

Early Child Care: The Known and the Unknown

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Child care research during the last 20 years has made considerable progress in addressing questions about (a) the effects of child care quality, (b) the effects of amount and timing of early child care, and (c) the effects of different types of care such as centers, child care homes, and relative care. This commentary summarizes the converging research evidence with respect to each of these questions and then outlines some future directions for child care research.

The second half of the 20th century witnessed substantial changes in the lives of young children as maternal employment increased and more children participated in nonparental care arrangements. The available evidence indicates that these care arrangements vary widely in quality, amount, and type (National Institute of Child Health and Human Development Early Child Care Research Network [NICHD ECCRN], 1996; 2000a; U.S. Census Bureau, 2003). These variations and the large number of children in care (over 10 million children in the United States in 1999) have raised several questions: (a) Does quality of early child care matter? (b) Does amount and timing of early child care matter? and (c) Does type of early child care matter? Answers to these questions are important for parents and policymakers who are interested in the individual and collective well-being of children. They also are important for developmental theory because of their relevance to fundamental issues in the discipline such as the role

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of early versus later experience and the efficacy of enrichment and intervention efforts.

In this commentary, I have two goals. My first goal is to summarize the converging research evidence with respect to the three questions about child care. The evidence from scores of studies represents what we currently *know* about the effects of child care on child developmental outcomes. The evidence presented is not exhaustive, but illustrative. My second goal is to consider areas that are unresolved or have not yet been examined. These *unknowns*, I believe, represent next steps for child care research.

The need for data to address the questions about early child care was one reason that the NICHD Study of Early Child Care (SECC) was created (NICHD ECCRN, 2001c). Key elements in the design of the SECC included (a) a sufficiently large sample ($n = 1,364$) to detect effects; (b) a diverse sample that included children of color (24%), mothers with less than a high school education (11%), and single-parent households (14%); (c) robust longitudinal measures of child care quality, amount, timing, and type (e.g., center, family day care home, nanny); (d) measures of children's social, cognitive, and language development, obtained during infancy, early childhood, and middle childhood by multiple methods; (e) extensive family measures collected shortly after the child's birth to use as controls for selection bias; and (f) longitudinal family assessments to evaluate changes in family functioning in response to child care.

The NICHD Early Child Care Research Network (ECCRN), the name adopted by the investigators who work collectively on papers from the SECC, has now considered the effects of quality, amount and timing, and types of care in a series of papers that examined children's attachment to mother (1997b, 2001b), mother-child interactions (1999a, 2003c), peer interactions (2001a), behavior problems (1998, 2002b, 2003a), social competence (1998, 2002b, 2003c), and cognitive, language, and preacademic performance (2000b, 2002b). Other investigators (Brooks-Gunn, Han, & Waldfogel, 2002; Sagi, Koren-Karie, Gini, Ziv, & Joels, 2002) have used the SECC data set to address related questions. Instructions for obtaining copies of the public use data set can be found at <http://secc.rti.org/>.

In addition to the SECC, other large, multisite studies include the Cost, Quality, and Outcomes Study (Peisner-Feinberg et al., 2001), the Family and Relative Care Study (Kontos, Howes, Shinn, & Galinsky, 1995), the National Day Care Study (Ruopp, Travers, Glantz, & Coelen, 1979), and the Child-Care Staffing Study (Howes, Phillips, & Whitebook, 1992). These studies have focused on particular types of care.

Challenges and Cautions

Before examining the progress in answering the child care questions, several overarching challenges and accompanying cautions should be noted. The first challenge is that most child care research is correlational. As is the case with any correlational evidence, there are concerns that sample selection and omitted variables may explain obtained relations. For example, if educationally minded parents place their children in more cognitively stimulating child care settings, then an apparent relation between cognitively stimulating child care and children's academic skills may be explained by these preexisting family differences. Or, if parents place children who are challenging or difficult in child care for more hours than less difficult children, then a relation between child care hours and problem behaviors may be explained by this preexisting child difference. The challenge, then, is to reduce the likelihood that child care effects are explained by these other factors.

One way of addressing this problem has been to adopt experimental designs in which children are randomly assigned to child care of varying types and quality. In several studies that are discussed later in this paper (e.g., Campbell & Ramey, 1994; Schweinhart, Weikart, & Larner, 1986), experimental designs were used to examine the effects of high-quality center-based programs for children who were at risk for school failure. In other research also to be reviewed (Ruopp et al., 1979), two aspects of child care quality—child-adult ratio and caregiver education and training—were experimentally manipulated to determine their effects on children's cognitive and social functioning. To my knowledge, no one has studied the effects of amount/timing in an experimental study.

In the absence of random assignment experiments, researchers have adopted other strategies to minimize selection bias and omitted variables. One strategy, which was first used in the 1980s and has since become standard practice, is to include family and child measures as covariates. The early studies typically controlled for a limited number of demographic factors such as maternal education and child gender. Recent research, however, has incorporated extensive covariates.

In the SECC (NICHD ECCRN & Duncan, 2003), the sizes of child care coefficients were compared in statistical analyses that included no covariates, a limited number of family and child covariates, and extensive covariates. The size of the child care coefficients was substantially reduced when the demographic covariates were added to the base model, indicating that the base model containing no covariates was biased. The inclusion of more extensive measures of family functioning to the demographic variables, in contrast, resulted in little

or no change in the size of the child care coefficients, suggesting that it was unlikely that unobserved family characteristics could account for the obtained child care effects.

Although the use of multiple covariates reduces the likelihood that obtained relations can be explained by omitted variables, it has its own limitations. Because only the unique variance is attributed to child care and all shared variance is attributed to other factors, the strategy yields a conservative estimate of effects. Thus, investigators may be controlling for and thereby removing the very effects of interest (Newcomb, 2003).

Another strategy to minimize the likelihood that omitted or unmeasured factors account for obtained child care effects has been to use children's prior performance as a control. Analyses of this sort used in the SECC (NICHD ECCRN & Duncan, 2003) and the Cost, Quality, and Outcomes Study (Peisner-Feinberg et al., 2001) have asked if a particular child developmental outcome is predicted by quality, amount/timing, or type of care when the child's prior performance is included as a covariate. These residual change analyses are better able to adjust for observed and unobserved factors, but have less power, than simply controlling for family and child demographic factors.

A second challenge is that child care is a complex phenomenon that varies along multiple dimensions. Because research initially focused on quality *or* type *or* amount, it was not possible to ascertain if ostensible effects of quality were actually effects of quantity or type; or, if ostensible effects of quantity could be explained by the type or quality of the care. Consequently, recent research such as the SECC has sought to examine effects of one aspect of care while controlling for other aspects.

A third challenge and caution is the (obvious) caveat that our research evidence is based on the particular samples of children who have been studied in child care of particular quality, amount, and type. If families with impoverished circumstances (or more affluent circumstances) are not included in research studies, then our ability to understand child care effects in those circumstances is reduced. Understanding the effects of child care also requires sampling across the full array of child care variations. We are likely to underestimate child care effects if analyses are based on a restricted range of quality, hours, or types of care. One reason that research studies conducted in Sweden generally failed to find quality effects may be that the quality was uniformly high. Consistent with this point, Sagi et al. (2002) noted that child-adult ratio in centers was not related to attachment security in separate analyses involving the NICHD SECC and the Haifa Study of Early Child Care. However, when the two samples were combined and a broader range of child-adult ratios was tested, relations between

ratios and attachment were detected. In the SECC, it is likely that the effects associated with quality were underestimated because refusal rates were higher for informal care settings and settings that were caring for children of low-income families. Consistent with this point, child outcomes in the SECC were significantly lower for children who attended child care settings that were not observed (NICHD ECCRN & Duncan, 2003).

With these challenges, limitations, and caveats in mind, let us now consider the first of our three questions.

Does Quality of Child Care Matter?

An indication of our progress in addressing the quality question is clear when we recall Belsky and Steinberg's classic review published in 1978. In that review of the extant literature of the time, some 40 studies, Belsky and Steinberg observed, "Our actual knowledge of its [day care] effects is exceedingly limited. Generally investigations have been conducted within high-quality centers which are not representative of most substitute-care environments" (p. 929). This dearth of research led them to conclude, "The findings from existing research on day care may not be generalizable to the kind and quality of care available to most of the nation's families" (p. 930).

The need to understand the effects of child care quality motivated much of the research during the next 25 years. Early studies by Howes (1983), Clarke-Stewart (1987), Phillips, McCartney, and Scarr (1987), and Vandell and Powers (1983) observed children in child care and recorded their experiences. High-quality child care was conceptualized as involving supportive interactions with caregivers, positive interactions with peers, and opportunities for cognitively stimulating play, whereas poor-quality care was conceptualized as involving negative interactions with caregivers and peers and aimless wandering. From these and other studies during this period, *process quality* came to refer to the experiences that children have with caregivers, peers, and materials.

Further progress in addressing the quality question occurred with the development and adoption of a common set of measures of process quality. The Early Care Environment Rating Scale (ECERS; Harms & Clifford, 1980) consists of 7-point ratings of the social, language, reasoning, and physical environment in child care centers. The Infant/Toddler Environment Rating Scale (ITERS; Harms, Cryer, & Clifford, 1990) and the Family Day Care Rating Scale (FDCRS; Harms & Clifford, 1989) are related measures of center-based care for children less than 2 1/2 years and child care homes, respectively. The

Observational Record of the Caregiving Environment (ORCE), developed by the SECC (NICHD ECCRN, 1996, 2000a) assesses quality in all types of care using time-sampled behavioral counts of caregiver actions, peer interactions, and child activities as well as qualitative ratings of caregivers' behaviors. Age-appropriate versions are available for infants, toddlers, and preschoolers. Quality also is measured by *structural/caregiver characteristics* such as child-adult ratio and caregiver's training and education.

Motivated by the policy question of "How can process quality be improved?" and the search for easy-to-monitor indicators, researchers have considered relations between structural/caregiver characteristics and process quality. From this work, consistent findings have emerged (Committee on Family and Work Policies, 2003; Vandell & Wolfe, 2000). In settings in which child-adult ratios are lower, caregivers spend less time managing children in their classrooms and children are less apathetic and distressed (Ruopp et al., 1979); caregivers are more stimulating, responsive, warm, and supportive (NICHD ECCRN, 1996, 2000a); and process quality scores are higher (NICHD ECCRN, 1996, 2000a; Phillips, Mekow, Scarr, McCartney, & Abbott-Shim, 2000).

The number of children in the group also is associated with process quality. In multivariate analyses that controlled for child-adult ratio, caregiver training, and caregiver education, the NICHD ECCRN (1996, 2000a) found that caregivers were more responsive, socially stimulating, and less restrictive when there were fewer children in the group. Process quality also is higher in child care homes that are in compliance with recommended age-weighted group sizes (Clarke-Stewart, Vandell, Burchinal, O'Brien, & McCartney, 2002).

Caregivers' education—both formal education and specialized training—also is related to process quality. Caregivers tend to be more stimulating, warm, and supportive, to organize materials better, and to provide more age-appropriate experiences when they have more formal education and more child-related training (Burchinal, Cryer, Clifford, & Howes, 2002; Clarke-Stewart et al., 2002; NICHD ECCRN, 1996, 2000a; Phillips et al., 2000). Two experimental studies—the National Child Care Study (Ruopp et al., 1979) and the Florida Child Care Improvement Project (Howes, 1997)—have provided evidence of causal relationships between structural/caregiver characteristics and process quality.

Child Care Quality and Child Developmental Outcomes

The development of measures of child care quality paved the way to examine the effects of quality on child developmental outcomes in a series of three logically related propositions (NICHD ECCRN, 2000a). The first proposition is that quality, measured by structural/caregiver

characteristics and process quality, is related to child functioning in the child care setting. The second proposition is that child care quality is related to (influences) children's concurrent functioning in other settings such as home or lab. And the third proposition is that child care quality is related to (influences) children's long-term child developmental outcomes. In the text that follows, research pertaining to each proposition is presented.

Child Care Quality and Child Behavior in Child Care. A recent review by the National Academy of Science (Committee on Family and Work Policies, 2003) reported six studies as finding relations between process quality and children's behavior in the child care setting, and six studies as finding relations between structural/caregiver characteristics and child behavior in the child care setting. To summarize these findings, children appeared happier and more securely attached to caregivers in care settings in which process quality was higher and adult-child ratios were lower. Children appeared more prosocial and positively engaged with peers when caregivers were sensitive and positive to them and when child-adult ratios were lower. Children were rated as more cognitively competent during free play in child care settings that offered more opportunities for art, blocks, and dramatic play, and in settings in which caregivers had college degrees and more early childhood training.

Recent research also has related child care quality to physiological measures (Detting, Parker, Lane, Sebanc, & Gunnar, 2000). Children who attended child care homes that were higher in quality showed decreases in cortisol from morning to afternoon, whereas children who attended poorer quality child care homes showed increases in cortisol from morning to afternoon. This rise is the opposite pattern of the typical circadian rhythm of cortisol, but it is similar to a rise across the work day that has been recorded in adult executives who were under high pressure at work.

Thus, research suggests that children who attend higher quality child care are exposed to different environments and hence engage in different behaviors and activities than children who attend poorer quality child care. The next question is whether variations in quality are related to child functioning in other contexts.

Child Care Quality and Concurrent Cognitive and Social Development. Twenty-three studies were cited by the National Academy's Committee on Family and Work Policies (2003) as finding relations between process quality and children's cognitive and socioemotional development in other contexts, after controlling for family and child background factors. In particular, the committee noted that children whose care was higher in process quality scored higher on concurrently

administered language and cognitive tests, had fewer behavior problems, and were more socially competent. Since the report was prepared, other investigators (Loeb, Fuller, Kagan, & Carrol, 2004; Love et al., 2003) also have found higher quality care (measured by the ECERS and FDCRS) to be associated with better cognitive performance and fewer behavior problems.

The Committee on Family and Work Policies (2003) cited 14 studies in relation to structural/caregiver characteristics and child developmental outcomes. For example, the NICHD ECCRN (1999b) found positive developmental outcomes, controlling for maternal education and parenting quality, when children attended centers that were in compliance with the American Public Health Association's recommended structural and caregiver guidelines. Children who attended centers that met child-adult ratio standards displayed fewer behavior problems and more positive social behaviors according to their mothers than children whose centers did not meet the recommended standard. When centers met the recommended guidelines for staff specialized training and education, children exhibited fewer behavior problems and obtained higher school readiness and language comprehension scores. In subsequent analyses at 4 1/2 years, larger group sizes were associated with lower academic achievement and lower cognitive development, and higher caregiver education was related to higher cognitive development and higher academic achievement, controlling for family factors and children's prior cognitive functioning (NICHD ECCRN & Duncan, 2003). Similar relations between structural/caregiver characteristics and child developmental outcomes have been found in child care homes (Clarke-Stewart et al., 2002).

Child developmental outcomes also have been examined in relation to aggregated structural/caregiver characteristics. Some programs, for example, trade off teacher training and group size by having teachers who have more training and education care for more children, whereas other programs have highly trained teachers assigned to fewer children. And in still other programs, centers fail to meet any recommended standards. In the SECC (NICHD ECCRN, 1999b), children who attended centers that met more recommended standards had fewer behavior problems and higher school readiness and language comprehension scores. In these analyses, for example, 3-year-olds who attended centers that met none of the recommended guidelines scored 14 points below the mean of the norming sample for the Bracken Basic Concept Scale, whereas 3-year-olds in centers that met all four standards scored 2 points above the mean of the norming sample, a 16-point difference.

The available experimental evidence indicates causal relations between child care quality and child developmental outcomes. In the National Day Care Study (Ruopp et al., 1979), preschoolers who were assigned to classrooms in which teachers had more education and training displayed greater gains in cooperative behavior, task persistence, and school readiness over a 9-month period relative to children assigned to classrooms in which teachers had less education and training.

Child Care Quality and Longer-term Outcomes. Eighteen studies cited by the Committee on Family and Work Policies (2003) examined relations between child care quality and children's subsequent development. Relations were more evident in studies that had assessed quality at several points in time (Burchinal et al., 2000; NICHD ECCRN, 2000b, 2002b) and less evident in studies that relied on a single assessment (Chin-Quee & Scarr, 1994; Deater-Deckard, Pinkerton, & Scarr, 1996). These discrepancies may be explained by the reliability of the child care scores. Because children often experience several care arrangements, longitudinal assessments of quality probably yielded more accurate indications of quality.

In the SECC (NICHD ECCRN, 2000b, 2002b; 2003b), cumulative measures of caregiver behavior as measured by the ORCE predicted children's performance on standardized cognitive and language assessments at 15, 24, 36, and 54 months, controlling for amount and type of care and an extensive list of family covariates. In the Cost, Quality, and Outcomes Study, a prospective longitudinal study of 579 children who attended 151 centers, process quality as measured by the ECERS predicted cognitive, language, and social development during the early gradeschool years (Peisner-Feinberg et al., 2001). Children who had closer relationships with their preschool teachers were more sociable in kindergarten, controlling for prior child adjustment and family factors, and children who were enrolled in higher quality child care displayed better math skills prior to school entry and during kindergarten and 2nd grade. In other analyses from the Cost, Quality, and Outcome Study, children who had closer relationships with their caregivers at age 4 years were reported by their 2nd-grade teachers to be more socially competent with peers, controlling for family factors and prior child functioning (Howes, 2000).

Relations between structural/caregiver characteristics and children's subsequent social and cognitive development also have been reported. Howes (1988), for example, found relations between structural/caregiver characteristics (teacher training, child-adult ratio, group size, a planned curriculum, and space) at age 3 years and children's functioning in 1st grade. Children whose early care met more structural/caregiver guidelines had fewer behavior problems and better work habits in comparison

to children whose early care met fewer guidelines, controlling for family factors. In a different sample, children were rated as more difficult by preschool teachers and as more hostile by kindergarten teachers when they had a history of poor-quality care, as measured by a composite score of structural/caregiver characteristics (child-adult ratio, caregiver training, caregiver stability) at 18, 24, 30, and 36 months (Howes, 1990).

Thus, the available evidence indicates that child care quality is related to child developmental outcomes during the early elementary school years. We do not know if these early relations are maintained after this period, if they disappear, or if the early relations are magnified over time.

How Large Are the Effects of Quality?

In addition to considering statistical significance, it is informative to consider the practical significance of effects (McCartney & Rosenthal, 2000). One way of evaluating practical significance is to compare the size of an obtained effect to other effects such as parenting and poverty that are believed to be important. In the case of cognitive functioning, effect sizes (d) associated with child care quality in the SECC were .39 for school readiness and .44 for expressive language at 36 months, whereas effect sizes for parenting and home quality were roughly twice as large, .83 and 1.01, respectively (NICHD ECCRN, 1999c). For children's preacademic skills at 54 months, the effect size (d) of child care quality was .39, and the effect size of poverty was .83. Thus, the child care effects were roughly half the size of parenting and poverty. Against these benchmarks, one can conclude that effects associated with child care quality are meaningful.

Are Quality Effects Moderated by Child and Family Characteristics?

In addition to the main effects described above, investigators have identified some instances of moderated effects. In some domains, poor-quality care appears to function as a risk factor. For example, in the SECC, low-quality care coupled with low maternal sensitivity was associated with insecure infant-mother attachment relationships (NICHD ECCRN, 1997b). In other cases, high-quality child care served as a protective factor for children who were otherwise at risk. Children in the SECC whose mothers were depressed appeared more positively engaged with their mothers at age 4 1/2 years and 1st grade when they attended higher quality child care (NICHD ECCRN, 2003c). In analyses of school readiness, receptive language, and expressive language, higher

quality child care was found to buffer young children from the negative effects of family poverty (McCartney, Dearing, & Taylor, 2003).

Next Steps

The recent findings pertaining to the effects of child care quality are consistent with Lamb's summary conclusions in the 1998 *Handbook of Child Psychology* that (a) high-quality child care has positive effects on intellectual, verbal, and cognitive development, and (b) children receiving high-quality care have superior relationship skills whereas children receiving poor-quality care have deficient skills. Furthermore, evidence from multiple studies of relations between structural/caregiver characteristics and process quality provide guidance for ways to support or improve quality.

At the same time, there are a number of unknowns with regard to child care quality that warrant further study. First, researchers have examined effects of quality only through the primary grades (kindergarten, 1st grade, and 2nd grade). We do not know if the effects associated with quality are maintained through middle childhood and adolescence. Second, we do not know how many children attend poor-quality child care in the United States or elsewhere because only convenience samples have been studied. Quality estimates derived from the NICHD SECC, however, suggest that child care quality is not high. Positive caregiving was rated as "not characteristic" in fully 60% of the settings that were observed, and only 10% of the settings were rated as excellent (NICHD ECCRN, 2000a). Representative surveys of child care quality, conducted at regular intervals to assess quality trends over time, are clearly needed.

In addition, we have not studied the effects of child care quality beyond its impact on individual children. Studies of the aggregated effects of child care quality on public school classrooms are needed to ascertain if high-quality care serves as a springboard for classrooms to function well or if poor-quality child care places classrooms at risk. It seems likely that classrooms containing more children who had attended high-quality child care will differ from classrooms containing a preponderance of children who had attended poor-quality child care. Finally, we do not know which sets of policies are the best ones to adopt if we want to improve child care quality or to support high-quality child care. A number of proposals (Blau, 2001; Helburn & Bergmann, 2002; Lombardi, 2003; Vandell & Wolfe, 2000) have been put forward, but these proposals have not been tested. Experimental studies are needed to test the effectiveness of different approaches for improving child care quality (both process quality and structural/caregiver characteristics) and to

relate these strategies to child developmental outcomes. Evaluations of these alternative models will be strengthened by further collaboration of scholars in psychology, education, economics, and public policy.

Do Amount and Timing of Early Child Care Matter?

Questions about the effects of amount and timing are also central to child care research. Jay Belsky (1986, 1988, 2001) has played a central role in framing these questions. Citing evidence of relations between amount of early child care and children's noncompliance and aggression in the initial research (Baydar & Brooks-Gunn, 1991; Bates et al., 1994; Schwarz, Strickland, & Krolick, 1974; Vandell & Corasaniti, 1990), Belsky argued that early and extensive hours place young children at risk for socioemotional problems. Others, however, countered that these relations could be explained by (a) the quality of the child care (Phillips, McCartney, Scarr, & Howes, 1987), (b) differences in family background (Richters & Zahn-Waxler, 1990), or (c) a failure to distinguish between avoidance and independence in assessments of infant attachment relationships and between child assertiveness and aggressiveness in assessments of older children (Clarke-Stewart, 1989). Because the initial research investigating amount and timing of care did not include measures of child care quality, assertion or independence, and controlled for few family factors, it was not possible to test these different possibilities. In recent years, however, researchers have adopted more comprehensive study designs that enabled them to evaluate these alternative explanations. These findings are reviewed below.

Although researchers and policymakers are interested in understanding both the effects of amount of care and the effects of when care was initiated, the reality of child care participation, at least in the United States, makes it difficult to disentangle these effects. For example, 84% of the children in the SECC experienced nonmaternal care on a routine basis by 12 months (NICHD ECCRN, 1997a). Of this group, 72% entered care by 4 months. At first entry, infants were in care for 29 hours a week, on average. Furthermore, once care was initiated, the amount of time spent in care on a weekly basis remained more or less stable throughout early childhood. Thus, timing and amount of care are highly correlated.

Investigators who have studied the effects of these naturally occurring variations in amount and timing have approached the problem of collinearity in two ways: (a) by focusing on either amount *or* timing in their analyses but recognizing that some (most?) of the variance may be shared with the omitted variable, and (b) by including both amount

and timing in their analyses and recognizing that focusing only on unique variance may result in substantial underestimations of both effects. In the text that follows, much of the evidence reflects the combined effects of amount and timing.

Attachment Security

One of the central questions motivating child care research in the 1980s and 1990s was whether early and extensive child care increased the likelihood of children developing insecure attachment relationships with their mothers. In the initial studies (see Barglow, Vaughn, & Molitor, 1987; Belsky & Rovine, 1988), elevated rates of insecure attachment were reported in children who experienced extensive child care during the first year. None of these studies, however, controlled for child care quality, and most did not control for potential family differences.

More recently, the SECC (NICHD ECCRN, 1997b) examined relations between early and extensive child care and child attachment at 15 months, controlling for quality and type of child care and for family background, in a large sample of children ($n = 1,153$). The strongest predictors of attachment security were mother's observed sensitivity with the child at 6 and 15 months, and the mother's psychological adjustment. Amount of early child care was significant only in conjunction with maternal sensitivity: the likelihood of an insecure attachment increased only if children were in child care for more than 10 hours a week *and* mothers were highly insensitive. If mothers were sensitive, being in care for more than 10 hours a week was not related to attachment quality. A similar interaction was observed at 36 months ($n = 1,140$) (NICHD ECCRN, 2001b): High hours were associated with an ambivalent attachment only when mothers were insensitive.

Quality of Mother-Child Interaction

Researchers also have considered associations between the amount of early child care and the quality of mother-child interaction. Related studies considered the effects of early maternal employment. Some of these studies reported amount of early care to be related to more negative mother-infant interactions (Campbell, Cohn, & Meyers, 1995; Owen & Cox, 1988). Others have found positive effects of amount of care on mother-child interaction (Crockenberg & Litman, 1991; Vandell, 1979), and still others found no effects (Burchinal, Bryant, Lee, & Ramey, 1992). Much of the initial research in this area, like other research of the time, was limited because of

small sample sizes, few controls for family background, and a reliance on a single time of measurement.

Recent reports have sought to address these limitations. In the SECC, mother-child interactions were observed at 6, 15, 24, and 36 months for over 1000 families. More hours in child care was associated with less maternal sensitivity and less child positive engagement with the mother, controlling for quality and type of child care, family income, maternal education, marital/partner status, maternal depressive symptoms, maternal separation anxiety, child gender, child temperament, and ethnicity. The effect size of child care hours (.15) was similar to that of maternal depression and difficult child temperament but considerably smaller than the effect associated with maternal education (.70).

In a follow-up report (NICHD ECCRN, 2003c), the study of relations between amount of child care and mother-child interaction was extended to age 4 1/2 years and 1st grade. At these later ages, relations between hours and mother-child interaction were evident only for particular subsamples. Higher hours were associated with less maternal sensitivity and less positive engagement in White children, but greater maternal sensitivity and more positive engagement in African American and Hispanic children.

The Wisconsin Maternity Leave and Health Project (Clark, Hyde, Essex, & Klein, 1997) contrasted the quality of mother-infant interaction at 4 months in 198 families in which mothers had 6 weeks versus 12 weeks of parental leave. Shorter leaves were associated with mothers expressing more negative affect and negative behavior toward their infants. In addition, mothers were less likely to express positive affect to their infants when short leaves were combined with maternal depressive symptoms and difficult child temperament.

Behavior Problems

Amount of child care also has been considered in relation to children's socioemotional adjustment (behavior problems and social competence) in a series of reports in which child care quality and type were controlled as well as family factors. At age 2 years, children who had spent more hours in child care were observed to have more negative interactions with peers (NICHD ECCRN, 2001a) and were reported by their caregivers to have more behavior problems and by their mothers to be less socially competent than children who had fewer hours in child care (NICHD ECCRN, 1998). At age 4 1/2 years, children who had been in child care for more hours were observed to have more negative play with a friend and were reported by caregivers to be less socially competent, and to have more externalizing behavior problems

and more conflicts with caregivers (NICHD ECCRN, 2003a). In kindergarten, children with more hours in early child care were reported by mothers and teachers to have more externalizing behavior problems, and teachers reported more teacher-child conflict.

Several alternative explanations for these findings have been examined (NICHD ECCRN, 2003a). One possibility is that the relations were the result of other aspects of child care. Another possibility is that the hours effects were mediated by differences in mother-child interaction. These possibilities were tested in analyses that included controls for other aspects of child care (quality, type, instability, exposure to peers) and maternal sensitivity. The addition of these controls resulted in modest reductions in the hours coefficients, but the coefficients continued to be statistically significant, indicating that the hours findings were not explained by quality of child care or quality of parenting, at least as they were measured in this study.

Studies by Gunnar and colleagues (Dettling, Gunnar, & Donzella, 1999; Tout, de Haan, Campbell, & Gunnar, 1998; Watamura, Donzella, Alwin, & Gunnar, 2003) suggest a potentially fruitful avenue for understanding the relations between hours in care and adjustment. These investigators examined children's cortisol levels and patterns at child care and at home. Salivary cortisol was observed to increase from midmorning to midafternoon on those days in which children were in centers but not on days in which these same children were at home (Watamura et al., 2003). In other reports, the largest increases in cortisol across the day were observed in children who had the most difficulty regulating negative emotions and behavior (Dettling et al., 1999), were more fearful (Watamura et al., 2003), were less involved in peer play (Watamura et al., 2003), and were less socially competent (Tout et al., 1998). Rises also were more evident in toddlers and preschoolers than in infants and school-aged children (Dettling et al., 1999; Watamura et al., 2003). These findings suggest that toddlers and preschoolers who are learning to negotiate with peers may experience group settings as socially demanding and stressful. What is not known is whether changes in the organization of child care programs or in caregivers' efforts might result in less stressful and more supportive social environments for children (Maccoby & Lewis, 2003).

How Large Are the Quantity Effects on Child Behavior Problems?

The practical significance of the quantity findings can be evaluated in several ways. In terms of effect sizes, the effect sizes associated with amount of early care and behavior problems ranged from .08 to

.20 in the SECC. Effect sizes for parenting quality were similar, ranging from .09 to .16. This comparison suggests that the quantity effects are meaningful.

A second way of evaluating the significance of the behavior problems findings is to compare the scores in the SECC to those of the sample used to norm the Child Behavior Checklist (CBCL). In the SECC, children who were in care for less than 30 hours a week received scores, on average, that were less than the norming sample mean of 50: children who were in child care for 0 to 9 hours a week scored, on average, 47.8 and children in care for 10 to 29 hours a week scored 49.0. Children who averaged more than 30 hours a week of child care from 3 to 54 months scored higher, on average, than the norming sample mean of 50. Children who averaged 30 to 45 hours a week received scores of 51.3 on average. Children in child care more than 45 hours a week from 3 to 54 months had the highest externalizing scores (53.1 at 54 months and 52.1 at kindergarten), a difference of about one third of a standard deviation above the norm.

A third way of assessing the size of the quantity effect is to consider the proportion of children evincing "high" behavior problems, defined as 1 standard deviation above the mean for the CBCL norming sample. With this criterion, one would, by definition, expect 17% of the children to score 60 or higher. In the SECC, only the group of children who averaged more than 45 hours per week in child care from 3 to 54 months exceeded this expectation—24% were reported by teachers, and 26% were reported by mothers, to display high levels of behavior problems at 54 months. These analyses suggest that it was only children who spend substantial hours in child care (45 hours a week) over an extended period (3–54 months) who displayed more externalizing behavior problems than might be expected within the population as a whole.

Cognitive and Language Development

Findings are mixed with respect to amount (and timing) of child care and children's cognitive, language, and academic performance. Analyses conducted by the NICHD ECCRN (2000b, 2002b, NICHD/ECCRN & Duncan, 2003) found no relations between amount/timing and cognitive and language measures at 15, 24, 36, or 54 months, controlling for other aspects of care and family factors. Others (Baydar & Brooks-Gunn, 1991; Brooks-Gunn et al., 2002; Waldfogel, Han, & Brooks-Gunn, 2002), however, have detected amount/timing effects under some conditions. In analyses of the European American children in the SECC, Brooks-Gunn et al. (2002) reported that children whose

mothers were employed for 30 or more hours a week by 9 months had poorer preacademic skills at 36 months than children whose mothers worked less than 30 hours a week. These effects were not evident in the European American children's cognitive performance prior to 36 months nor in the cognitive performance of ethnic minority children at 15, 24, or 36 months. These researchers also have found extensive maternal employment in the first year to be related to lower cognitive performance of European American (but not African American and Hispanic) participants in National Longitudinal Survey of Youth (Baydar & Brooks-Gunn, 1991; Waldfogel et al., 2002). Vandell and Ramanan (1992), in contrast, found early maternal employment to be positively associated with academic performance in grade 2 for the subsample of low-income children in the National Longitudinal Survey of Youth.

Next Steps

Additional research is needed to identify the processes that mediate relations between quantity of care and child developmental outcomes. By and large, in the work to date from the SECC, effects were not attenuated when maternal sensitivity and child care quality were included as controls, suggesting that the quantity effects were not mediated by the quality of caregiving provided by child care providers or mothers, at least as measured by the study investigators.

An important next step is to consider other aspects of child care quality. The quality of the peer environment is particularly important to consider (Fabes, Hanish, & Martin, 2003; Watamura et al., 2003). The specific strategies that caregivers use to promote children's social skills and to handle children's noncompliance and aggression also may help to explain the effects associated with quantity of care. The extensive child care observations conducted in the SECC, which are available in the public release data set, include peer-related items as well as observations of caregivers' socialization strategies. These observations could be useful in testing these mediation hypotheses.

Further research also is needed to disentangle the effects of amount and of timing. One possibility, if sufficient families are interested, is to mount an experimental study of paid parental leave in which children (and families) are assigned to varying amounts of child care (0–40 hours) and to different entry ages (2–24 months). Recent large-scale experimental studies of early education and work-based antipoverty programs indicate that such projects are feasible and

compelling (Administration for Children and Families, 2002; Gennettian & Miller, 2002; Huston et al., 2001).

Does Type of Child Care Matter?

A third question central to child care research is whether child developmental outcomes are affected by different types of child care. In some cases, correlational designs have related attendance at centers, child care homes, and relative care to child developmental outcomes. Others have used experimental and quasi-experimental designs to study the effects of participation in high-quality early education programs.

In an early study of 80 preschool-aged children in Chicago, Clarke-Stewart (1987) found child care centers, child care homes, and in-home care (nannies and relatives) to differ in a myriad of ways. Child care centers typically had more highly educated caregivers, larger group sizes, more time spent in "lessons," more structured activities, and more child-oriented materials, activities, and toys. Caregivers in centers had more professional orientations and were less likely to provide care as a favor for the family. In contrast, child care homes typically devoted more time to free exploration, casual learning, and watching TV than did centers. Consistent with their more educational focus, children who attended centers scored higher on standardized cognitive assessments, controlling for family demographic characteristics and observed parenting. Children in center-based care also were more competent with strangers and independent of mothers in a laboratory playroom. Least advanced were children with caregivers in their own homes.

Similar findings were obtained in the SECC (NICHD ECCRN 1996, 2000a). Centers had the largest group sizes, the highest child-adult ratios, the most stimulating physical environments, and caregivers with the most training and education. Child care homes (sometimes called family day care) were intermediate between centers and the care provided by grandparents and nannies. Child developmental outcomes were related to type of care. Children who had more experience in center-based care (defined as the proportion of 3-month epochs that they had attended centers) obtained higher cognitive and language scores at ages 2 years (2000b), 3 years (2000b), and 4 1/2 years (2002b), controlling for family background characteristics and the quality and amount of child care. Effect sizes in these analyses ranged from .21 to .43. In other analyses, changes in cognitive functioning associated with center care were considered: children who attended centers between the ages of 27 and 54 months (but not earlier) scored 4.1 points higher on

cognitive tests relative to children who never attended centers during this period, controlling for family characteristics (effect size = .27) (NICHD ECCRN & Duncan, 2003).

Loeb et al. (2004) also determined center-type care to be related to cognitive benefits. In that study, children in three sites ($n = 451$) were observed in centers, kith and kin, and child care homes after their parents began working in connection with TANF (Temporary Assistance to Needy Families). Children were 2 1/2 years on average at Wave 1, and 4 years on average at Wave 2. Children who attended centers during both waves and children who moved to centers by Wave 2 obtained higher cognitive and school readiness scores (effect sizes 0.6 and 0.4), controlling for family background and prior child performance. Participation in centers was not related to child behavior problems.

The available experimental and quasi-experimental evidence indicates that high-quality center-based care confers cognitive and academic benefits for children who are at risk for school failure. In the Carolina Abecedarian Project, the treatment group attended a high-quality full-day program from shortly after birth through age 5 years while the control group received family support social services, pediatric care, and child nutritional services. At 8 and 12 years, the treatment group obtained higher IQ scores (Campbell & Ramey, 1994). At age 15 years, they had higher reading and mathematics achievement scores, were less likely to have been retained a grade, and were less likely to have been placed in special education (Ramey, Campbell, & Blair, 1998). At age 21 years, they were more likely to have attended a 4-year college (Campbell, Ramey, Pungello, Sparling, & Miller-Johnson, 2002). Not all of the effects reported from this program were positive, however. In grade 1, children in the treatment group were reported by teachers to be more aggressive (Haskins, 1985).

A second experimental study, the Perry Preschool Project, also found long-term effects of participation in a high-quality center-based program, in this case a half-day program that began at age 3 years. This sample of 123 children has been followed to 27 years, at which time members of the experimental group had higher incomes and fewer arrests, and were less likely to be receiving public assistance, than members of the control group (Schweinhart, Barnes, & Weikart, 1993).

A third experimental study, the Infant Health and Development Project, was a multisite randomized treatment study that included high-quality center-based care as a component of a comprehensive intervention targeted to low-birth-weight (LBW) premature infants. The treatment group received home visits from the 1st through the 3rd

year and high-quality, full-day center-based programming during their 2nd and 3rd years. Children's cognitive and behavioral functioning was assessed at ages 5 and 8 years (Brooks-Gunn et al., 1994). The initial analyses contrasting the intention-to-treat group versus the control group found cognitive benefits at ages 5 and 8 years only for the heavier LBW infants. A recent paper (Hill, Brooks-Gunn, & Waldfogel, 2003) has extended this study to consider dosage. The dosage analyses indicated considerably larger cognitive effects through age 8 years for both lighter and heavier LBW infants who had attended the program for more days.

Results from quasi-experimental studies also support the proposition that high-quality center-based programs can have long-term beneficial effects for low-income children. In a series of papers (Reynolds, 1994; Reynolds & Robertson, 2003; Reynolds & Temple, 1998; Reynolds, Temple, Robertson, & Mann, 2001), Reynolds and colleagues have followed the educational and social development of African American and Hispanic children who lived in central city Chicago. The treatment group consisted of children who participated in government-funded Title I early childhood programs in 1985–1986 ($n = 989$); the comparison group consisted of other children in the same neighborhoods who did not attend these programs and received the “treatment as usual” in the community ($n = 550$). The Chicago Parent-Child Center curriculum emphasized basic skills in language and math through fairly structured activities that were taught by teachers with college degrees; parent involvement was an integral part of the program.

Program effects have been found through age 20. Children who participated in the early childhood program obtained significantly higher math and reading achievement test scores at 5, 8, and 14 years, controlling for family risk status, child gender, and program participation during the primary grades (Reynolds & Temple, 1998). At age 20, participants were more likely to have completed high school and to have low rates of juvenile crime (Reynolds et al., 2001). Program participation also was associated with reductions in child abuse and child neglect, with the largest effects seen when children were 10 to 17 years old (Reynolds & Robertson, 2003).

Conclusions

The last 25 years have been marked by substantial progress in answering questions about the effects of child care quality, amount and timing, and type. This progress has occurred, in part, because of the study of large and diverse samples, the development of a common set

of reliable and valid measures that facilitated cross-study comparisons, the use of sophisticated analytic strategies that minimized the likelihood of biased findings, longitudinal designs in which child care and the family were assessed at regular intervals, and the consideration of a broad array of social and cognitive outcomes evaluated by multiple methods.

With respect to child care quality, both process quality (the experiences that children have with caregivers, peers, and materials) and structural/caregiver features have been consistently found to predict children's cognitive, language, and social development, even when extensive covariates are included in analyses. Much of this research has reported main effects of quality, but there is some evidence that the effects of child care quality are larger in children who are at risk because of poverty, maternal depression, or poor parenting. Effects associated with child care quality are "small" or "moderate" by Cohen's (1988) standard, but they may still be judged as meaningful when compared to the effects of poverty and parenting.

With respect to amount and timing of child care, the research evidence suggests that substantial hours in care beginning in infancy is associated with less sensitive mother-child interactions and with more behavior problems in children. In the NICHD SECC, children in child care for less than 30 hours a week from 3 to 54 months had externalizing scores that were, on average, below the norming sample mean of 50, whereas children in child care for substantial hours (i.e., more than 45 hours a week from 3–54 months) had externalizing scores that were, on average, 2 to 3 points above the norming sample mean. Children with substantial early hours also evinced a higher than expected rate of "high" levels of behavior problems, while children with less extensive hours did not. Further research is needed to identify the processes that mediate and moderate relations between amount of care and behavior problems.

Finally, with respect to the effects of different types of care, experimental studies of high-quality programs serving at-risk children have found positive short-term and long-term effects on children's academic, cognitive, and social outcomes. Correlational studies also indicate that attending child care centers is associated with higher cognitive and language scores.

Although much progress has been made in understanding the effects of early child care further research is clearly needed because there is much we still do not know. Our unanswered questions include the following: First, will effects of child care quality, amount, and type continue to be evident during middle childhood and adolescence? That

is, are the effects of early experience maintained or do they dissipate? Second, what is the quality of child care in the United States? How much of the available care is of poor quality? Third, do measures of quality need to be expanded to reflect the peer context? Fourth, can effective policies be implemented to improve child care quality? Fifth, can the effects of amount and timing of early child care be disentangled? Finally, what are the effects of different parental leave policies on the well-being and development of children and families? As progress is made on these questions, child care research should help to advance developmental theory and application.

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