Relations Among Time Spent in Child Care Centers, Background Characteristics and Academic Performance of Entering Kindergartners

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RELATIONS AMONG TIME SPENT IN CHILD CARE CENTERS, BACKGROUND CHARACTERISTICS AND ACADEMIC PERFORMANCE OF ENTERING KINDERGARTNERS

A THESIS SUBMITTED TO THE FACULTY OF THE GRADUATE SCHOOL IN CANDIDACY FOR THE DEGREE OF MASTER OF ARTS

DEPARTMENT OF PSYCHOLOGY

BY

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INTRODUCTION

"Johnny can't read." The catch-phrase for years to describe the academic difficulties of American school children is still true today. In fact, many U.S. students meet only the most basic standards of performance in reading, arithmetic, and science (Mullis & Jenkins, 1990). In a world of global competition, American students continue to lag behind students from other countries in comparisons of academic achievement (Stevenson & Lee, 1990). Further, the risk of failure in school is even greater for the nearly one-quarter of American children who live in poverty (Committee for Economic Development, 1987)—these children are at increased risk of academic delays, poor self-concept, and increased likelihood of dropping out of school (Ramey & Ramey, 1990).

Studies have found that the academic difficulties of American students begin early in school, and that performance at the start of formal schooling sets a pattern that for many children has lasting implications for future success or failure in school (Alexander & Entwisle, 1988). Moreover, studies have found substantial variation in children's academic ability from the moment they set foot in a kindergarten classroom (Morrison, Griffith, & Williamson, 1993). These findings have demonstrated that powerful influences on literacy development operate prior to the beginning of formal schooling.

While the home environment is likely the most powerful predictor of a child's early development, a potential influence outside the home is attendance in center-based child care, affecting the lives of over 33% of American children (National Child Care Survey,
Studies have found a positive relationship between aspects of nonparental care and children's early school adjustment, classroom skills, academic skills, and behavioral conduct (Bates, 1994; Clarke-Stewart, 1990; Howes, 1988; Howes, 1991). Further, the benefits of early experience have been noted both in preschool intervention programs designed to foster the intellectual development of low-income children (Beurreta-Clement, Schweinhart, Barnett, Epstein, & Weikart, 1984; Ramey & Ramey, 1990) and in more typical child care settings (McCartney, Scarr, Phillips & Grajek, 1985; O'Brien Caughy, DiPietro, & Strobino, 1994). Lastly, child care has been found to compensate for the effect of home environments low in cognitive stimulation and emotional support (O'Brien Caughy, DiPietro, & Strobino, 1994).

In an effort to search for potential solutions for the academic troubles of American students, the current study investigated relations between time spent in center-based child care and early academic performance. It was hypothesized that the amount of time spent in child care centers prior to school entry was a source of the variation in childrens' academic abilities upon entrance to school. Moreover, spending time in center-care prior to school was suspected to be particularly beneficial for children from disadvantaged home environments (either economically or economically and educationally). Specifically, the study had three major goals: (1) To describe the nature of relations between the amount of time spent in child care centers prior to school entry and the background characteristics and academic performance of children entering kindergarten; (2) to determine the unique contribution of time in care (months) to the prediction of variance in kindergarten academic performance, beyond the variance accounted for by child and family factors; and
(3) to consider the possibility of a compensatory effect of time in center-care on the academic performance of (a) low-SES children, or (b) low-SES children from families providing a minimal literacy environment.
CHAPTER 1

ACADEMIC PERFORMANCE IN AMERICA: CAUSE FOR CONCERN

The shortcomings of American students in literacy domains such as math, reading, and science have been well-documented at the national level (NAEP, 1994) and become increasingly apparent in cross-cultural comparisons of achievement (Stevenson & Lee, 1988). In attempting to better understand the nature of the achievement troubles of American students, researchers have discovered that large individual differences in achievement exist as early as the beginning of kindergarten and that low levels of academic performance in early elementary school have lasting implications for later school adjustment (Alexander & Entwisle, 1988; Morrison, Griffith, & Williamson, 1993). Further, children living in poverty are at considerable risk of school failure (Ramey & Ramey, 1990), particularly those whose families lack an emphasis on education and literacy (Clarke, 1983). The following chapter highlights the complex nature of academic performance in America by presenting results of national and international studies of academic achievement, early schooling studies, and research on the school performance of lower-income children.

National Studies

An estimated 30 million Americans have serious difficulties with common reading
tasks, and 7 percent of the adult population reads below the fifth-grade level (Stedman & Kaestle, 1987). Equally serious problems exist in mathematics and science as well (Stevenson & Lee, 1990). Thus, national studies have been conducted to describe the academic performance of American students across varying age levels and over several years.

Results from a series of large scale national studies conducted by the National Assessment of Education Progress (NAEP) provide a glimpse into the nature of American students’ academic performance. Assessments of 9-, 13-, and 17-year-old students were conducted in several years since 1969 across a variety of literacy domains. While the level of performance across the years remained generally stable, the most current assessments indicate American students are not performing up to standards. Results of the 1988 assessment of reading suggested that while the majority of 9-, 13-, and 17-year olds performed adequately at the two lowest levels of reading proficiency (performing simple reading tasks, and understanding specifically related information), fewer percentages of these students reached higher levels of performance; less than 20% of 13-year-olds, and less than 50% of 17-year olds reached the third level of proficiency (finding, understanding, and explaining complicated information). Furthermore, only 5 percent of 17-year-olds reached the most advanced level (ability to synthesize and learn from material), and virtually none of the younger students reached this level.

Results for mathematics in 1988 presented a similar picture as the results for reading. Again, while the majority of students were proficient at lower levels, fewer students were proficient on more difficult tasks. For mathematics, 81-100% of students of each age
were proficient in the basics of math (addition, subtraction, etc.) but only 19% of 13-year-olds were able to solve more complicated computations (i.e. with decimals or fractions) and only 7% of 17-year-olds were proficient at the highest levels of math that involve solutions to multi-step problems or algebra. The results of reading and mathematics assessments suggest that although many students are functionally literate at a rudimentary or basic level of difficulty, a large portion of American students lack the skills needed to function at a higher level of literacy.

International Studies

The deficits in academic performance among U.S. students becomes even more apparent in international comparisons of achievement. In assessments across several industrialized nations, American students never placed first or second on 19 different tests of academic achievement, and placed last on 7 of these tests (NCEE, 1983). American students spend less time in school working on academic subjects, have less homework, are more likely to participate in nonacademic activities after school, read the newspaper less, are less likely to read for pleasure, are less likely to have their own desk than their peers in China or Japan (Stevenson & Lee, 1990).

In a cross-cultural investigation of academic performance, Stevenson and Lee (1990) compared both the top 100 and bottom 100 scores of a group of U.S., Taiwanese, and Japanese first and fifth grade students on tests of reading and mathematics. If the performance across cultures had been equal, 33 American students would have been in each list of scores. The results for reading are somewhat difficult to interpret because
American children were overrepresented in both the top 100 and bottom 100 scores across the cultures; however, the results for mathematics are clear. In first grade, American students comprised 56 of the lowest 100 math scores, but only 14 of the highest scores. In fifth grade, 67 of the lowest math scores were American students-- twice what would be expected if performance across cultures was equivalent-- and only one American scored in the top 100 math scores. These findings clearly document the sub-performance of American students.

**Early Schooling Studies**

Further investigations of the academic difficulties of American students have confirmed the existence of academic troubles during the earliest grade school years (Alexander & Entwisle, 1988; Morrison, Griffith, & Williamson, 1993). When children begin school, they enter a world of academic evaluations and standardized testing that influences their academic self-concept and has lasting effects on their school performance (Entwisle & Alexander, 1993). In a longitudinal study of the transition to formal schooling, Alexander & Entwisle (1988) found that although the academic performance on the California Achievement Test was similar for black and white children at the beginning of first grade, the gains in performance across the school year were significantly higher for white children. Not only does this finding suggest racial differences in the transition to school, but more importantly provides empirical evidence that variations in school performance begin early in school, placing some children at considerable risk of failure.
Another study has documented variability in children's academic performance (Morrison, Griffith, & Williamson, 1993). In this study, major individual differences in the academic performance of 531 children were found upon entrance into kindergarten on tests of mathematics (PIAT), reading recognition (PIAT), cultural knowledge (PIAT), and receptive vocabulary (PPVT). Some children scored as much as eight age-equivalent years higher than their counterparts on a given test. Further, possible sources of the variation in performance were considered, including particular background characteristics of the child and family. For example, children with higher IQ's scored 1 1/2 age-equivalent years above children with lower IQ's on a measure of receptive vocabulary (PPVT), and children from more educated mothers scored over a year age-equivalent higher than children from less educated mothers.

Lastly, both the Alexander & Entwisle (1988) and Morrison (1993) studies found that the early existence of variation in children's academic performance was predictive of later school performance. In the Alexander & Entwisle (1988) study, the gains in performance placing white children at an advantage by the end of first grade were sustained at least until the end of second grade. In the Morrison (1993) study, individual differences in performance remained stable in reading and receptive vocabulary, and increased in mathematics and cultural knowledge. These findings suggest that variations in performance from the moment children enter formal schooling establish patterns of performance which last at least throughout the early grade school years.
The Academic Performance of Children “At-risk”

Given the variability in academic performance in the early school years, an important goal is to identify which children are at-risk of low performance, and why. In this country, 25% of children under six years of age live in poverty, a factor placing them at considerable risk of developmental delays and school failure (Committee for Economic Development, 1987). Being poor has devastating effects on the educational lives of many low-income children, including lowered aspirations for success, low grades and standardized test scores, increased retention, and school dropout (Committee for Economic Development, 1987; Ramey & Ramey, 1990). Moreover, evidence suggests that these children are often viewed by teachers as immature and held to lower expectations than their higher status peers (Entwisle & Alexander, 1993).

The impact of the family may be especially important in preventing academic difficulties among low-SES children. In a study of Chicago families living in poverty, Clarke (1983) describes the impact of families in shaping their children’s attitudes toward and performance in school. Many low-income children lack adult role models who create a home atmosphere supportive of education and literacy experiences. These children arrive to school unfamiliar with the academic materials and activities so common to their more advantaged peers (Heath, 1984). Thus, out-of-home experiences such as time in child care may be especially beneficial for these children from economically and educationally disadvantaged home environments (O’Brien Caughy, DiPietro, & Strobino, 1994).
CHAPTER 2

IMPACT OF CHILD CARE ON COGNITIVE PERFORMANCE

Given the increased use of nonparental child care over the past decades, researchers have investigated the impact of child care on the development of young children. Studies of the influence of child care (especially infant care) on social development have been conducted, with great controversy. However, a body of child care research has examined the impact of care on children's cognitive development as well. The studies reviewed in this chapter were chosen as most relevant to the goals of the study, and are reviewed below.

Child Care and Cognitive Performance

Several studies have examined the relationship between aspects of child care and children's intellectual or academic performance, and these studies reflect the complexity of child care research: numerous interactions were found between aspects of child care (i.e. the amount, type, or quality of care), family variables (i.e. income level, marital status, beliefs about care) and different measures of school performance (i.e. academic tests, teacher grades, teacher-rated adjustment) or intellectual ability (test of language, memory, or general intelligence). Thus, the "effect" of child care on children's cognitive development depended on the particular independent and dependent variables chosen for
investigation, and the methodology of the study. However, many studies have found a positive effect of various aspects of care on children’s academic progress, school skills, behavioral conduct, adjustment to school, language development, and intellectual ability (Bates, 1994; Clarke-Stewart, 1990, 1991; Field, 1991; Howes, 1988, Howes, 1991, McCartney, 1984).

A study by Field (1991) demonstrated the long-term effect of the amount of time spent in child care centers on (number of months) on sixth graders (M 11.5 yrs) performance in school. Unfortunately, differences in the background characteristics between children with varying amounts of time in care was not addressed, due to the homogeneity of the sample (all children came from middle-SES, highly educated, dual-career families). However, the link between attendance in care and school performance was addressed: significant positive associations were found between the amount of time in care prior to school entry and assignment to a gifted program (r = .29*) and higher math grades (r = .38*) in sixth grade.

The Chicago Study of Child Care and Development (Clarke-Stewart, 1991) investigated the relationship between time in care and the “intellectual ability” among 150 children ages 2-4 in the Chicago area who attended a variety of child care arrangements for varying lengths of time (number of months and hours per day). Intellectual ability was a measured via standardized tests of language comprehension, memory span verbal fluency, and knowledge of concepts. Background characteristics were obtained through parent interviews regarding the occupation, education, income, and attitudes of parents,
and were controlled for in statistical analyses investigating the unique impact of aspects of care.

Similar to the Field (1991) study, the Chicago study did not describe relations between background characteristics of children with differential amounts of center-care experience, perhaps due to a restricted sample of higher-than-average socioeconomic status families (Clarke-Stewart, 1991). However, the researchers did control for family variables predictive of intellectual ability that confounded the relationship between aspects of child care and intellectual ability. In doing so, the effects of varying aspects of center-care combined (different types, quality, amount) predicted 1.8% of the variance in preschoolers' intellectual performance.

The authors of the Chicago study did provide a more detailed description of relations between time in care and the intellectual ability of young children, revealing complex and intriguing associations. First, when considering the total number of months and number of hours per week in child care centers including children not in care at all, the associations between these variables and preschoolers' intellectual ability were positive (r = .25* for number of months; r = .20* for hours per week). However, when considering only the subsample of children in care, the correlations were negative (r = -.20* for months, r = -.38** for hours per day). This suggested the data appeared curvilinear. Indeed, significant curvilinear relations were found between the number of hours per week in care and preschoolers' performance on intellectual tasks, with the highest mean score among the group of children with 10-30 hours per week in center-based child care.
Clarke-Stewart (1991) has pointed out that investigation of curvilinear trends in child care data has “for the most part been ignored in the day care literature” (p. 75). The Chicago Study provides evidence that relations between at least one variable, hours per week in care, and intellectual ability was nonlinear—in other words, more was not necessarily better. However, whether the obtained curvilinear trends reflected differences in the background characteristics of children with varying amounts of care, or a negligible or negative effect of too much time in care was not determined (Clarke-Stewart, Gruber & Fitzgerald, 1994). The present study attempted to identify the true cause of the curvilinear patterns by sorting out the relative influence of background characteristics and time in care.

**Intervention Programs**

Although many studies of child care investigated the impact on children from all home backgrounds, it seemed likely that some children would benefit more from spending time in child care than others. In this study, the focus was to consider a possible compensatory effect of time in child care centers on the academic performance of children from low-SES or low-literacy home environments. While the goal was to consider the impact of typical child care centers on these children, the motivation for the investigation was primarily the result of readings on the impact of Head Start and preschool interventions designed to improve the cognitive status of lower-income, disadvantaged children.

Perhaps the most frequently cited benefit of early intervention programs for low-income children has been the development of “social competence” among attendees,
reflected in lower rates of grade retention, special education, pregnancy and juvenile
delinquency and higher levels of health and school attendance than children not enrolled
(Berrueta-Clement, Schweinhart, Barnett, Epstein, & Weikart, 1984; Lazar et al., 1982).
However, the premise that these results are somehow more predictive of life-success than
IQ or other standardized tests has been seriously questioned (Locurto, 1991).

Literature focused on the cognitive development of low-income children includes two
types of studies: studies of Head Start, the federally funded program established during
the War on Poverty in the 1960’s (Zigler & Styfco, 1994), and studies of more specialized
preschool intervention programs that are usually of high quality and intensity (Consortium
of Longitudinal Studies, 1983). Despite considerable debates over the methodology and
criterion for success used in evaluations, the literature suggests some overall conclusions
regarding the effects of early experience. First, there is general agreement that early
intervention has no lasting-effect on the IQ scores of disadvantaged children (Head Start
Bureau, 1985; Berrueta-Clement et al., 1984). However, high-quality, intensive
interventions have been judged effective in preventing the “intellectual dysfunction”
associated with poverty when considering other standardized tests (i.e. academic
achievement, problem solving, language tests) in addition to IQ (Ramey & Ramey, 1990;
Zigler & Styfco, 1994). These conclusion warrant discussion of at least two major
points.

First, it may be that measure of IQ is less relevant to school success than other types
of measures—after all, it is the low performance of American students on academic (not
IQ) tests that has typically been of concern (i.e. Mullis & Jenkins, 1990; Stevenson &
Lee, 1990). However, given the strong association between IQ and academic performance (Locurto, 1991; Morrison, Griffith & Williamson, 1993), it may also be that relationship between early intervention and “intellectual” (IQ) performance is different than the relationship between intervention and “academic” (standardized tests of language, problem-solving, reading, or math) performance.

Second, the obsession with long-term effects of interventions in evaluations of effectiveness has been rightly criticized (Zigler & Styfco, 1994). Is it realistic to expect relatively short-term interventions to inoculate children from the effects of poverty throughout the grade school years? The initial goal of Head Start was to help children arrive to school with improved social competence and “mental processes” needed for success in school (Zigler & Styfco, 1994). When considered this way, the impact of intervention becomes clearer. Both Head Start and the Consortium for Longitudinal Studies (1983) evaluations found immediate gains in IQ and achievement test scores of participants when they reached the primary grades of school (Brown, 1985; Zigler & Styfco, 1994). For example, in one study, Head Start “graduates” scored significantly higher on the California Preschool Competency Test than their low-income peers who did not attend preschool (Lee, Brooks-Gunn, Schnur & Liaw, 1990). Thus, regardless of long-term effects, the benefit of intervention in helping low-income children enter school with improved cognitive status is evident.

Typical Child Care Programs
Although Head Start and other preschool interventions likely benefit low-income children in preparation for school, participation in these programs is costly and unavailable to many low-income children. Therefore, researchers began to determine the impact of more typical child care programs on the intellectual status of disadvantaged children, as a form of intervention (McCartney, Scarr, Phillips, & Grajek, 1985; O'Brien Caughy, DiPietro, & Strobino, 1994).

Perhaps one of the first studies to consider the possibility of typical child care as a form of intervention was conducted on a sample of low-income, Black children in Bermuda. (McCartney, Scarr, Phillips, & Grajek, 1985). The study compared the language and social skills of children 3-5 years of age attending a high-quality, government-sponsored day care to children of the same age range attending 8 centers of lesser quality. In this study, quality was considered an index of intensity of treatment (high-quality as more intense), determined by an observational rating scale (ECERS, Harms & Clifford, 1980). The groups were matched in terms of the range of maternal education and occupation levels, maternal score on the PPVT, and household size--thus directly (vs. statistically) controlling for the influence of family background. Results indicated that children attending the high-quality center scored significantly higher on the Peabody Picture Vocabulary Test-Revised (PPVT-R) and the Preschool Language Assessment Instrument (PLAI) than children of similar family background attending lower quality centers.

Although the Bermuda study highlighted the importance of investigations of typical child care programs as interventions, its' application to the child care experience in
America is unclear. A recent American study was conducted by O'Brien Caughy, DiPietro, & Strobino (1994), investigating the impact of child care participation in the first 3 years of life among children whose mothers were included in the National Longitudinal Study of Youth (1986). The purpose of the study was to explore interactions between patterns of child care (type, age of entry, total number of years in care) and either family income (although 90% of the mothers made < $30,000) or the home environment of the family (HOME-SF) in predicting 5-6 year olds mathematics and reading recognition scores on the Peabody Individual Achievement Test (PIAT). The HOME-SF, a maternal report of the “emotional support and cognitive stimulation” of the child’s home, determined the quality of the home environment. In this study, the amount of time in care was calculated as the total number of years in care (0-3) based on whether the child was in care at some point during each of the first 3 years of life.

The overall hypothesis of the study was that the impact of participation in child care (type, amount, age of entry) would vary as a function of income. One specific hypothesis was that more time in care was expected to be more beneficial for lower-income children who may not receive adequate stimulation at home. Indeed, an interaction was found between the total number of years in care and income for children’s reading recognition scores, in the expected manner. However, to explore the influence of the home on children’s performance, interactions between the HOME-SF and different patterns of child care were also investigated. In this case, no interactions between the home environment and the total number of years were found, but for children from homes with a low HOME-SF score, those enrolled in center-based child care scored higher on the mathematics test.
than children in other types of care. Overall, results of the study suggested a beneficial impact of child care experience on the mathematics and reading performance of children from low-income homes or homes scoring low on the HOME-SF.
CHAPTER 3
AN EMPIRICAL INVESTIGATION

Extending the Child Care Literature

The current study extended knowledge of relations between child care and children's academic performance in at least five ways. Specifically, when compared to the studies reviewed in Chapter 2, the current study: (1) Minimized the chances of schooling effects in accounting for the differences in school performance seen in the Field (1991) study of sixth graders by obtaining measures of academic performance upon entrance to school. (2) Included centers of varying quality when considering the impact of time in care on the academic performance of children of all socioeconomic backgrounds. (3) Focused on the impact of time in care among school-aged children (5-6 yrs) rather than preschoolers (Clarke-Stewart et al. 1984), and included measures of both intelligence (Stanford-Binet) and standardized tests of academic achievement (PIAT, PPVT). (4) Further explored the possibility of curvilinear relations between time in care and background and academic variables (Clarke-Stewart et al., 1984), focusing on the total number of months in center-care (vs. hours per week), and determined whether an obtained curvilinear relationship between total months and academic performance was confounded by significant curvilinear relations between total months and background...
characteristics, or was truly an effect of time in care. (5) Investigated the unique impact of time in typical child care centers on the intellectual and/or academic performance of children in America (vs. Bermuda--McCartney et al., 1985) and further included a direct analysis of the impact on a sample of children of low-SES and low-literacy homes (vs. separate interaction analyses which may or may not represent this group of children—O’Brien Caughy, DiPietro, & Strobino, 1994).

Goals of the Study

Before conducting the investigation, an initial step was to identify key goals the research would address. Based on the child care literature and questions of interest, three major goals formed the basis of the investigation: Goal (1): To describe the nature of relations between the amount of time spent in child care centers prior to school entry and the background characteristics and academic performance of children entering kindergarten. Goal (2) To determine the unique contribution of time in care (months) to the prediction of the kindergarten academic performance, beyond the variance accounted for by child and family factors. Goal (3) To consider the possibility of a compensatory effect of time in center-care on the academic performance of a) low-SES children, or b) low-SES children living in a low-literacy home environment.

Method

Participants
Subjects for the study were 531 children ages 5-6 enrolled in kindergarten classrooms in the Guilford County Public School System in Greensboro, NC. Sixteen schools participated in the study whose combined populations of children reflected the demographics of the larger population of Greensboro based on the locations and sizes of the schools. The sample included roughly equivalent percentages of blacks and whites and of males and females.

Background Information

Several background characteristics of the child and family were obtained from the parents and the child. Parent questionnaires provided information regarding maternal and paternal occupation, maternal and paternal education, maternal and paternal age, and number of months of center-based child care attended by the child. Parental education was defined as the total number of months of schooling. Parent occupation was the obtained score based on a ranking system of the relative prestige of various occupations. The short form of the Stanford-Binet Intelligence Scale (4th Ed.) was administered to children when they were in kindergarten to obtain the child's IQ score. Further, a parent questionnaire designed to measure the literacy environment of the home provided information such as who reads to the child and how often, reading habits of the parent and child, possession of library card, and television viewing habits. This measure of family literacy environment was used in creating the low-SES/low-literacy sub-sample of children considered most “at-risk” of school failure.
Academic Measures

Five academic measures were used in the study to reflect abilities in receptive vocabulary, reading recognition, mathematics, general information, and letter recognition.

Receptive Vocabulary

The child's level of receptive vocabulary was measured using the Peabody Picture Vocabulary Test-Revised (PPVT-R, 1981, Form L), in which the child was shown four pictures at a time, and asked to identify the picture that matched a word spoken by the experimenter. Scores were recorded in raw form.

Reading Recognition

The Reading Recognition subscale of the Peabody Individual Achievement Test (PIAT, 1989) was used to assess the child's level of reading recognition. This subscale consists of items of increasing difficulty from recognition of letters to reading longer words. The child's score was determined based on the standardized scoring system explained in the manual, using basal and ceiling levels to determine the score.

Math

The child's level of mathematic ability was evaluated using the Math subscale of the PIAT (1989). Items on the Math subscale increase in difficulty from number identification to complex word problems. Again, the scoring procedure from the PIAT manual was used.

General Information

The general information subscale of the PIAT was used as a measure of cultural knowledge. This test is designed to assess the child's knowledge of the world in which
he/she lives, and items are arranged in order of increasing difficulty. Basal and ceiling levels used to determine scores.

**Letter Recognition**

Letter recognition was measured using alphabet flash cards. Children were shown capital letters of all 26 letters of the alphabet, one at a time, and asked to name the letter on the card. The percent of correctly identified letters was recorded.

**Procedure**

Data for this study was obtained from a larger study of literacy conducted by Frederick Morrison, Ph.D. while at the University of North Carolina, Greensboro, NC. In the larger study, consent forms and background questionnaires were obtained through the schools at the beginning of the 1991-1992 school year. If consent was received, the academic measures were administered beginning in the fall of 1991 school year. Although further testing was continued throughout the early grade school years, only data from the initial testing will be considered in this study.
CHAPTER 4

RELATIONS AMONG TIME IN CENTER-CARE, BACKGROUND CHARACTERISTICS, AND ACADEMIC PERFORMANCE

This chapter presents the results of ANOVA’s and simple multiple regressions conducted to address the first goal of the study: to describe the nature of relations between the amount of time spent in center-based child care prior to school entry and the background characteristics and academic performance of children entering kindergarten.

Time in Center-care: No-care vs. Care

Background Differences

Initial analyses were conducted to consider differences in background characteristics between children who had or had not attended child care prior to kindergarten (N = 531). A series of one-way ANOVA’s with two-levels of center-care attendance, ‘No-care’ (n = 85) and ‘Care’ (n = 446) revealed significant group differences on 7 of the 8 background variables presented in Table 1. Children in center-care came from families with a significantly higher maternal and paternal occupation, maternal and paternal education, maternal age, and more stimulating family literacy environment than children not in care (all p’s < .05). Children in center-care also had significantly higher scores on the Stanford-
Binet IQ than children not in care. No significant race or sex differences were found between the groups.

Table 1.-- Differences in Background Characteristics Between No-care and Care Groups

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>No-care (n = 85)</th>
<th>Care (n = 446)</th>
<th>F</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>M (SD)</td>
<td>M (SD)</td>
<td></td>
</tr>
<tr>
<td>EDUCATION</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Maternal</td>
<td>12.4 (1.9)</td>
<td>13.9 (2.4)</td>
<td>34.3*</td>
</tr>
<tr>
<td>Paternal</td>
<td>12.8 (2.0)</td>
<td>14.9 (2.7)</td>
<td>34.6*</td>
</tr>
<tr>
<td>AGE</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Maternal</td>
<td>31.1 (7.1)</td>
<td>33.9 (6.8)</td>
<td>13.0***</td>
</tr>
<tr>
<td>Paternal</td>
<td>36.0 (9.5)</td>
<td>36.8 (6.1)</td>
<td>.7</td>
</tr>
<tr>
<td>OCCUPATION</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Maternal</td>
<td>37.2 (13.3)</td>
<td>42.8 (14.1)</td>
<td>14.2***</td>
</tr>
<tr>
<td>Paternal</td>
<td>38.4 (11.7)</td>
<td>36.8 (14.5)</td>
<td>19.9*</td>
</tr>
<tr>
<td>CHILD IQ</td>
<td>93.0 (13.5)</td>
<td>98.2 (15.4)</td>
<td>9.3**</td>
</tr>
<tr>
<td>FAMILY LITERACY</td>
<td>10.1 (3.2)</td>
<td>11.9 (3.8)</td>
<td>24.5*</td>
</tr>
<tr>
<td>ENVIRONMENT</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* p < .05, ** p < .01, *** p < .001

Academic Performance

After identifying background differences between children with or without attendance in center-care prior to kindergarten, ANOVA's were then conducted to determine group differences in academic performance at the start of kindergarten. For each ANOVA, the independent variable was attendance in care (No-care vs. Care) and the dependent variable was one of five academic measures: reading recognition (PIAT), mathematics (PIAT),
receptive vocabulary (PPVT), general information (PIAT), and letter recognition (alphabet cards). As shown in Table 2, findings revealed significant group differences in academic performance based on attendance in care: children in center-care had significantly higher mean scores in receptive vocabulary, reading recognition, mathematics, general information, and letter recognition than children not in care (all p's < .05).

Table 2.--Differences in Academic Performance Between No-care and Care Groups

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>No-care (n=85)</th>
<th>Care (n = 446)</th>
<th>F</th>
</tr>
</thead>
<tbody>
<tr>
<td>Receptive Vocabulary</td>
<td>48.4 (16.4)</td>
<td>57.7 (18.8)</td>
<td>18.2**</td>
</tr>
<tr>
<td>Reading Recognition</td>
<td>6.2 ( 4.5)</td>
<td>8.5 ( 5.9)</td>
<td>12.2***</td>
</tr>
<tr>
<td>Mathematics</td>
<td>9.2 ( 4.6)</td>
<td>12.1 ( 5.6)</td>
<td>20.7***</td>
</tr>
<tr>
<td>General Information</td>
<td>10.3 ( 7.6)</td>
<td>14.6 ( 9.1)</td>
<td>17.2***</td>
</tr>
<tr>
<td>Letter Recognition (% correct)</td>
<td>53.0 (36.5)</td>
<td>75.5 (31.5)</td>
<td>34.7***</td>
</tr>
</tbody>
</table>

* p < .05  ** p < .01  *** p < .001

Time in Care: Five Care-groups

Given the large number of children with some amount of center care experience (N=446), it was possible to extend analyses beyond a dichotomous no-care/care distinction to compare background and academic measures between groups of children with varying amounts of time spent in care. A series of one-way ANOVA's were
conducted with time in center-care as the independent variable categorized into five levels of approximately twelve-month intervals: '0' = 0 months in care; '1' = > 0 \leq 12\ months; '2' = > 12 \leq 24\ months; '3' = > 24 \leq 36\ months, and '4' = > 36\ months. Dependent variables in the analyses included eight background characteristics and five academic measures.

Group comparisons were made on several background characteristics including maternal and paternal education, maternal and paternal age, maternal and paternal occupation, family literacy environment, and child IQ. Group n's varied depending on the availability of background data, but there were always at least 50 cases per group. Comparisons were also made between the five care-groups on measures of receptive vocabulary, reading recognition, mathematics, general information, and letter recognition. In this case, group n's were consistent, and are listed in Table 4. Significant differences between particular care-groups were identified through Scheffe tests at the p < .05 level. The purpose of these ANOVA's to provide an overall picture of the nature of the relations between center-attendance, background variables, and academic performance.

Background Characteristics: Five Care-groups

Results of ANOVA's comparing the background characteristics of each of the five-care groups revealed several significant differences between particular care-groups using Scheffe tests (see Table 3). Interestingly, the mean score of children who spent no time in child care prior to school did not differ statistically (p < .05) from the mean score of children who spent 12 or fewer months in care on any background characteristic, but both groups had significantly lower mean IQ scores and lower mean levels of maternal
education than children who spent more than 12 months in care prior to school. Children with no child care experience also had a significantly lower mean paternal education and mean maternal age than children with more than 12 months of care. Children with more than 24 months but less than 36 months of time in care had the highest mean score on each background characteristic considered.

Table 3.-- Differences in Background Characteristics Between Care-groups

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Group 0 (n= 87)</th>
<th>Group 1 (n= 125)</th>
<th>Group 2 (n= 100)</th>
<th>Group 3 (n= 107)</th>
<th>Group 4 (n= 91)</th>
<th>Significant Comparisons</th>
</tr>
</thead>
<tbody>
<tr>
<td>EDUCATION:</td>
<td>M (SD)</td>
<td>M (SD)</td>
<td>M (SD)</td>
<td>M (SD)</td>
<td>M (SD)</td>
<td></td>
</tr>
<tr>
<td>Maternal</td>
<td>12.2 (1.9)</td>
<td>12.6 (2.1)</td>
<td>13.9 (2.1)</td>
<td>14.9 (2.1)</td>
<td>14.7 (2.1)</td>
<td>0 v. 2,3,4</td>
</tr>
<tr>
<td>Paternal</td>
<td>12.6 (2.0)</td>
<td>13.7 (2.5)</td>
<td>15.2 (2.6)</td>
<td>15.4 (2.5)</td>
<td>15.3 (2.9)</td>
<td>1 v. 2,3,4</td>
</tr>
<tr>
<td>AGE:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Maternal</td>
<td>31.1 (7.1)</td>
<td>32.1 (8.6)</td>
<td>34.5 (5.4)</td>
<td>34.8 (5.8)</td>
<td>34.6 (6.0)</td>
<td>0 v. 2,3,4</td>
</tr>
<tr>
<td>OCCUPATION</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Maternal</td>
<td>35.7 (13.3)</td>
<td>35.8 (12.5)</td>
<td>43.3 (14.4)</td>
<td>45.5 (12.6)</td>
<td>48.0 (13.8)</td>
<td>0 v. 2,3,4</td>
</tr>
<tr>
<td>Paternal</td>
<td>37.9 (11.7)</td>
<td>39.3 (15.3)</td>
<td>48.0 (15.0)</td>
<td>49.3 (12.3)</td>
<td>50.4 (13.8)</td>
<td>0 v. 2,3,4</td>
</tr>
<tr>
<td>FAMILY LIT</td>
<td>9.2 (3.1)</td>
<td>8.7 (3.8)</td>
<td>11.1 (3.3)</td>
<td>12.5 (3.0)</td>
<td>10.8 (3.4)</td>
<td>0 v. 2,3,4 2 v. 3</td>
</tr>
<tr>
<td>CHILD IQ</td>
<td>92.4 (13.5)</td>
<td>91.6 (12.1)</td>
<td>99.4 (15.3)</td>
<td>103.4 (16.1)</td>
<td>100.4 (15.5)</td>
<td>0 v. 2,3,4 3 v. 4 1 v. 2,3,4</td>
</tr>
</tbody>
</table>

Note: '0' = 0 months attendance, '1' = >0 ≤ 12 mns, '2' = >12 ≤ 24 mns, '3' = > 24 ≤ 36 mns, and '4' = >36 mns. * p < .05, ** p < .01, *** p < .001.
Academic Performance: Five Care-groups

ANOVA's were also conducted on the five care-groups to compare differences in receptive vocabulary, reading recognition, math, general information, and letter recognition. The pattern of group means was similar to those found in ANOVA's of background characteristics. Again, several care-group differences were statistically significant (Scheffe). As seen in Table 4, children with 12 or fewer months of center-care experience (groups 0 and 1) had significantly lower means on all five academic measures than children with more than 24 months in care (groups 3 and 4), and significantly lower means than children with >12 ≤ 24 months of care (group 2) in receptive vocabulary, general information and letter recognition. However, the mean scores of children who spent no time in care prior to school (group 0) did not differ significantly from the mean scores of children with 12 months or less of care (group 1) on any academic measure. No differences in mean performance were significant among children with more than 24 months of time in care (groups 2, 3, and 4).
Table 4.— Differences in Academic Performance Between Care-groups

<table>
<thead>
<tr>
<th>Measure</th>
<th>Group 0 (n= 87)</th>
<th>Group 1 (n= 125)</th>
<th>Group 2 (n= 100)</th>
<th>Group 3 (n= 107)</th>
<th>Group 4 (n=91)</th>
<th>Significant Comparisons</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>M (SD)</td>
<td>M (SD)</td>
<td>M (SD)</td>
<td>M (SD)</td>
<td>M (SD)</td>
<td></td>
</tr>
<tr>
<td>Receptive Vocabulary</td>
<td>48.4 (16.4)</td>
<td>49.3 (15.5)</td>
<td>56.9 (18.3)</td>
<td>66.2 (19.5)</td>
<td>60.1 (17.9)</td>
<td>0 v. 2,3,4</td>
</tr>
<tr>
<td>Reading Recognition</td>
<td>6.2 (4.5)</td>
<td>6.2 (4.5)</td>
<td>8.3 (5.3)</td>
<td>10.9 (7.3)</td>
<td>9.1 (5.7)</td>
<td>1 v. 3,4</td>
</tr>
<tr>
<td>Mathematics</td>
<td>9.2 (4.6)</td>
<td>10.1 (4.7)</td>
<td>11.8 (5.4)</td>
<td>13.8 (5.9)</td>
<td>13.2 (5.5)</td>
<td>1 v. 3,4</td>
</tr>
<tr>
<td>General Information</td>
<td>10.3 (7.6)</td>
<td>10.6 (7.0)</td>
<td>14.8 (8.9)</td>
<td>18.2 (9.4)</td>
<td>15.9 (9.4)</td>
<td>1 v. 3,4</td>
</tr>
<tr>
<td>Letter Recognition</td>
<td>53.0 (36.5)</td>
<td>62.6 (35.2)</td>
<td>75.5 (32.0)</td>
<td>81.3 (24.1)</td>
<td>85.6 (33.5)</td>
<td>1 v. 3,4</td>
</tr>
</tbody>
</table>

* p < .05  ** p < .01  *** p < .001

Graphs of Care-group Comparisons

Graphs of the ANOVA results described above were created to provide a visual depiction of the nature of relations between center-care attendance and background and academic measures (see Figures 1-12, Appendix A). Although interpretation was limited given the non-significant differences between children with more than 12 months of care (groups 2, 3, and 4), graphs of both background characteristics and academic measures portrayed a similar pattern of group means across the five care-groups on every measure.
considered. In each case, the means for each care-group peaked among children with >24 ≤ 36 months of care, and then leveled off or dropped slightly among children with more than 36 months of care.

Curvilinear Trends

The visual depiction of the pattern of means seen in the graphs suggested the relations between number of months in center-care and various measures was non-linear, similar to the curvilinear pattern of mean intellectual ability based on the hours per week in care in the Chicago study (Clarke-Stewart, 1991). Therefore, forced entry regressions were used to test for significant curvilinear relations between number of months and each background characteristic or academic measure. Essentially, this was achieved by determining the unique variance accounted for in the various measures when entering 'number of months in care' as a linear (months) term on the first step of each equation, followed by months in care as a quadratic (months x months) term on step 2.

Results of these regressions revealed significant curvilinear relationships between the number of months in care and the following background characteristics: maternal education, maternal age, child IQ, family literacy environment, and paternal occupation (all p’s < .05). The relations between months in care and paternal education, paternal age, and maternal occupation were linear, (although the curvilinear trends approached significance for maternal occupation and paternal age).

The significant curvilinear relations between several of the background characteristics and total months in center-care suggested that perhaps the obtained pattern of means on
academic measures across the five care-groups was not due to a true effect of time in care, but was merely the result of the curvilinear patterns of background characteristics. In other words, children with 24-36 months of care may have scored higher on academic measures because they came from families with different background characteristics, not because they had received the “optimal” amount of care.

To explore this possibility, the background characteristics curvilinearly related to months in care (family literacy environment, maternal education, child IQ, maternal age, and paternal occupation) were entered first into a forced-entry regression, followed by the number of months in care as a linear term on the next step, and months in care as a quadratic term on the final step. If unique variance was predicted by the quadratic term above and beyond the variance of the preceding steps, then the relationship between months in care and academic measures represented a true effect of time in care. If not, the relationship between months in care and academic performance was best considered linear (Keppel & Zedeck, 1989).

Results of these regressions indicated that no unique variance was predicted by total months in center-care as a quadratic term. Thus, the relationship between the amount of time in center-care and kindergartners’ academic performance was best described as linear, and the appearance of significant trends were most likely due to the background characteristics of children in care rather than an affect of time in care per se.
CHAPTER 5
THE UNIQUE IMPACT OF TIME CENTER-CARE
ON KINDERGARTEN ACADEMIC PERFORMANCE

The results presented in this chapter are from analyses centered on goal (2): to determine the unique contribution of time in care (months) to the prediction of kindergarten academic performance, beyond the variance accounted for by child and family factors. Analyses were first conducted to determine which particular child and family factors were most predictive of academic performance; these variables were then controlled for in determining the unique association between total months in center-care and academic performance (using partial-correlations) and the unique contribution of length of attendance in predicting the variance in kindergartners' academic performance (forced-entry regressions). The process of identification of these child and family covariates and results of partial-correlations and forced-entry regression analyses are presented in the following pages.

Identification of Covariates

Analyses were conducted to determine which of the several background variables were most predictive of academic performance. Correlations, stepwise regressions and forced-entry regressions performed on variables available in the study indicated three
forced-entry regressions performed on variables available in the study indicated three statistically significant powerful influences on academic performance: **family literacy environment**, **child IQ**, and **maternal education**. An example of the strength of these predictors was the statistically significant associations found between each variable and scores in receptive vocabulary (PPVT): family literacy environment and PPVT, $r = .62$; child IQ and PPVT, $r = .59$ and maternal education and PPVT, $r = .46$. Together, these variables predicted 48% of the variance in PPVT scores. Therefore, in order to investigate the unique association between time in child care and academic performance, the impact of these three covariates was controlled for in both partial-correlation and forced-entry regression analyses.

**Child IQ as a Covariate**

Given findings of environmental influence on the development of intelligence (Head Start Bureau, 1985), the question of why IQ was included as a covariate rather than a dependent in this study was certainly valid. First, the strong association between IQ and academic measures may have been partly due to the impact of attendance in care on child IQ given the significant correlation between IQ and months in care ($r = .22$, $p < .01$). Second, the possibility that the relationship between length of attendance in center-care and child IQ would be different than the relationship between attendance and academic achievement tests was of considerable interest. Therefore, before including child IQ as a covariate in analyses, it was necessary to determine what impact time in care had on the IQ scores of children in this sample.
A forced-entry regression controlling for maternal education and family literacy environment was performed to consider the unique contribution of total number of months in care in predicting the variance in children’s IQ scores. Results indicated that for this sample ($N = 510$), number of months in center-care failed to predict unique variance in IQ scores beyond maternal education or family literacy environment. Because the relationship between child IQ and academic performance was substantial ($r$’s ranged from .45 to .61) and was likely to confound the relationship between time in care and academic measures, a conservative approach chosen, which was to include child IQ as a covariate in analyses conducted to determine the unique impact of time in care.

**The Unique Impact of Care: Results**

Partial correlations and forced-entry regressions were used to determine the unique contribution of total number of months in care beyond the influence of child and family factors. Because of missing data on measures of family literacy environment and maternal education, the number of children in the regressions ($N = 387$) was fewer than the number of children in the ANOVA's, but was still representative of the entire sample.

**Partial-correlations**

Partial-correlations depicted the direction, strength, and statistical significance of the association between center-care attendance and the five academic measures, independent of the influence of the covariates (family literacy environment, maternal education, and child IQ). The reduced size of the partial-correlations in comparison to the simple correlations (see Table 5) statistically verified the assumption that maternal education,
child IQ, and family literacy environment were confounding the relationship between time spent in care and academic outcomes (Keppel & Zeddeck, 1989).

After removing the covariates, the partial-correlation between number of months in center-care and academic performance was strongest for letter recognition ($r = .18$), followed by math ($r = .12$) and reading ($r = .10$). The partial-correlations between attendance and receptive vocabulary ($r = .05$) or general information ($r = .04$) were not statistically significant.

Table 5.-- Correlations Between Months In Center-Care and Academic Performance

<table>
<thead>
<tr>
<th>Academic Measure</th>
<th>Multiple Correlation</th>
<th>Partial-Correlation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Receptive Vocabulary</td>
<td>.20**</td>
<td>.05</td>
</tr>
<tr>
<td>Reading Recognition</td>
<td>.21**</td>
<td>.10*</td>
</tr>
<tr>
<td>Mathematics</td>
<td>.21**</td>
<td>.12*</td>
</tr>
<tr>
<td>General Information</td>
<td>.19**</td>
<td>.04</td>
</tr>
<tr>
<td>Letter Recognition</td>
<td>.27**</td>
<td>.18*</td>
</tr>
</tbody>
</table>

* $p < .05$  ** $p < .01$  *** $p < .001$

Forced-entry Regressions

Forced-entry regressions were used to examine the unique contribution of center-care attendance to the prediction of variance in scores on academic measures after controlling for child and family predictors. A series of forced-entry regressions were conducted with family literacy, child IQ, and maternal education entered first as a block followed by the number of months in center-care prior to kindergarten. As shown in Table 6, the
covariates captured the majority of variance in scores based on the predictors entered into the equation (24% to 46%). However, despite the conservative approach of including child IQ as a covariate in analyses, the number of months spent in center-based child care still predicted significant unique variance above and beyond child and family factors in reading recognition (.7%, p < .05), mathematics, (1.0%, p < .01), and letter recognition (2.5%, p < .001) scores. This result not only indicated a unique contribution of time in care to the prediction of variance in reading, math, and letter recognition scores, but further provided evidence that the relationship between time in care and these academic variables was indeed different than the (lack of) relationship between time in care and child IQ.
Table 6 -- Unique Variance Predicted by Length of Center-Care Attendance

<table>
<thead>
<tr>
<th></th>
<th>Receptive Vocabulary</th>
<th>Reading Recognition</th>
<th>Math</th>
<th>General Information</th>
<th>Letter Recognition</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>$R^2$</td>
<td>$R^2$</td>
<td>$R^2$</td>
<td>$R^2$</td>
<td>$R^2$</td>
</tr>
<tr>
<td><strong>Step 1:</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Family literacy</td>
<td>.487</td>
<td>.283</td>
<td>.363</td>
<td>.440</td>
<td>.237</td>
</tr>
<tr>
<td>Environment, Child IQ and Maternal Education</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Step 2:</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Center-care Attendance (mnths)</td>
<td>.001</td>
<td>.007*</td>
<td>.010**</td>
<td>.001</td>
<td>.025***</td>
</tr>
<tr>
<td><strong>Total $R^2$</strong></td>
<td>.488</td>
<td>.290</td>
<td>.373</td>
<td>.441</td>
<td>.262</td>
</tr>
</tbody>
</table>

Note: Step 1, all $R^2$, $p < .001$.
+ $p < .10$, * $p < .05$, ** $p < .01$. 
CHAPTER 6
TIME IN CENTER-CARE AND ACADEMIC PERFORMANCE AMONG LOW-SES CHILDREN

The third goal of this study was to consider the possibility of a compensatory effect of time in center-care on the academic performance of (a) low-SES children or (b) low-SES children from low-literacy environment homes. Therefore, analyses similar to those conducted on the larger data set were conducted on a subsample of low-SES (N= 220) or low-SES/low-literacy (N=103) children. The low-SES subsample was defined as children whose mothers had 12 or less years of education. In order to compare the performance of low-SES children to more advantaged peers, a middle-SES subsample (>12 ≤16 years maternal education, N=229) and a high-SES subsample (> 16 years maternal education, N=40) was also created. Finally, a low-SES/low-literacy group was comprised of low-SES children whose families scored lower than a '9' on the family literacy environment scale used in the study (the range of possible scores on the scale was 1-17, and a score of '9' or less represented the bottom 35% of the sample).

The Academic Performance of Low-SES Children

Before considering a compensatory effect of care on low-SES children, a first step was to compare the academic performance of low-SES children to children of higher
socioeconomic status, to gain a clear picture of the academic risk associated with being poor. Table 7 shows the mean scores of low-SES (N = 220), middle-SES (N = 228) and high-SES (N = 40) children on academic tests of receptive vocabulary (PPVT), reading recognition (PIAT), mathematics (PIAT), general information (PIAT), and letter recognition (alphabet cards). Clearly, the mean of low-SES children was lower than the mean of middle- or high-SES children on each academic measure.

The next step was to compare the academic performance of low-SES children who did and did not spend time in center-care prior to kindergarten. For this low-SES sample (n = 220), children enrolled in center-care (n = 159) prior to kindergarten had significantly higher mean scores on mathematics and letter recognition tests (p < .05) than children not enrolled in care (n = 61), and higher (non-significant) scores on receptive vocabulary and general information. For reading recognition, the No-care group scored slightly higher, but the difference was non-significant (see Table 7). Thus, time in center-care appeared to benefit low-SES children in mathematics and letter recognition in particular, and in receptive vocabulary and general information, but did not raise the average scores of low-SES children in reading recognition above those of low-SES children not in care.
<table>
<thead>
<tr>
<th>Measure</th>
<th>LOW-SES</th>
<th></th>
<th>MID-SES</th>
<th></th>
<th>HIGH-SES</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>M (SD)</td>
<td></td>
<td>M (SD)</td>
<td></td>
<td>M (SD)</td>
<td></td>
</tr>
<tr>
<td>(M. no-care v. care)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Receptive Vocabulary</td>
<td>48.1 (16.1)</td>
<td>(46.0 v 48.9)</td>
<td>62.1 (17.4)</td>
<td></td>
<td>71.5 (18.1)</td>
<td></td>
</tr>
<tr>
<td>Reading Recognition</td>
<td>6.1 (4.3)</td>
<td>(6.3 v 6.0)</td>
<td>9.8 (6.5)</td>
<td>11.2 (7.9)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mathematics</td>
<td>9.9 (4.9)</td>
<td>(8.7 v 10.3**)</td>
<td>12.9 (5.5)</td>
<td>15.2 (6.3)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>General Information</td>
<td>10.0 (7.2)</td>
<td>(9.3 v 10.3)</td>
<td>16.7 (8.5)</td>
<td>21.7 (9.1)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Letter Recognition</td>
<td>61.4 (35.7)</td>
<td>(51.5 v 65.3**)</td>
<td>80.2 (28.4)</td>
<td>93.6 (26.6)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note: Low-SES (n=220), Mid-SES (n = 229), High-SES (n= 40). Within Low-SES, no-care (N = 61), care (N = 159). * p < .05, ** p < .01.

Because of the significant differences between No-care and Care groups within the low-SES subsample, multiple correlations were obtained among the low-SES sample to determine the strength and direction of the association between time in care and academic performance. Significant positive correlations were found between number of months in care and mathematics (r = .23, p < .001), general information (r = .15, p < .05), and letter recognition (r = .20, p < .01), and marginally significant associations were found between number of months in care and receptive vocabulary (r = .13, p < .10) reading recognition (r = .09, p > .10).
Unique Impact of Time in Care Among Low-SES Children

Clearly, as a group, low-SES children scored significantly lower than their higher-SES peers on all academic measures: receptive vocabulary, reading recognition, math, general information, and letter recognition. However, the higher means of low-SES children in center-care vs. low-SES children not in care and the positive correlations between time in care and academic performance suggested a compensatory effect of attendance in care on the academic performance of low-SES children. To explore this possibility further, regression techniques identical to those used in the entire sample were performed on the low-SES sub-sample of children to determine the unique impact of care beyond child and family factors. Results of partial-correlations and forced-entry regressions are provided below.

Partial-correlations

Similar to analyses on the entire sample, partial-correlations between center-care attendance and each academic measure were obtained for the low-SES subsample, controlling for the association between covariates (family literacy environment, maternal education, and child IQ) and each measure. As shown in table 8, two partial-correlations among the low-SES sample were statistically significant at the p < .05 level: mathematics (r = .25) and letter recognition (r = .21); and two partial-correlations were marginally significant: general information (r = .13) and receptive vocabulary (r = .15).
Table 8. Partial-correlations and Unique Variance Predicted By Time in Care Among Low-SES Children

<table>
<thead>
<tr>
<th>Academic Measure</th>
<th>Low-SES Partial r</th>
<th>Low-SES ΔR²</th>
</tr>
</thead>
<tbody>
<tr>
<td>Receptive Vocabulary</td>
<td>.15+</td>
<td>.012+</td>
</tr>
<tr>
<td>Reading Recognition</td>
<td>.08</td>
<td>.005</td>
</tr>
<tr>
<td>Mathematics</td>
<td>.25*</td>
<td>.045**</td>
</tr>
<tr>
<td>General Information</td>
<td>.13+</td>
<td>.012+</td>
</tr>
<tr>
<td>Letter Recognition</td>
<td>.21*</td>
<td>.036**</td>
</tr>
</tbody>
</table>

+ p < .10, *p < .05, ** p < .01. N = 220.

Forced Entry Regressions

Using the same format of entry used in the entire sample, a series of forced-entry regressions were conducted on the low-SES sub-sample (N=163) to determine the unique contribution of center-care attendance to the prediction of variance in receptive vocabulary, reading recognition, mathematics, general information, and letter recognition beyond child and family factors. Again, family literacy environment, maternal education, and child IQ were entered first as a block into the equation (step 1) followed by the number of months spent in center-care prior to school entry (step 2).

As shown in tables 8 and 9, total number of months in center-care predicted significant or marginally significant variance in four of the five academic measures among the low-SES children. Specifically, time in center-care accounted for significant unique variance in mathematics (4.5%) and letter recognition (3.6%) scores, and marginally significant unique variance in receptive vocabulary (1.2%) and general information (1.2%) scores among low-SES children, above and beyond the variance predicted by child and family factors.
Table 9.-- Unique Variance Predicted by Length of Center-Care Attendance Among Low-SES Children

<table>
<thead>
<tr>
<th>Step 1:</th>
<th>Step 2:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Family literacy Environment, Child IQ and Maternal Education</td>
<td>Center-care Attendance (mnths)</td>
</tr>
<tr>
<td>Receptive Vocabulary</td>
<td>total R²</td>
</tr>
<tr>
<td>Reading Recognition</td>
<td>.420</td>
</tr>
<tr>
<td>Math</td>
<td>.137</td>
</tr>
<tr>
<td>General Information</td>
<td>.269</td>
</tr>
<tr>
<td>Letter Recognition</td>
<td>.347</td>
</tr>
<tr>
<td>R²</td>
<td>.164</td>
</tr>
<tr>
<td>ΔR²</td>
<td>.012+</td>
</tr>
<tr>
<td>ΔR²</td>
<td>.005</td>
</tr>
<tr>
<td>ΔR²</td>
<td>.045**</td>
</tr>
<tr>
<td>Note: Step 1, all R² p &lt; .001. + p &lt; .10, * p &lt; .05, ** p &lt; .01.</td>
<td></td>
</tr>
</tbody>
</table>
Low-SES and Low-Literacy: A Risky Combination

Results on the low-SES subsample suggested that a greater amount of time spent in center-based child care prior to school entry had a positive impact on the mathematics and letter recognition scores of children from low-SES environments. However, given the impact of the family in shaping the academic development of low-SES children (Clarke, 1983), variation in the degree of family stimulation of literacy and education experiences was of interest. Of particular concern were low-SES children who were likely at greatest risk of academic failure because of minimal home literacy experiences. Therefore, analyses were conducted to determine whether time spent in child care had a positive impact on the academic performance of a sample of children from low-SES and low-literacy homes (N = 103).

Identification of Risk

Again, an initial step was to determine the degree of academic risk associated with being poor and not receiving support at home. An ANOVA was conducted to compare a low-SES/low-literacy group to low-SES/ middle-literacy and low-SES/high-literacy groups. As seen in the table, children from the low-SES/low-lit group had significantly lower means than the low-SES/higher-literacy groups in receptive vocabulary, reading recognition, mathematics, general information, and letter recognition.
Table 10 -- Academic Performance in Low-SES and Low-SES/Low-Literacy Samples

<table>
<thead>
<tr>
<th>Academic Measure</th>
<th>LOW-SES\LOW-LIT M (SD)</th>
<th>LOW-SES\MID-LIT M (SD)</th>
<th>LOW-SES\HIGH-LIT M (SD)</th>
<th>F</th>
</tr>
</thead>
<tbody>
<tr>
<td>Receptive Vocabulary</td>
<td>44.0 (13.2)</td>
<td>54.2 (15.7)</td>
<td>68.7 (18.4)</td>
<td>44.6***</td>
</tr>
<tr>
<td>Reading Recognition</td>
<td>5.7 (4.2)</td>
<td>6.8 (3.5)</td>
<td>9.4 (6.5)</td>
<td>18.6***</td>
</tr>
<tr>
<td>Mathematics</td>
<td>9.4 (4.6)</td>
<td>11.5 (4.7)</td>
<td>13.8 (5.8)</td>
<td>15.5***</td>
</tr>
<tr>
<td>General Information</td>
<td>8.3 (5.7)</td>
<td>12.8 (6.0)</td>
<td>18.7 (11.2)</td>
<td>37.3***</td>
</tr>
<tr>
<td>Letter Recognition</td>
<td>57.4 (35.6)</td>
<td>76.1 (30.0)</td>
<td>83.5 (30.1)</td>
<td>16.6***</td>
</tr>
</tbody>
</table>

Note: Low-SES (N = 220), Low-SES/Low-LIT (N = 103).
*** p < .001

Partial-correlations

As was done in determining the unique impact of care on academic performance among the entire and low-SES sample, partial-correlations between time in care and each academic measure were obtained within the low-SES/low-literacy group. After accounting for maternal education, child IQ, and family literacy environment, the partial-correlations for the low-SES/low-literacy group revealed significant unique associations between total months in care and mathematics \( r = .32, (p < .01) \); general information \( r = .22, (p < .05) \); and letter recognition \( r = .21, (p < .05) \); and marginally significant unique associations between months in care and receptive vocabulary (PPVT) \( r = .09, (p > .10) \) and reading recognition \( r = .14, (p > .10) \). These correlations indicated that the significant positive associations found between time in care and math, general information,
and letter recognition in the multiple correlations remained significant after controlling for child and family factors.

Forced-entry regressions

The final step in determining the unique impact of time in care on the academic performance of low-SES/low-literacy children was to perform a set of forced-entry regressions similar to those conducted on the previous samples of children. Results of the forced-entry regressions controlling for child IQ, maternal education, and family literacy environment indicated that for the low-SES/low-lit group (N = 103), statistically significant unique variance was predicted by total months in care in mathematics (8.4%), general information (4.1%) and letter recognition (4.1%) scores. Thus, time in center-care was a significant predictor of the variance in math, general information, and letter recognition scores of low-SES children from low-literacy home environments, above and beyond the influence of child and family factors.
CHAPTER 7

SUMMARY OF RESULTS

Several key findings were revealed in this empirical investigation of the relationship between time in center-care and kindergarten academic performance. These are presented below, categorized by their relationship to each of the three major goals in the study.

The first goal of the study was to describe the nature of relations between the amount of time spent in child care centers prior to school entry and the background characteristics and academic performance of children entering kindergarten. At least 5 major findings resulted from analyses related to this goal:

(1). Kindergartners who had attended any amount of center-care prior to school entry had significantly higher scores on background and academic measures than children who had not attended care.

(2). Significant differences were found across background characteristics and academic measures between “care-groups” based on differential amounts of care (in months). In general, children spending up to 12 months in care did not look significantly different than children with 0 months in care on any background characteristic or academic measure. However, both these groups differed significantly from children with more than 12 months (groups 2, 3, 4) of care on both background and academic variables. Few significant differences were found between groups 2, 3, and 4.
(3). Graphs of the means across care-groups on several background characteristics and all measures of academic performance revealed a remarkably consistent pattern. On several measures, the pattern of means suggested a linear relationship with time in care up to the group of children with 36 months of time in care, followed by a slightly dip among children with more than 36 months of care.

(4). The pattern of means across the five care-groups was significantly curvilinear on measures of maternal education, family literacy environment, child IQ, paternal occupation, and maternal age.

(5). However, the relationship between time in care and academic measures was not significantly curvilinear once the variance associated with time in care and background characteristics was removed.

Key results were also obtained from analyses conducted as part of the second goal of this study: to determine the unique contribution of the number of months in center-care to the prediction of kindergarten academic performance, beyond the variance accounted for by child and family factors.

(1). Significant partial-correlations were obtained between the number of months in center-care prior to school entry beyond the influence of maternal education, family literacy environment, and child IQ on academic measures of letter recognition (.18*), mathematics (.12*) and reading recognition (.10*).

(2). Further, the number of months in center-care prior to school entry predicted unique variance above and beyond the influence of child and family factors among children entering kindergarten. Time in care predicted unique variance in the reading recognition
(< 1%), mathematics, (1%), and letter recognition (2.5%) scores among the entire sample of children.

(3). Lastly, in forced-entry regressions, number of months in center-care did not predict significant unique variance in children’s IQ scores beyond the influence of maternal education and family literacy environment.

Next, significant results were also found in analyses related to the third goal of the study: to consider the possibility of a compensatory effect of time in center-care on the academic performance of (a) low-SES children, or (b) low-SES children from low-literacy environment homes.

(1a). Among the low-SES subsample, significant partial-correlations between time in care beyond the associations with family literacy environment, maternal education, and child IQ were found for the unique association between total months in care and mathematics (.25*) and letter recognition (.21*) scores.

(1b). Among the low-SES/low-literacy subsample, significant partial correlations were found on measures of mathematics (.32**), general information (.22*) and letter recognition (.21*).

(2a). Among the low-SES subsample number of months in center-care predicted significant unique variance in forced entry regressions, beyond the influence of maternal education, family literacy environment, and child IQ in mathematics (4.5%) and letter recognition (3.6%) scores.
(2b). Among the low-SES/low-literacy group, time in care again predicted unique variance in mathematics (8.4%) and letter recognition (4.1%) scores, but also predicted variance in general information (4.1%) scores.
CHAPTER 8
DISCUSSION

Chapter 7 summarized the main results of the current investigation of relations between time spent in center-care prior to school entry, background characteristics of children and families, and the academic performance of kindergartners' in reading, math, general information, vocabulary, and letter recognition. The study extended knowledge of these relations both among a group of children of all socioeconomic levels, and among groups of children from low-SES environments who may have been at a greater risk of low academic performance, particularly those from a low-literacy environment as well. Several points are noteworthy in discussing the results of the study, and are described in sections related to the goal they addressed.

Goal 1

First, an investigation of the first goal of this study revealed that the relationship between time in care and the characteristics of the children and families in care was non-linear, a possibility often neglected in the child care literature (Clarke-Stewart, 1991). Significant curvilinear trends were found on several of the background characteristics of children with different amounts of time in care prior to school. Graphs of the pattern of means across groups of these children suggested that among children in care, children who
spent up to 36 months in care came from families of higher maternal education, maternal age, paternal occupation, and family literacy environment than children with fewer number of months of care. Further, although no significant curvilinear trends were found for the relations between time in care and academic measures, the consistent and similar pattern of means across academic measures indicated that children with more time in care performed better as a group on tests of than children with less time in care. However, the highest level of performance was for children who spent more than 24 but less than 36 months of time in care prior to school.

Goal 2

Analyses to determine the unique impact of care among the children of varying socioeconomic levels suggested that more time in center-care prior to school entry had a modest, positive association with children’s mathematics, reading recognition, and letter recognition performance at the beginning of kindergarten, even beyond the impact of child and family factors. Thus, the amount of time children spend in child care centers in the pre-school was found to be a significant predictor of the variance in math, reading, and letter recognition scores in kindergarten, in a positive direction. That is, center-care may help children develop academic skills in math, reading, and the recognition of letters even before these skills are formally taught in school.

Unlike the unique impact of time in care on performance on certain academic achievement tests, no unique impact of time in center-care was found on children’s intelligence beyond influences of the family (maternal education, family literacy environment). However, because the relationship between child IQ and total months in
care was curvilinear, the unique variance predicted in IQ when entering ‘months in care’ as a quadratic term was considered. Again, after controlling for family factors, time in care was not a significant predictor of the variance in child IQ scores in kindergarten. This suggested that while child care centers may have affected a child’s knowledge of math, reading, and recognition of letters, it did not significantly change the child’s overall level of intelligence. This finding was similar to the differential impact of early experiences found in evaluations of Head Start and intervention programs, although in this case it applied to children of all socioeconomic backgrounds.

Goal 3

The final goal of this study was to determine whether the amount of time (in months) spent in center-based child care had a positive impact on the academic performance of low-SES children who may have been at-risk of lower academic performance. Results supported the view of a compensatory effect of time spent in care for children from low-SES homes in mathematics and letter recognition, and a similar effect for children from low-SES/low-literacy homes in math, letter recognition, and general information (knowledge of ‘everyday’ aspects of life in the United States). It appeared that for these samples of disadvantaged children, spending time in center-care provided opportunities to learn about math, the alphabet, and the world around them that they may not have received at home.

Thus, the amount of time in center-care was a source of the variation in certain academic skills of children entering kindergarten. These results support policy decisions aimed at extending child care to greater numbers of children. However, the results also
suggest that the benefits of time in care are present in even more typical child care centers which are not likely to be as high-quality or intense as specifically designed interventions. Thus, it may be that the positive impact of center-care in improving the academic status of children is simply the result of spending more time in centers rather than an effect of high-quality, detailed curricula programs.
APPENDIX 1

GRAPHS OF BACKGROUND CHARACTERISTICS
Maternal Education

Mean (yrs)

Care groups

'0' = 0 m, '1' = >0 <12 m, '2' = >12 <24 m,
'3' = >24 <36 m, '4' = >36 m
Mean (score)

Paternal Occupation

'0' = 0 m, '1' = >0 <12 m, '2' = >12 <24 m,
'3' = >24 <36 m, '4' = >36 m.
Family Literacy Environment

Mean

0 1 2 3 4
Care groups

'0' = 0 m, '1' = >0 < 12 m, '2' = >12 <24 m,
'3' = >24 <36 m, '4' = >36 m.
Note: '0' = 0 m, '1' = >0 <12 m, '2' = >12 <24 m, 
'3' = >24 <36 m, '4' = >36 m.
Maternal Age

Mean (yrs)

0 1 2 3 4

Care groups

'0' = 0 m, '1' = >0 < 12 m, '2' = >12 < 24 m
'3' = >24 <36 m, '4' = >36 m.
APPENDIX 2

GRAPHS OF ACADEMIC PERFORMANCE
Mean (score)

Reading Recognition

Care groups

Mean (score)

0 1 2 3 4

'0' = 0 m, '1' = >0 < 12 m, '2' = > 12 < 24 m,
'3' = >24 < 36 m, '4' = >36 m
Mathematics

Mean (score)

Care groups

'0' = 0 m, '1' = >0 < 12 m, '2' = >12 < 24 m,
'3' = >24 < 36 m, '4' = >36 m
General Information

Mean (score)

Care groups

'0' = 0 m, '1' = >0 < 12 m, '2' = >12 <24 m
'3' = >24 < 36 m, '4' = >36 m
Letter Recognition

Mean (score)

'0' = 0 m, '1' = >0 <12 m, '2' = >12 <24 m,
'3' = >24 < 36 m, '4' = >36 m
Receptive Vocabulary

Mean (score)

0 1 2 3 4

Care groups

'0' = 0 m, '1' = >0 <12 m, '2' = >12 <24 m,
'3' = >24 <36 m, '4' = >36 m
REFERENCES


VITA

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Research includes the acceptance and/or presentation of three conference posters at National Conferences including the Annual Meeting of the American Educational Research Association (1st author), the Society for Research in Child Development (3rd author), and the 10th Biennial International Conference on Infant Studies (1st author). A manuscript based on this thesis will be submitted to Child Development. Teaching experiences include conducting small discussion groups in the Psychology Department and guest lecturing in a course in Psychology. Professional development includes membership in the following societies: American Educational Research Association, National Association for the Education of Young Children, Society for Research in Child Development, and the American Psychological Association.
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The final copies have been examined by the director of the thesis and the signature which
appears below verifies the fact that any necessary changes have been incorporated and that
the thesis is now given final approval by the committee with reference to content and
form.

The thesis is, therefore, accepted in partial fulfillment of the requirements for the degree of
Master of Arts.

Date       Director’s Signature
2-2-96