studies focus on disadvantaged children only, so generalizations to the universe of schoolchildren is an issue.

The existing reviews do not present the results across studies in the same metric, so comparison of educational significance is problematic. Frequently studies will only present average values for two groups without the standard deviation. Or, studies will simply state that group A performed better than group B without any supporting data. Where possible, this review will present the effect size for full-day kindergarten, computed as the difference between the average score of the full-day and half-day groups divided by the standard deviation of the half-day group.

Lastly, the existing reviews of full-day and half-day have not always been sensitive to the fact that their program emphasis is often different. That is, the contrast being made is often one of program focus (e.g., academic versus developmental), not time. The extension to full-day often accompanies a change to an academic emphasis. Therefore, the effect of full-day includes both an effect of program and time. In the discussion of each study, we note, when data are available, the nature of the program.

Review Methodology

This review of the effects of the full-day kindergarten orders the available studies by the adequacy of their methodology and emphasizes the evidence from the more rigorously conducted studies.

We classified each study according to its method of assignment to treatment group (half- versus full-day) and its use of pre-post or posttest-only designs. Figure 1 categorizes the studies on full-day and half-day kindergarten along these dimensions. Studies which used random assignment to treatment and control and had a pre- and posttest of known validity were given the highest adequacy rank. Studies using matched treatment and control groups are ranked next, followed by studies which used convenience samples -- either intact and nonequivalent groups, or nonequivalent groups created by screening out "at-risk" students who scored below a certain cut off point. These studies typically used analysis of covariance procedures to adjust for pre-existing differences. Several studies which used a posttest-only design with nonequivalent groups are also briefly discussed.

Figure 1 About Here

Table 1 presents a summary of each of the studies, ordered by the adequacy of study design. We discuss the studies in this order. Effect sizes (the difference between experimental and control group means divided by the control group's standard deviation) were computed for this review based on available data using techniques described by Glass, McGaw and Smith (1981). The last column in Table 1 (Notes) is used to describe any non-standard computation procedure. When it is not possible to compute effect sizes, the general direction of the effect is indicated as (+) or (-) favoring full-day or half-day programs.

Table 1 About Here

Random assignment/matched control group studies

Johnson

Johnson (1974) randomly assigned students to half- or full-day programs in three separate experiments carried out in 1970, 1971 and 1972 in Princess Anne, Maryland. Each year, twenty students were assigned to a control (regular half-day) and experimental (extended-day) condition. The forty students were assigned so that each group contained equal numbers of culturally disadvantaged, economically disadvantaged, and middle-class children and males and females. On the pre-test (Walker Readiness), the experimental and control groups were virtually identical for all three replications (see Table 2).

The experimental and control children received the same curriculum; the additional time for the full-day group was used for enrichment activities. The full-day students attended school for five hours and fifteen minutes; the half-day students attended school for two hours and thirty minutes.

Readiness scores and achievement test scores were obtained for all students in May of the kindergarten year. Reading group placement in the fall of first grade was also used as an indicator

of program effectiveness. Reading level attainments at the end of first grade were used to examine longer-term effects.

Johnson's study illustrates a quality research design. In addition to satisfying the criteria of random assignment to treatment and control conditions, the study conducted the experiment on three occasions and examined effects after the termination of the kindergarten year. The major difficulty with the study is the small sample size.

Johnson compared the post-tests of the two comparison groups in the three experiments and concluded that "there was no statistically significant difference between full-day and half-day groups on any of these measures." We note that a .01 significance level was used in reaching this conclusion. Because Johnson included the actual raw data in her dissertation, it was possible to compute the actual significance levels, which are reported in Table 1. The effect sizes are also presented, even though with the small sample size these effect sizes cannot be considered reliable. The obtained significance levels do suggest, Johnson's conclusions to the contrary, marginally positive effects for the experimental group (full-day) in the first and third cohorts. There are no effects in the second cohort. The mean effect sizes across the three cohorts are .38 at the end of kindergarten and .21 a year later.

The Johnson study contributes much to the question of effectiveness of full-day programs, for it is the only study with random assignment to groups, with replications, with longitudinal

effects and with usage of the same curricula in both groups. This study suggests that extension of a regular kindergarten program by the addition of enrichment activities may increase children's readiness and achievement, but that the effects are not consistent or very large.

Johnson also examined whether full-day kindergarten was differentially effective for disadvantaged students. She pooled the three years of data for the culturally disadvantaged to obtain a subsample of twenty students in the full-day and twenty in the half-day treatment. The t-test reported for the difference between means (101.3 vs 95.0) was 1.128, for an effect size of .36.

The reading group placement of the experimental and control students in first grade was not consistently related to length of kindergarten day. Attendance at full-day kindergarten is related to placement only in the third cohort, the year which also shows the largest achievement gains for full-day attendees.

The description of the enrichment activities given during the full-day program suggests a model of diagnosis and prescription not atypical of remedial kindergarten strategies. Students' work is evaluated and the child is helped to succeed through a combination of independent activities, one-to-one tutoring, small-group instruction and learning stations. That is, students were basically given more time and additional feedback in a loosely structured extension of the regular kindergarten. The effects of this study, then, seem to represent effects for "more time" with supplemental resources, within the same curricula.

Winter and Klein

Winter and Klein (1970) also used random assignment to treatment and control groups in which the essential difference between the groups was the additional time and enrichment provided to the full-day students. They carried out two studies in which students were selected on the basis of a pre-test score to receive further instruction in an additional ninety-minute program. One study selected disadvantaged students; the other selected advantaged students. The small disadvantaged sample had only six students in the treatment group and seven in the control. Students were assigned randomly to treatment or control. Three tests were given: the Metropolitan Readiness Test at the end of kindergarten, and the Stanford Achievement Test at the end of kindergarten and at the end of first grade. The disadvantaged students showed positive and significant effects of the program on the Metropolitan at the end of kindergarten, but not on the Stanford at the end of kindergarten or at the end of first grade. The effect sizes are not very meaningful because of the small sample size.

The advantaged group study had twenty-six students in the treatment group and twenty-nine in the control. Significant pre-test differences, as measured by the Peabody Picture Test, favored the experimental group. Adjusting for these pre-test differences by analysis of covariance, the authors report that there were no significant differences on the Metropolitan or Standard tests at the end of kindergarten, but there were significant

differences favoring the full-day treatment group at the end of first grade. Table 3 summarizes these results.

Despite involving few students in the disadvantaged treatment group, the Winter and Klein study does suggest positive effects of extended-day enrichment programs. Studies by Warjanka and Slaughter (1982), which examined similar types of extended-day enrichment activities, are considered later in this review. These studies also show positive effects for disadvantaged students for this type of program.

Oliver

The dissertation by Oliver (1980) is a carefully conducted study which contrasts the amount of exposure of kindergarten students to a structured readiness program. In contrast to many studies in which it is not clear what comparisons are being made, Oliver's study presents a clear contrast of differences in the amount of instructional time spent in readiness activities. In the full-day program, the students were provided 585 minutes of instruction in readiness activities per week, while in the half-day program the students averaged 419 minutes per week. The study took place over 100 days in the school year. The control group contained sixty-one students in five classes; the full-day program contained ninety-eight students in six classes. Although they were not randomly assigned, treatment and control students were matched on age and pre-reading ability to form equivalent groups.

Oliver used analysis of variance with the classroom as the unit of analysis. He found that the full-day classrooms significantly exceeded the half-day classrooms on both the Clymer-Barrett and the Murphy-Durrell prereading inventories. The program used by both full- and half-day programs was Sound Start, a prereading curriculum developed by Durrell and Murphy (1976). The effect sizes presented in Table 1 are not comparable to other computed effect sizes because of the use of the class standard deviation, which inflates the effect size.

Non-matched control group/pre-post studies

The next studies discussed did not randomly assign students or classes to treatment and control conditions or provide sufficient evidence that the groups were equivalent prior to the treatment. Typically, these studies employed a pre-post analysis of covariance methodology. The reliability and validity of the pre-test measure is therefore important in these studies.

Carapella and Loveridge

Carapella and Loveridge (1979) examined the effects of an experimental program for low-achieving students in the St. Louis school system. Some five hundred students scoring below the 50th percentile on the Cooperative Preschool Inventory were invited to participate in an extended kindergarten program. Not all students who were eligible for the full-day program participated in it, and

234 of these eligible non-participants were used as a control group and compared to a selected group of participants, matching on pre-test and school (n=273). These 234 students attended the half-day program only. No discussion was provided as to why these eligibles did not participate in the extended-day program.

The class size in the extended-day program was not more than 15, and the major purpose of the program was to provide supplementary instruction. The students attended a regular half-day kindergarten program as well. The extended-day and regular kindergarten were expected to routinely exchange diagnostic and instructional information about the students taught jointly.

Analysis of covariance was used to examine program effects on CTBS reading and math scores given at the end of the kindergarten year. On both subtests, the extended-day program had a positive and significant effect ($p<.001$) with effect sizes of .32 and .43 for reading and math respectively. The study is also limited because self-selection effects may have benefitted the experimental group. For example, more achievement oriented families or those in which mothers held full-time jobs may have been more likely to participate.

Nieman and Gastright

Nieman and Gastright (1981) studied 551 Chapter I kindergarten students in Cincinnati, examining the short-term and long-term consequences of variation in preschool experience by comparing

achievement in kindergarten, fourth, and eighth grade. Students in a full-day program had also been in a preschool, while students in the half-day program had not typically had any preschool experience. Information was not supplied about what activities the full-day school experience included.

On the pre-test given in September of the kindergarten year, the two groups were not significantly different. This is especially noteworthy given that the extended-day kindergarten group had had more preschool experience than the half-day kindergarten group. The full-day program children scored significantly higher on the Boehm, administered in December, which the authors interpret as an effect of the program. The group also scored significantly higher on the April administered Metropolitan Achievement test.

Nieman and Gastright were able to follow up 70% of their sample in the fourth grade and 50% of their sample in the eighth grade. As fourth- and eighth-graders, the full-day program students scored significantly higher than the controls, although the computed effect sizes for these differences are modest (.25). Positive effects were also found for rates of grade retention and referral to special education programs.

Nieman and Gastright tested for the significance of pretest differences, but did not use the pre-test as a covariate -- instead, they used a post-test only design. Although not significantly different, the pre-test did favor the full-day group. An analysis of covariance, especially for the analyses of the December Boehm and

April Metropolitan would have provided stronger evidence for interpreting these differences as due to treatment and not pre-test differences. Undercontrolling for pre-existing differences remains a viable explanation for finding a large effect size. This is especially true because the evidence for no significant differences on the pre-test was a locally developed "goal card" of unknown reliability. Because data were not presented on the nature of pre-test differences nor on the activities/curriculum in the pre-school, it is difficult to know to what extent these differences reflect program or selection effects.

More importantly, although the students in the full-day program did not differ significantly from the students in the half-day program in September of the kindergarten year on a single test of unknown reliability, they clearly did differ in preschool experience, which was likely to produce at least short-term acehivement benefits (Weikart, 1986; McKey, 1985). Thus the fact of preschool attendance for the group of full-day kindergarten attendees is a serious confounding factor which calls into question the interpretation of these results as due to full-day kindergarten attendance alone.

Hatcher

Cognitive, affective and psychomoter development of children with differing kindergarten exposures were compared in a study by Hatcher (1978). One hundred twenty students from four school districts in Texas were matched on sex, ethnicity and contrasting

full-day/half-day kindergarten enrollment. Hatcher compared the growth in affective and cognitive areas for the students in the full-day and half-day programs and found no significant difference between the two groups. She concluded that length of kindergarten day was therefore not an important variable.

However, although Hatcher's study found no significant effects on the total scale, significant differences did emerge on three subtests measuring auditory discrimination, letter recognition and quantitative language, areas which are essential prereading skills.

Adcock

Adcock (1980) compared the academic performance of 189 Maryland students in all-day kindergarten groups (n=131) and half-day groups (n=58). Pretests were given in September of the kindergarten year and post-tests in the spring. The Metropolitan Readiness Test was used as both a pre- and posttest. No data were presented on the differences in pre-test between the two groups, nor were data supplied on the characteristics of the programs.

Using analysis of covariance to estimate the effects of the programs, Adcock concluded that effects of all-day kindergarten programs are highly significant ($p<.001$). Using the t value which produces this p, we estimated the effect size at .56.

Jarvis and Molnar

An examination of the effects of a city-wide change to full-day kindergarten in New York City was reported by Jarvis and Molnar (1983). The City of New York went to a full-day kindergarten in 1983. Some of the schools were unable to start their full-day as scheduled, but continued with the half-day program. Jarvis and Molnar used this naturally occurring variation in kindergarten schedule to explore the effects of full- versus half-day programs. Student growth across the kindergarten year was measured by the Brigance K and 1 Screen and by the Language Assessment Battery (LAB).

The schools which had half-day classes for the entire year were located in the most crowded districts. Comparison of place of birth for the full-day and half-day sample indicated that 7.5 percent of the full-day students were born outside the USA, compared to 14.5 percent of the half day students. About 40 percent of the full-day students came from non-English-speaking homes, compared to 57.5 percent of the half-day students. Thus, the students in the half-day program were probably more educationally disadvantaged than students in the full-day program and certainly more likely to have limited English proficiency.

The major question addressed in this research was the effect of full-day kindergarten on cognitive growth. Using an analysis of covariance and analyzing the effects separately for English and non-English speakers, Jarvis and Molnar found that the all-day

students had significantly higher performance on the Brigance than the half-day, for both language groups. They report effect sizes for fall to spring growth for the different groups (English, all-day = .99, English, half-day = .86; non-English, all-day = .96, non-English, half-day = .68).

Using the adjusted posttest means, we computed an effect size for the difference between full- and half-day for the English speakers (.09) and the non-English speakers (.43). This finding of the greater importance of full-day programs for language minority students is significant given that many locales may not have money to fund full-day programs in all schools. This study suggests a rationale for targeting money to students with limited English proficiency.

Evans and Marken

Evans and Marken (1984) compared the achievement of first, second and third grade students who had been enrolled in a half- or full-day program in kindergarten. An ex post facto design was used in which first, second, and third grade students were selected on the basis of earlier participation in half- (n=87) or full-day (n=87) kindergarten. The dependent variables were scores on the CAT and on the Early Childhood School Sentiment Scale (a 32-item self-report scale), teachers' ratings of students' personal-social classroom behavior and attitudes toward reading, and rates of referral to special education. All measures were administered at the same time, thus providing data on students one, two, or three years after exit from kindergarten.

Program effects were examined by analyses of covariance in which fall kindergarten cognitive-intellectual ability, grade level, sex, and program (full or half) were covariates. No main effects for program were found except for reading attitudes, which unexpectedly favored the half-day group. The authors conclude that additional time in kindergarten does not have long-term effects. Idiosyncratic interaction effects by grade and program were found. Teacher ratings showed lower task orientation for full-day students in grades 1 and 2, but greater task orientation of these students in grade 3. The authors suggest that the inconsistent findings in social-behavioral dimensions are probably due to cohort differences or differences in teacher rating behaviors.

The authors consider the most surprising finding of their study to be differences in the rate of referral to special education in the two studies. Among students who attended the half-day classes, 16 percent of all students were referred; in the full-day, 35 percent were referred. The authors speculate that the greater opportunity for evaluation and interaction by teachers in full-day programs could explain the discrepancy. However, they present no data on ability differences between the students while they were in kindergarten, so pre-existing group differences could be the major determinant of special education referral.

Derosia

Derosia (1980) compared the achievement of kindergarten and first- and second-graders who had attended kindergarten for a full-

or a half-day. She used analysis of covariance with pretest, parental SES, age, and sex as covariates. No data were provided to indicate the equivalence of the comparison groups. She concluded that the full-day enrollees performed better at the end of kindergarten, using the Boehm as the assessment device, but that there were no significant differences at the end of the first or second grades.

Warjanka

Warjanka (1982) examined the effect of an extended-day program on the achievement of low-performing students. Thirty students who scored less than 65 on the Metropolitan Readiness Test were enrolled in an extended-day program in addition to their regular kindergarten for a six-month period. The extended day was used to provide enrichment activities on the basis of the students' achievement. The achievement pre- and posttests of these thirty students were compared to forty students enrolled in the regular half-day program (same classes) only. At the pre-test, the extended-day group was one standard deviation lower than the half-day group on the Metropolitan Readiness Test. After six months of treatment, the extended-day and the half-day groups had identical scores on the Metropolitan Readiness Test.

Selecting students into a group for treatment on the basis of low test scores will naturally produce a later rise in test scores, due to regression effects (Reichardt, 1979). It is not possible to determine how much of the effect is artifactual and how much is

real. Nonetheless, the positive effects of Warjanka's study, coupled with evidence from other investigations, suggest the utility of adding enrichment and remedial activities for kindergarten students.

Slaughter

Slaughter (1982) compared the pre-post achievement test gains of students in an extended-day program to those enrolled only in a regular half-day program. The extended-day participants were 96 students who were identified as at risk of educational failure. This group received additional instruction in smaller classes and with a specific curricular approach (whole language). At pre-test the extended-day group was significantly lower than the regular group on the CAT listening skills subtest. After a year, the extended-day group had made significant gains while the scores of the regular group had declined.

Again, some unknown portion of this gain can be attributed to artifacts of the design (regression to the mean), so it is difficult to interpret these findings.

Lysiak and Evans

The study by Lysiak and Evans (1976) does not exclusively address the benefits of full-day versus half-day kindergarten, but includes the effects of different curricular approaches and full/half day programs. The comparison of half-day versus full-day was conducted in the context of particular curricula and for different

ethnic/social class groups. The study found that low SES children benefited from the full-day program in all curricula but especially in highly structured language-based curricula such as the Lippincott Beginning to Read, Write and Listen Program which was found to be most effective for low SES, high SES and Anglo and Black children.

Anderson

Anderson (1985) compared the math and reading achievement of an experimental 270-minute kindergarten program to a typical 190-minute control. Sixty children enrolled in two schools were selected to be in the experimental group. The most mature students were selected in one school; in the other, students were selected more or less at random. Comparison classrooms were matched to project classrooms on the basis of age, SES, and a kindergarten skills assessment.

The major difference between the two conditions was the amount of time allocated for different instructional activities. For example, the full-day treatment received 90 minutes of reading/language instruction while the half-day received 40 minutes. Anderson reports the actual time engaged in instruction to be 63 and 26 minutes, respectively.

The Stanford Early School Achievement Test (SESAT) was used to compare year-end scholastic achievement across the four classrooms. No data on initial achievement were supplied to indicate equivalence of the matched groups. Raw scores and grade equivalent scores for the different subtests are presented, although standard deviations

are not. Anderson reports that the full-day students "did significantly better on average than children in comparison classes in terms of their skills, knowledge, and understanding in reading, mathematics, social studies and science." However, no formal tests for statistical significance were reported.

Entwisle et al.

Entwisle, Alexander, Cadigan and Pallas (1986) used a large representative sample of Baltimore first graders to examine the extent to which kindergarten attendance promoted cognitive or socialization goals. The effect of full-day versus half-day kindergarten was not a major consideration. Separate means for full-day and half-day attendees were not presented, so it is not possible to compute an effect size for this study. They used structural equation models to test whether the amount of kindergarten experience was related to cognitive growth and/or socialization growth. The model examined the effects of amount of kindergarten on first-grade CAT scores, first-grade teachers' marks, and affective and socioemotional outcomes. They found that full-day kindergarten attendance, with sex, race, parents' educational attainment and pre-kindergarten experience controlled, had significant positive effects on fall verbal and math CAT scores, as well as first-quarter marks. Amount of kindergarten did not have corresponding effects on the affective variables. They note that the cognitive effects are generally stronger for blacks than they are for whites.

Examining the effects of kindergarten on first grade performance in the spring, the authors conclude that there is no significant long-term effect. Actually the effects on gains are negative.

The authors conclude that full-day kindergarten primarily affects cognitive, not affective, scores and that these effects are short-lived. Because the study indicates no reasons for enrollment in full- or half-day programs, and reports no control for entering kindergarten ability, the effects documented as treatment effects may really be due to selection effects.

Alper and Wright

The effects of a program in Phoenix, Arizona which doubled the length of the kindergarten day and also halved class size was reported by Alper and Wright (1979). They report that "percentage gains on the Metropolitan Readiness test were substantially higher for the extended day group." Actual means, standard deviations and statistical significance tests were not reported.

Non-matched/ posttest only studies

Humphrey

An often-cited study which shows positive effects of all-day kindergarten was conducted by Humphrey (1983) in the Evansville-Vanderburgh School district. The study compared the achievement and other outcomes in 1982 of two cohorts of students

(1979 and 1980) enrolled either in a half-day or full-day program. The full-day experimental group was matched with a half-day group on the socio-economic conditions of the schools. The 1978-79 cohort contained 81 students in the experimental group and 108 in the control; the 1979-80 group contained 115 in the experimental and 114 in the control.

The students' achievement scores at kindergarten entry/exit were not provided. The study instead compared the differences in the two groups in 1982, when the 78-79 cohort was in the third grade and the 79-80 cohort was in the fourth grade.

As with many of the other comparisons of existing full-day and half-day programs, the Humphrey study supplies no information which indicates initial equivalence of the groups or the curriculum so that we know who and what is being contrasted.

McClinton and Topping

McClinton and Topping (1984) studied the effect of an extended-day kindergarten in two public schools in Colorado. Their sample consisted of 80 children in 10 first-grade classrooms. Eight children from each classroom were randomly selected, balancing on half- and full-day attendance. No information was provided on the equivalence of the groups or on the reasons for attendance in different programs. The study employed a post-test-only design without evidence of initial differences or selection factors. The authors report that there were no significant differences in

end-of-year achievement between the two groups, but that the teachers rated the full-day attendees more favorably than the half-day group. They suggest, therefore, that one of the intangible benefits of the full-day program is the favorable perception of the first-grade teacher of student's preparation for and adjustment to first grade.

Additional data indicated more favorable parental attitudes in the full-day program, with differences in parental rating of growth in self-confidence, independence, and ability to work with others favoring the full-day program.

Although these results are plausible, the weakness of the study design makes it impossible to adequately evaluate. Without knowing how children were selected into full- or half-day programs or their characteristics at the beginning of the program, we have no way of knowing whether the differences in ratings are due to pre-existing student differences or to the program.

Harman

Harman (1982) located three schools in the Paterson (NJ) School District which had both extended-day and half-day programs. No information was supplied on how students were selected for attendance in the two programs or on initial differences upon entry. The post-test only design compared the spring achievement of the fifty-five students in the half-day with that of the sixty-six in the extended-day, but reported that the results are not significant

at the .05 level. Actually, recomputation of the t values for math and reading indicate that, in fact, the math scores of the extended-day group are significantly higher than those of the half-day group ($p<.05$). But without data on the initial equivalence of the groups or information on the selection procedure, it is not possible to know whether these differences are due to treatment or were already in place prior to treatment.

Chicago's Government-Funded Programs

The major conclusion from an analysis of Chicago's government-funded programs was that class size, not length of day, is the important element in student achievement. Examining the achievement profiles from 110 schools, mostly in poverty areas, the study concludes that the strongest influence on kindergarten achievement is the pupil/teacher ratio. It reaches this conclusion by comparing the percentage of students scoring in the lowest quartile across contrasting classroom conditions.

Table 1 shows the proportion of students scoring in the lowest quartile for different program types. The Chapter I half-day kindergarten with a class size of 16 has 26 percent in the bottom quartile, while the board-funded half-day kindergarten with twenty-eight students had some 73 percent in the bottom quartile.

The study concludes that class size, not length of the kindergarten day, is the important element in succeessful kindergarten programs. However, the weakness of the study design

limits the interpretability of these findings. There is other evidence (primarily in the PRIMETIME studies) of similar effects for reducing class size in the kindergarten year. Still, we do not have available convincing studies which have simultaneously varied classroom size and the length of the kindergarten day.

Conclusions

Table 1 summarizes the effects for all-day kindergarten across studies. It is clear that the effects for full-day kindergarten are inconsistent, partially because of differences in study methodology, tests, programs and populations served. To reach any conclusions about the effectiveness of full-day kindergarten, we need to group studies by design, by timing of the assessment (long-term versus short-term effects) and by population served (regular or special needs students). Table 2 presents these groupings for those studies which used either random assignment, matching, or analysis of covariance on nonequivalent groups. Studies using posttest-only designs are excluded.

Each cell lists the study author and the direction of the effect. Some studies are counted in more than one cell, such as studies which examined both short-term and long-term effects. The Johnson study involved three separate samples, but is counted only once. If a study gave multiple posttests and found a significant effect of any test, it is counted as a positive effect.

Table 2 suggests where the effects of all-day kindergarten programs are located. Disadvantaged students who receive additional instruction are the primary source of the positive effects. Nine studies focused on the effect of full-day kindergarten for underachieving and disadvantaged students. Of the two strongest studies using random assignment, one showed significant effects for the full-day kindergarten treatement. The bulk of the studies fell into the less methodologically rigorous category. All seven studies in this category found positive effects for all-day kindergarten.

It is clear that there are no long-term effects demonstrated for attendance at full-day kindergarten. The only study to demonstrate significant long-term effects was Niemann and Gastright's (1981), but limitations of this study limit the credibility of the results. First, the study compared students who had preschool and all-day kindergarten to those in half-day programs, a somewhat different comparison than in the other studies. Second, their test for equivalence of the two groups at entry into kindergarten was of unknown validity and reliability. Finally, the long-term results in the 4th and 8th grade included only 70 and 50 percent of their initial samples. Sample attrition may have been differentially important.

Other studies focusing on the effects of compensatory efforts (Lazar, 1985; McKey, 1986) have found that the results of the extended-day/year are primarily immediate and not long-term, and our findings support this conclusion concerning the effects of full-day kindergarten.

The finding that full-day kindergarten programs seem to be most effective in the case of short-term measures for disadvantaged populations raises many new questions. To what extent is this finding due to differences in the sheer amount of time in school or due to differences in program emphasis and focus? Although it is not possible to answer this question with these data, it seems possible that both a combination of more time and greater emphasis on academic preparation are important. Studies linking the allocation of time to differences in achievement results typically find only modest results (Karweit, 1985). One primary reason is that the same allocated time can have quite varied actual usages in different classrooms, depending upon the grouping patterns, the curriculum, the teacher and the students.

An observational study of kindergarten instruction in three school districts by Meyer (1985) illustrates this point. Contrasting the use of time in districts which have half-day and full-day programs, Meyer showed that the actual amount of time on academic matters was not all that different in the full- and half-day programs observed. The total minutes allocated to instruction in the half-day classes (150 minute sessions) was 78 minutes while in the full-day classes (330 minutes), the total instructional allocated time was 103 minutes. In general, the students in the full-day programs had more total minutes allocated to instruction, although some teachers in the half-day schedule actually exceeded the allocated time of some teachers in the full-day schedule. Again, individual teacher practices and

curricula seemed to be important elements in determining how the school day was spent.

This suggests that future studies of kindergarten and policies toward kindergarten need to be concerned with more than the issue of the length of the school day. What instructional programs are effective for kindergarten students? What difficulties are there in operating these programs in a full-day or half-day setting? Is it possible to have effective half day programs and thus save the considerable expense in expanding the kindergarten? And if districts decide to extend their kindergarten day, what programs have been demonstrated to be effective? Do they require a full day for successful implementation?

The limited research evidence on the relative effectiveness of different programs suggests that this is an important area in which to expand our future investigations. The limited evidence on relative program effectiveness suggests that some programs are more effective than others and for particular students. Lysiak and Evans (1976) compared achievement growth using six contrasting kindergarten curricula. They found that systematic and structured instructional models were effective for lower and higher SES students. They also found that the longer day was beneficial to lower SES and language minority students. Their study suggests that it is not simply the addition of time for disadvantaged students which is important, but the use of that time in particular and structured ways. The added time may be a factor simply because it

is very difficult to compress all that is needed to be done into the typical 9-11:30 schedule of the half-day kindergarten.

The major conclusion from this examination of the effects of full-day kindergarten is that attendance at full-day programs appears to be beneficial for disadvantaged students. The source of this effect -- whether it is simply more time in school, or a change in the focus of the kindergarten program which accompanied a shift to full-day -- is not clear. Future work will examine the nature of this effect in greater detail by focusing on the nature of the programs which seem to be effective for disadvantaged kindergarten students.

Table 1

Summary of effects of full-day
vs. half-day kindergarten programs

Random assignment/Matched Control Group Studies

Study	Sample	Treatment	Effects	Effect Size	Notes
Johnson (1974) Pre-post Random assignment Replicated Longitudinal effects	Princess Anne, MD 20 students matched on age, race, SES, sex and ability assigned to TRT (full-day) or CTL (half day) 3 experiments 1970,1971&1972	EXP= full-day (5'15") CTL= half day (2'30") Same curriculum Enrichment given full-day Measures: Walker Readiness Stanford Achievement Reading group grade 1	Fall/Spring Walker Readiness K Cohort 1 posttest 2 3 Spring Stanford Achievement Cohort 1 posttest only 2 3 Reading Group Placement 1st Cohort 1 2 3	 .66 p<.05 .58 ns .08 ns .13 ns .28 ns .59 ns .00 ns .06 ns .57 ns	
Winter and Klein (1970) Screened; then random assignment to treatment/control	Two studies: 1) Disadvantaged treatment and control selected from lowest 10% of kinder class TRT: n=6 CTL: n=7	CTL=attendance am/pm TRT=regular+90 minutes academic pgm No pre-test difference	Metropolitan at end of K Stanford at end of K Stanford at end of 1st	+3.01 p<.005 .62 ns .62 ns	
	2) Advantaged Selected trt & control from those most able to benefit TRT n=26 CTL n=29	CTL=attendance regular TRT=regular+90 minutes academic pgm Significant pre-test differences favoring TRT	Pretest Peabody Picture Metropolitan at end of K (adj post) Stanford at end of K (adj post) Stanford at end of 1st (adj post)	1.28 p<.05 - ns - ns 1.03 p<.05	
Oliver (1980) Pre-post ANCOVA No pretest differences Comparable program	61 students in 4 classes half day 98 students in 6 classes full-day Cambridge, MA	EXP=full-day with structured curric. 117 minutes/day CTL=half day with same structured curriculum 83.8 minutes per day	Clymer-Barrett Prereading Inventory Murphy-Durrell Prereading	2.84 p<.05 1.16 p<.05	Effect size inflated by use of class means

Table 1 (cont'd)

Summary of effects of full-day
and half-day kindergarten programs

Non matched groups/pre-post studies

Study	Sample	Treatment	Effects	Size	Notes
Carapella and Loveridge (1978) ANCOVA both groups eligible, control group of non-participants who were eligible	St. Louis public schools 507 students who scored below 50th percentile on CPI who were eligible for attendance at extended day kindergarten 273 enrolled 234 control	Supplementary instruction for kindergarten pupils using small group and individual instruction in extended day	Comprehensive Test of Basic Skills Mathematics Reading	 .43 p<.001 .32 p<.001	
Nieman & Gastright (1981) Existing sample Longitudinal Post only With evidence of initial equivalence	551 kindergarten students in 16 Cincinnati schools receiving Title I Full-day students had preschool experience, half-day did not.	EXP=full-day K (n=410) CTL=half day K (n=141) EXP also had preschool	Pretest (Sept Kinder "Goal card") Boehm (December Kinder) Metropolitan (April Kinder) Metropolitan (4th grade - 70% sample) Metropolitan (8th grade - 50% sample) grade retention special education	NS .35 p<.001 .35 p<.001 .25 p<.01 .25 p<.01 .13 p<.01 .25 p<.001	
Hatcher (1980) ANCOVA adhoc sample	4 school districts in Texas, 2 having half day K and 2 having full-day K 60 students selected at random	Half day vs Full day No information on curriculum or on differences in treatments	Metropolitan Readiness California Test of Personality Valett Developmental Survey Basic	ns ns ns	
Adcock (1980) ANOVA adhoc sample	189 urban and rural kindergarten children in 5 Maryland local education agencies Comparison of existing full-day and half day Ks	EXP=full-day(n=131) CTL=half day(n=58) Measures: Metropolitan (pre and post)	Results ANCOVA Post = pre + K type	.56 p<.001	estimated setting t=3.09, minimum value for p<.001

Table 1 (cont)

Summary of effects of full-day
and half-day kindergarten programs

Non matched groups/pre-post studies

Study	Sample	Treatment	Effects	Size	Notes
Jarvis and Molnar (1986) ANOVA half day sample schools in process of going full-day	New York City 1807 full-day K 223 half day K Citywide conversion to full-day K, Half day were ones unable to convert	Contrasts: Half day/language Full day/language Measures: Brigance Pre/Pst LAB Pre/Post	Results ANCOVA Brigance English speakers Non-English speaker LAB	 .09 ns .45 p<.05 .38 p<.05	
Evans and Marken (1984) pre-post ANCOVA students are at different points beyond K	metropolitan school district in Wash. state, mostly white, middle class 174 1st,2nd 3rd in 2 diff elem schools who had different kindergarten pgms	Contrasts: Full day(n=87) Half day(n=87) Measures: Ability test (kinder) CAT (1,2 or 3) Early Chd School Sentiment Teacher ratings Reading attitude	Results ANCOVA CAT Reading attitudes Referral special education	- ns + -.26 p<.05	
Derosia (1980) pre-post ANCOVA students are at different points beyond K	384 students in kindergarten, 1st and 2nd grades having full or half day kindergarten Jefferson City, Colorado	Full day (n=67) Half day (n=93)	Boehm (adjusted for pretest, SES, age) CTBS (Grade 1) CTBS (Grade 2)	.36 p<.05 ns ns	

Table 1 (cont)

Summary of effects of full-day
and half-day kindergarten programs

Non matched groups/pre-post studies

Study	Sample	Treatment	Effects	Size	Notes
Warjanka (1982)	30 students who scored < 65 on Metropolitan Readiness Test and 40 students who were in same K classes with scores >65	Six month treatment, regular Kindergarten + extended day curriculum based on participant's ability	At pre-test, FDK group 1 standard deviation lower than other group (37.8 vs 20.5) on Metropolitan Readiness Test After six-months of treatment, EKD group and regular group were same (54.3).	(+)	
Slaughter (1983)	96 students who were identified as at risk and 191 other K students	Additional instruction (119 to 242 hours) Smaller classes (15:1) Curricular change-whole language approach	pre-post design At pre-test FDK group significantly lower than regular group on CAT listening skills subtest (In NCEs, (24 vs 45). At post-test FDK made significant gains, while regular group declined. (36 NCE to 42 NCE)	(+)	
Lysiak and Evans (1976) convenience sample replicated two years	916 students in 111 K classes in Fort Worth, TX	Comparison of six curricular models, for students of differing SES, ethnicity and for full-day and half day	Full day > Half day for low SES and for high SES	(+)	
Alper and Wright (1979)	98 students in Phoenix, Ariz kindergartens in extended day and regular	Full day had longer day (5 vs 2 1/2) and smaller classes (12-25) Teacher visits to homes Three month study	Metropolitan Readiness Test Extended day > regular No report of significance level	(+) ?	no significance levels computed

Table 1 (cont)

Summary of effects of full-day
and half-day kindergarten programs

Non-matched groups/Posttest only studies

Study	Sample	Treatment	Effects	Size	Notes
Humphrey (1983)	Evansville-Vanderburg School District	Contrasts: 2 cohorts 78-79 full=81 half=108 79-80 full=115 half=114	Reading Gates MacGintie 78-79 79-80 CTBS 78-79 Grade Retention 78-79 19% Half 9 Full	(+) (+) (+) (+) (+)	Significance not reported
McClinton and Topping (1984) Post only No evidence of initial equivalence	80 1st graders in 10 public schs randomly selected Exp= enrolled EKD Ctl= enrolled reg	EXP=4'15" CTL=2'40" Major difference was amount of time, not curriculum	CAT at end of K CAT at end of 1st Teacher ratings academic ability EXP>CTL F(1,9) = 5.15 p<.05	- ns - ns 1.42 p<.05	
Harman (1982) Convenience sample	55 half day 66 full-day in K classes in same school and matched on ethnicity, mobility &SES	Post-test only design Comparison of CAT reading and math at end of year	CAT reading math	+.27 ns .40 p<.05	
Chicago's Govt Funded Kindergarten Programs Convenience Sample	110 schools Comparison of existing programs	Contrasts Funding source: Chapter 1 Chapter 2 OEEO Board Funded Format: All Day Half Day No pretests	Percent scoring in first quartile ITBS HDK, chpt 1, size 16 = 26% ADK, chpt 2, size 23 = 39 ADK, , size 26 = 46 OEEO , size 28 = 51 board HDK , size 28 = 73		

Figure 1

Studies of full-day and half-day kindergarten categorized by comparison group and test

	Pre-Post	Post only
Random Assignment	Johnson Winter and Klein	
Matched Groups	Oliver	
Not matched groups	Carapella and Loveridge Nieman and Gastright Hatcher Adcock Jarvis and Molnar Evans and Marken Derosia Warjanka Slaughter Lysiak and Evans Anderson Entwisle et al Alper and Wright	McClinton and Topping Harman Chicago Evaluation Humphrey

Table 2
Summary of effects for full-day kindergarten by quality of study, immediacy of effect and population studied

	Regular or Advantaged Students				Disadvantaged Students			
	Kindergarten		Long term		Kindergarten		Longterm	
Random Assign or Matched	Johnson	+	Johnson	0	Johnson	0	Johnson	0
	Oliver	+	Winter	0	Winter	+	Winter	0
	Winter	0						
Non matched	Hatcher	0	Evans	0	Carapella	+	Niemann	+
	Adcock	+	Derosia	0	Niemann	+		
	Jarvis	0			Jarvis	+		
	Derosia	+			Warjanka	+		
					Slaughter	+		
					Lysiak	+		
					Entwisle	+		

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