

# Effectiveness of Early Intervention for Vulnerable Children: A Developmental Perspective

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An analysis of the current state of our knowledge of the effectiveness of early intervention for children at risk and for those with established disabilities was provided. A model focused on children's cognitive development was presented in which early intervention is placed firmly within a developmental framework. Both short- and long-term effects, the mechanisms through which early intervention exerts its influence, the relation between those mechanisms and the organization of existing service systems, current limits of programs, and prospects for future research were considered in this model.

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In the past 25 years, the extraordinary vulnerability of young children at risk for developmental problems due to environmental and biological factors as well as of those children with established developmental disabilities has been recognized. Poverty, prematurity and low birthweight, parenting difficulties, abuse and neglect, prenatal exposure to illicit drugs or alcohol, continuing exposures to toxic substances during early childhood, and hazards found in hostile environments constitute well-known risk factors that can significantly compromise young children's health and development (Breslau et al., 1994; Guralnick, 1997b; Hack et al., 1994; Sameroff, Seifer, Barocas, Zax, & Greenspan, 1987). There exist as well substantial numbers of young children who manifest established developmental disabilities arising from an array of conditions, including genetic disorders and congenital infections (Lipkin, 1996). Prevalence estimates for children with established disabilities range widely in accordance with a child's chronological age and the ascertainment method

(Yeargin-Allsopp, Murphy, Oakley, Sikes, & the Metropolitan Atlantic Developmental Disabilities Study Staff, 1992). Overall, in systematic surveys, investigators have found that approximately 800,000 children through age 5 years, a conservative estimate, manifest significant disabilities (2.2% of all children birth to 2 years of age and 5.2% of all 3- to 5-year-olds meet eligibility criteria to receive services under current federal legislation for early intervention [P.L. 99-457, 1986; now IDEA, 1997, see Bowe, 1995]).

The co-occurrence of multiple problems is now well-documented both for children at biological or environmental risk and for those with established disabilities. As discussed later, multiple risk factors, in particular, pose major challenges for the field of early intervention.

Poverty, for example, often implies the existence of numerous other risk factors that serve to compromise a child's development to an extraordinary extent (Halpern, 1993). Moreover, children referred to as "doubly vulnerable" (i.e., those at both biological and environmen-

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tal risk) are not only increasing in number but are especially susceptible to significant developmental problems (Bradley et al., 1994; McGauhey, Starfield, Alexander, & Ensminger, 1991; Ross, Lipper, & Auld, 1990). The power of this combination of conditions is most evident in the difficulty in finding protective factors that can prevent adverse outcomes (Bradley et al., 1994; McGauhey et al., 1991).

Children with established developmental disabilities are also susceptible to multiple problems. Many disabilities co-occur, such that children with cognitive delays often must contend with motor impairments, language problems, sensory difficulties, or epilepsy (Boyle, Decouflé, & Yeargin-Allsopp, 1994). Moreover, these same young children with established disabilities are "doubly vulnerable" in another sense, as they increasingly find themselves experiencing stressors associated with poverty and related environmental risks. Bowe (1995) estimated that 35% of families with children birth to 5 years of age having significant disabilities fall below the Census Bureau's threshold for low income.

The strong advocacy movement on behalf of these vulnerable children (Turnbull & Turnbull, 1978), the emergence of developmentally and neurobiologically based theories and data suggesting the unusual potential of intervening during the first few years of life (e.g., Clarke-Stewart, 1988; Futterweit & Ruff, 1993), and a growing legislative agenda in support of children at risk and those with established disabilities (Florian, 1995; Hutchins, 1994; Ireys & Nelson, 1992; Richmond & Ayoub, 1993; Smith & McKenna, 1994; Zigler & Valentine, 1979), have resulted in the establishment of a complex array of early intervention programs, both preventive and ameliorative in nature, in virtually every major community in the United States (Guralnick, 1997b). Yet despite these accomplishments, a number of serious challenges to the viability of this system of early intervention programs has emerged in recent years. To

some extent, these concerns are rooted in observations that the "system" of early intervention programs has evolved in a seemingly haphazard and fragmented manner. For children participating in formal developmental/educational programs, curricula and services differ radically, and it is difficult to find common theoretical ground even for children with similar risk or disability profiles (Bailey & Wolery, 1992; Bryant & Graham, 1993; Goodman & Pollak, 1993; Stayton & Karnes, 1994). The informal system of supports (e.g., respite care, parent groups, counseling) appears even more fragmented, as directories must be published and frequently reissued to guide families through the array of options, and coordination of services among health, education, and social services is always difficult (Benn, 1993). From this panoramic perspective, it is easy to understand how critics can argue that no truly coherent early intervention framework exists, thereby limiting prospects for meaningful benefits for children and families.

Equally damaging is the now intense professional debate surrounding claims of the effectiveness of early intervention. Fueled by the ascendance of more biologically oriented models of development, especially in relation to cognitive functioning (Herrnstein & Murray, 1994; Scarr, 1992), positions have been put forward suggesting that no long-term benefits of early intervention can be found; a conclusion that frequently finds receptive audiences at professional and political levels. Indeed, although I have argued later in this paper that this reading of the literature is not accurate either for children at risk or for those with established disabilities, sufficient data are nevertheless available to raise legitimate concerns regarding the long-term effectiveness of early intervention programs (Gibson & Harris, 1988; Spitz, 1986). Given the scrutiny with which all levels of government currently are examining the services they provide in this era of financial austerity, an analysis and framework that places this debate on

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the effectiveness of early intervention in perspective can have important conceptual, service, and public policy implications.

In this paper, I have attempted to demonstrate that a reliable and comprehensible pattern of early intervention effectiveness does exist and that this pattern is similar for children at risk and for those with established disabilities. Specifically, by placing early intervention services firmly within contemporary developmental theory, a rational basis for a seemingly haphazard array of services can be established, the mechanisms through which early intervention programs operate can be understood, and conflicting findings with respect to effectiveness, particularly in terms of long-term effectiveness, can be reconciled.

It is important to note that in this examination of the effectiveness of early intervention, I have focused exclusively on the domain of cognition. More specifically, the focus is on psychometrically defined intelligence (Neisser et al., 1996). Although other outcome domains are certainly critical for early intervention (Guralnick, 1990; Zigler & Trickett, 1978), standardized measures of cognitive development have been most widely applied across risk and disability samples, thereby increasing prospects for identifying consistent patterns of early intervention effectiveness. In addition, the primary studies evaluating effectiveness included in the analyses that follow were required to meet the following criteria: (a) were published since 1986 (i.e., post P.L. 99-457) or, if earlier, was part of a long-term evaluation of effectiveness; (b) investigator(s) employed a randomized, prospective, longitudinal design with appropriate control groups receiving traditional care (but not only contrasted with alternative interventions); (c) contained no significant methodological flaws; (d) investigator(s) intervened and/or followed children for at least a 3-year period; and (e) at minimum, investigator(s) evaluated the effects of early intervention during the first 5 years of life. Occasionally, to illustrate impor-

tant points or because they presented a compelling pattern of outcomes, I included (a) studies not meeting all criteria (especially methodological issues) or (b) those in which meta-analyses were reported.

## Short-Term Effects of Early Intervention

Analyses of the course of intellectual development for children at risk and those with established disabilities in the absence of early intervention have revealed the existence of a ubiquitous pattern, namely, a general decline in children's intellectual development occurs across the first 5 years of life (see Guralnick, 1988). Declines for children at risk have ranged widely (from .50 to 1.5 standard deviations [*SDs*]) based on control group data from studies meeting criteria for inclusion in this review. For children with established disabilities, despite starting at a far lower level than children at risk, the order of magnitude of the decline is approximately .5 to .75 *SDs* (approximately 8 to 12 IQ points).

There now exists unequivocal evidence that the declines in intellectual development that occur in the absence of systematic early intervention can be substantially reduced by interventions implemented and evaluated *during the first 5 years of life*. For children with established disabilities, studies in which investigators employed prospective, longitudinal, randomized designs with appropriate control groups are, unfortunately, extremely rare (see Guralnick & Bricker, 1987). The widespread availability of services today only allows investigators to compare alternative intervention techniques. However, a meta-analysis of pre-P.L. 99-457 studies conducted by Shonkoff and Hauser-Cram (1987) focused on children birth to 3 years of age revealed that participation of children in early intervention programs yields an average effect size of .62 *SD* for measures of cognitive development. For chil-

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dren with Down syndrome, the etiological group receiving the most attention from researchers, there exists general agreement that immediate effects of similar magnitude in response to early intervention are obtained (Gibson & Harris, 1988; Guralnick & Bricker, 1987). Support for these short-term effects can be found as well in longitudinal studies of children with Down syndrome enrolled during the first year of life in comprehensive early intervention programs and continuing their participation for 3 to 5 years. Reports from Wales (Woods, Corney, & Pryce, 1984), Israel (Sharav & Shlomo, 1986), Australia (Berry, Gunn, & Andrews, 1984), and the United States (Schnell, 1984) reveal consistent findings indicating that, although control groups were not included, the decline in intellectual development that occurs after the first 12 to 18 months for children with Down syndrome can be prevented almost entirely. Of course, children with Down syndrome continue to exhibit mild to moderate developmental delays, but preventing the further decline in intellectual development that typically occurs during the first few years of life is an important accomplishment (effect sizes .5 to .75 *SD*).

Precisely the same short-term effects of early intervention are found for children at biological risk. For example, the decline in intellectual development was reduced substantially for premature, low-birthweight children who participated in 3 years of early intervention as part of the Infant Health and Development Program (1990). An effect size of .83 was obtained for the heavier birthweight group (2001 g to 2500 g) and .41 for the lower birthweight group (< 2001 g). Two features of this study are notable. First, this large multisite randomized trial included samples that were highly heterogeneous with regard to family characteristics, although most families represented lower income groups. Second, the interventions were both comprehensive and intensive, containing center-based and home-visiting components

as well as parent groups. Interestingly, a far less intensive intervention that occurred in the Vermont study (only 11 one-hour sessions, 7 just prior to hospital discharge followed by 4 home visits) for generally intact middle-class families in a rural setting yielded even more powerful short-term effects, evident when the children were both 3 and 4 years of age (Rauh, Achenbach, Nurcombe, Howell, & Teti, 1988). Why low intensity interventions are capable of producing such impressive effects remains an important question, which is addressed in a subsequent section of this paper.

Based on numerous studies for children at environmental risk, general agreement also exists that early intervention produces substantial short-term effects. Despite legitimate concerns regarding the quality of some of the experimental designs, these outcomes appear consistently for diverse types of interventions (Barnett, 1995; Bryant & Maxwell, 1997). Of importance, these advantages are observed in well-designed randomized trials as well. Specifically, in the Abecedarian Project (Ramey & Campbell, 1984) children at high environmental risk were enrolled in infancy, with experimental group subjects receiving early intervention services in an intervention-oriented daycare program for the first 5 years of life. Although declines in development were evident for both experimental and control groups, the rate of decline was considerably less for children receiving the intervention, with significant differences in intellectual development between the two groups appearing at 2 years of age. Of note, by age 4, approximately 18% of the control children received an IQ below 70, whereas this was the case for less than 3% of the children participating in the intervention. Although children of mothers with more limited resources, as reflected by maternal IQ below 70, benefitted most (Martin, Ramey, & Ramey, 1990), the overall effect size for children at 4 years of age was .82 *SD*. A replication of this intensive inter-

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vention that included a systematic parent component produced similar results (Wasik, Ramey, Bryant, & Sparling, 1990).

*Summary.* Taken together, contemporary comprehensive early intervention programs for children at risk and for those with established disabilities reveal a consistent pattern of effectiveness as these programs are able to reduce the decline in intellectual development that occurs in the absence of intervention. The magnitude of these effects is of potential developmental significance, with effect sizes averaging .50 to .75 *SDs*, depending on the group's risk or disability status. The outcomes described to this point are short-term, however, evident only during the course of the program, soon after the program has ended, or later on, but still during the first 5 years of life.

That declines in cognitive development are evident for control group children receiving traditional community care, particularly for more contemporary post-P.L. 99-457 samples, is somewhat surprising. A reasonable expectation is that control group families would be able to take advantage of existing early intervention service systems themselves. After all, in most of the studies noted above, traditional care provided to control group families included referrals to appropriate community services. Apparently, in view of the fact that declines still occur, such early intervention services may be difficult to access and coordinate, and families may well require considerable guidance to take full advantage of the complex system of services and supports that are available (see Palfrey, Singer, Walker, & Butler, 1987). This may be especially true of families living under poverty conditions (e.g., Bradley et al., 1994; Burchinal, Roberts, Nabors, & Bryant, 1996; Ramey & Campbell, 1984; Resnick, Eyler, Nelson, Eitzman, & Bucciarelli, 1987; Wasik et al., 1990). However, when families in control groups are able to access some components available in the early intervention system, such as quality daycare, the rela-

tive effectiveness of early intervention compared to the experimental group is attenuated (Neser, Molteno, & Knight, 1989; Wasik et al., 1990).

Understanding why early intervention is able to produce these short-term effects constitutes a question of vital importance to the entire early intervention enterprise. A thorough knowledge of the "mechanisms" through which delays in cognitive development occur initially and how early intervention programs can prevent or mitigate those delays provides guidance for innovative interventions, establishes a basis for understanding how control groups might benefit from access to contemporary community-based early intervention systems, and may even provide a framework for designing early intervention services that maximize long-term benefits. In the analysis presented next, these mechanisms are placed firmly within a developmental framework.

## **A Developmental Framework for Early Intervention**

Experiential factors governing the course of child developmental outcomes, including a young child's cognitive development, can be divided into three sets of family patterns of interaction: (a) the quality of parent-child transactions, (b) family-orchestrated child experiences, and (c) health and safety provided by the family (Guralnick, 1997b) (see Figure 1). Constructs derived from these three proximal patterns of interaction have well-established correlates with child developmental outcomes and well-developed measurement systems. For parent-child transactions, the dimensions and characteristics of family interaction patterns that appear to support optimal development include responding contingently, establishing reciprocity, providing affectively warm and nonintrusive interactions, appropriately structuring and scaffolding the environ-

ment, being discourse-based, and ensuring developmentally sensitive patterns of caregiver-child interactions (e.g., Baumrind, 1993; Clarke-Stewart, 1988; Dumas & LaFreniere, 1993; Hart & Risley, 1995; Lewis & Goldberg, 1969; Pratt, Kerig, Cowan, & Cowan, 1988; Wachs, 1992; Wachs & Gruen, 1982).

friendship and family networks or alternative care arrangements. Many, though not all, of these dimensions of family-orchestrated child experiences are strongly correlated with child outcomes. Some of the dimensions captured in the HOME Inventory (Elardo, Bradley, & Caldwell, 1977) are most well-known, and sets of measures related to parental arranging of child experiences are now available (e.g., Ladd, Profilet, & Hart, 1992). Moreover, especially as children approach the preschool years, arranging for special developmental, educational, or recreational activities in response to their child's interests, talents, or even special needs becomes increasingly important in maximizing child developmental outcomes. Particularly for children with special needs, parents may elect to enroll their child in a developmentally oriented center-based program or in a highly specialized, therapeutic intervention. As discussed later, under certain conditions, various features of center-based interventions appear to make important independent contributions to child development. Finally, parents are directly responsible for ensuring the general health of and establishing a safe environment for their child (e.g., obtaining immunizations, providing adequate nutrition, protecting child from violence). Many of these dimensions operate in complex ways to alter child developmental outcomes, such as nutrition (Gorman, 1995). Others, such as protection from violence or witnessing violence, are not easily altered but are nevertheless likely to have a considerable impact on child developmental outcomes (Osofsky, 1995; Taylor, Zuckerman, Harik, & Groves, 1994).

These three general proximal patterns of family interaction that jointly or independently substantially influence child developmental outcomes are themselves products of an array of *family characteristics*, including parental attitudes and beliefs, maternal mental health status, coping styles, and existing supports and resources. As is generally the case, when these family characteristics are within

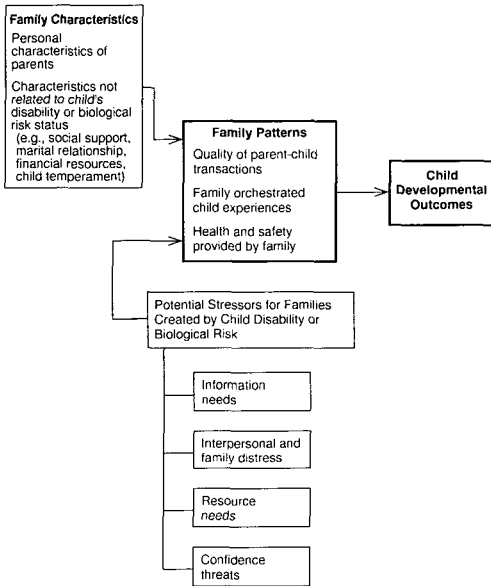


Figure 1. Factors influencing developmental outcomes for children. Figure taken from "Second Generation Research in the Field of Early Intervention" (p. 7) by M. J. Guralnick. In M. J. Guralnick (Ed.), *The Effectiveness of Early Intervention*, 1997, Baltimore: Brookes. Copyright 1997 by Brookes. Reprinted with permission.

The second family pattern of interaction governing child developmental outcomes consists of children's experiences with the social and physical environment that are orchestrated by family members, primarily parents. Major dimensions include the variety and developmental appropriateness of toys and materials provided, the general stimulation value of the environment, and the frequency and nature of contacts with other adults and children that occur through parent-based

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normative levels, child development proceeds in an expected manner (see Figure 1). From an alternative perspective, available evidence indicates that adverse family characteristics can stress or perturb the three patterns of family interaction that lead to optimal child developmental outcomes. Examples of such characteristics are maternal mental illness, particularly depression (Cicchetti & Toth, 1995), limited intellectual abilities of parents (Feldman, Case, Towns, & Betel, 1985), and inappropriate intergenerational and culturally transmitted beliefs and attitudes with respect to child-rearing (Crowell & Feldman, 1988; S. Miller, 1988; Murphey, 1992).

Similarly, other characteristics of the family (also not related to a child's disability or biological risk status) can also jeopardize the family's ability to establish optimal interaction patterns. These include the absence of adequate social supports (Cochran & Brassard, 1979; Melson, Ladd, & Hsu, 1993), stressful marital relationships (Emery & Kitzmann, 1995), and limited financial resources (Duncan, Brooks-Gunn, & Klebanov, 1994; McLoyd, 1990). Moreover, individual child characteristics, such as a difficult temperament can, under certain circumstances, create nonoptimal family interaction patterns, particularly parent-child transactions (Lee & Bates, 1985; Sameroff, 1993).

### ***Family Environmental Risk and Stressors***

The extent to which these (more distal) family characteristics are inconsistent with (more proximal) optimal family patterns of interacting can be said to constitute an important cluster of environmental risk factors in relation to children's development. Whether a child is considered to be "at risk" due to apparently adverse family characteristics depends on the definition of risk selected and the purpose for identifying risk status. Multiple risk indices can be extremely valuable, as it appears that

it is the compounding of risk factors that governs the impact on children's cognitive development (Sameroff et al., 1987). Of course, chronic poverty alone may be sufficient to justify a child as being at risk, as this circumstance creates significant levels of stress, often adversely affecting other family characteristics that influence family patterns of interaction (Duncan et al., 1994; Huston, McLoyd, & Garcia Coll, 1994; Parker, Greer, & Zuckerman, 1988). Nevertheless, poverty does not have an overriding effect (Sameroff et al., 1987), suggesting that specific adverse family characteristics aggregate to create *stressors* sufficient to alter family interaction patterns and, ultimately, child developmental outcomes. Proximal family interaction measures, such as the quality of parent-child transactions, are often included in indices of environmental risk as well as measures related to the more distal family characteristic measures (e.g., Sameroff et al., 1987). As conceptualized here, environmental risk can be thought of as consisting of two separate components: (a) dimensions related to family characteristics and (b) family patterns of interaction. This second cluster of risk factors is considered causal in the model illustrated in Figure 1 (see also Yoshikawa, 1994) but in reality can only constitute statements of elevated probabilities for adverse child development. Although the association between those proximal risk factors (family interaction patterns) and child development is well established, the connection is far from certain due to imperfect or incomplete measures or constructs, poorly understood interactions or unidentified risk factors, and protective factors within the individual child (Werner, 1995). Finally, the model in Figure 1 reflects only unidirectional relationships and is, therefore, an oversimplification of the processes involved. However, the model does capture the important experiential dimensions affecting child development and serves as a useful device for explanatory purposes.

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## ***Child Disability, Biological Risk, and Stressors***

Children born at biological risk or those with established disabilities create potential *additional* stressors with which families must contend. The lower portion of Figure 1 identifies four categories of potential stressors: (a) information needs, (b) interpersonal and family distress, (c) resource needs, and (d) confidence threats. As suggested by the figure, similar to circumstances of high family or environmental risk, I argue here that these stressors exert their influence on child developmental outcomes by interfering with one or more of the three critical family interaction patterns.

First, families face a "crisis of information" with respect to their child's current and anticipated health and development. For example, for families of premature low-birthweight children, the newborn period in particular evokes numerous questions about highly technical medical procedures and the impact of those procedures on their child's health and well-being (Meyer et al., 1995). For children at biological risk and those with established disabilities, numerous issues continue to emerge over time, as families struggle with building a relationship and understanding their child's developmental and behavioral patterns and needs. As a consequence, discussions with professionals with respect to sleep-wake cycles, unusual lags in specific developmental domains, problems in establishing affective bonds or joint attention, and difficulties recognizing and interpreting their child's cues are frequently among the issues addressed that are vital in helping families gain information needed to support them in their parenting role (Donahue & Pearl, 1995; Guralnick & Bricker, 1987; Shonkoff, Hauser-Cram, Krauss, & Upshur, 1992). Correspondingly, information needs regarding the implications of a specific diagnosis with respect to their child's developmental or behavioral expectations persist across the early childhood years,

often precipitated anew by transition points (hospital to home, home care to day care, entry into an early intervention program, preschool to kindergarten). Finally, for many families, numerous questions arise as to the nature and effectiveness of therapeutic services and how to gain access to the most expert clinicians and programs available (see Sontag & Schacht, 1994).

The importance and stressful nature of these information needs and their impact on family interaction patterns should not be underestimated. For example, combined with other types of stressors (e.g., family distress), families of children with established disabilities often find it difficult to form those parent-child transactions that promote secure attachments. Indeed, the absence of secure attachments (with corresponding difficulties in maternal sensitivity) has been observed for an unusually large proportion of children with Down syndrome (Vaughn et al., 1994; see also Atkinson et al., 1995).

Considerable interpersonal and family distress also is often a consequence of a child's biological risk or established disability. This intensely emotional and personal experience can take its toll on parental well-being and marital harmony, often involving stressful reassessments of the parents' own lives and expectations for their child and the family as a whole (Beckman & Pokorni, 1988; Hodapp, Dykens, Evans, & Merighi, 1992; Margalit, Raviv, & Ankonina, 1992; E. Miller, Gordon, Daniele, & Diller, 1992; Waisbren, 1980). Of importance is the fact that this distress does not appear to be time-limited. Following an initial process of adaptation, the family faces additional distress that recurs at various developmental stages and transition points (Wikler, 1986). To be sure, many families adapt well to children with disabilities in their family (e.g., Trute & Hauch, 1988), but recent evidence continues to suggest that it is not uncommon for parents to experience long-term difficulties even in resolving issues surrounding the diagnosis of a disability, a stressful



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circumstance that can affect important caregiving processes (Pianta, Marvin, Britner, & Borowitz, 1996). Moreover, families can easily fall prey to the forces of social isolation (Bailey & Winton, 1989; Lewis, Feiring, & Brooks-Gunn, 1987) or stigmatization (Goffman, 1963). In fact, distress can arise simply from the process of confronting and coping with problems related to their child's biological risk or disability status (Affleck & Tennen, 1993; Atkinson et al., 1995; Behr & Murphy, 1993).

For the third category of potential stressors (i.e., resource needs), children with a disability and those at significant biological risk typically create considerable stress on the usual routines of families and their ability to provide the type of caregiving that is necessary (Beckman, 1983; Bristol 1987; Dyson, 1993). Moreover, the burden of locating and even coordinating services for the child often falls on families, creating additional demands on their time and additional needs for resources (Rubin & Quinn-Curran, 1985). In fact, financial responsibilities for their child's health care, respite care, and therapeutic services can mount rapidly, particularly for children with severe disabilities or those at high biological risk (Birenbaum, Guyot, & Cohen, 1990).

Finally, these and related stressors conspire to undermine parental confidence in their ability to solve current and future child-related problems. The long-term well-being of the child and family is associated with the family's ability to maintain a sense of mastery and control over decision-making and to do so with reasonable competence and confidence (see Affleck & Tennen, 1993).

### ***Interactions Among Family Characteristics, Family Patterns of Interaction, and Stressors***

The developmental approach presented in this paper is based on concepts and

constructs derived from a number of related approaches that have been focused on diverse populations, including children at risk, children with established disabilities, as well as children and families not experiencing any unusual risks or stressors. As a consequence, the claim that this developmental framework is applicable to children and families with such a wide range of characteristics should not be surprising. Related approaches include Belsky's parenting model (Belsky, 1984; Belsky, Robins, & Gamble, 1984), Sameroff's transactional model (Sameroff, 1993; Sameroff & Chandler, 1975), Ramey's biosocial model (Ramey et al., 1992), Dunst's social support model (Dunst, 1985), and Bronfenbrenner's (1979) ecological model.

Central to most of these models, and the approach adopted here, is that numerous factors can interact to either mitigate or exacerbate stressors associated with risk or disability. Indeed, disastrous effects can result for children who are "doubly vulnerable," that is, those at both biological and environmental risk (e.g., Bradley et al., 1994). Figure 1 reflects the possible potentiating effects of these risk factors on family interaction patterns and subsequent child developmental outcomes.

From a more positive perspective, family characteristics that represent low environmental risk may well be able to mitigate many of the potential stressors associated with a child at biological risk or with an established disability. Evidence that such mitigated patterns operate for children at risk and those with established disabilities is widely available (e.g., Bradley, Rock, Whiteside, Caldwell, & Brisby, 1991; Crnic, Greenberg, Ragozin, Robinson, & Basham, 1983; Dunst, Trivette, & Cross, 1986). Moreover, as Belsky (1984) pointed out, the array of family characteristics is a buffered system itself, such that a high level of social support, for example, can mitigate the effects of a difficult marital relationship and, therefore, protect against significant interference with appropriate family patterns of interaction. Accord-

ingly, this issue of the actual impact (stress) of a child's biological risk or disability on family patterns of interaction in the context of the larger ecology of family characteristics is likely to be of considerable significance in the design of a cost-effective and efficient early intervention system and is considered in a subsequent section of this paper.

## The Early Intervention System

The argument put forward here is that the stressors created by risk and disability conditions operate through family interaction patterns to produce the declines in intellectual development noted earlier. I have argued further that early intervention programs are capable of altering either those nonoptimal family interaction patterns directly or by moderating the impact of stressors that influence those patterns (i.e., family characteristics). If this analysis is correct, at least for short-term outcomes, in order for early intervention programs to produce the effect sizes noted

earlier (.5 to .75 *SD*), the components of the system must be designed in a manner that is responsive to the stressors that have been identified. As presented in Figure 2, I suggest that this is precisely how the contemporary early intervention system is organized. Analyses of early intervention program components found in increasingly larger numbers of communities (and representing, to varying degrees, the service features of the research projects noted earlier) indicate that this system is comprised of three major features: (a) resource supports, (b) social supports, and (c) the provision of information and services. These early intervention system components are discussed next, first for children at biological risk and those with established disabilities and then for children at risk due to environmental factors.

## Biological Risk and Established Disability

Figure 2 summarizes the major components of early intervention programs as they are currently constituted. Organized

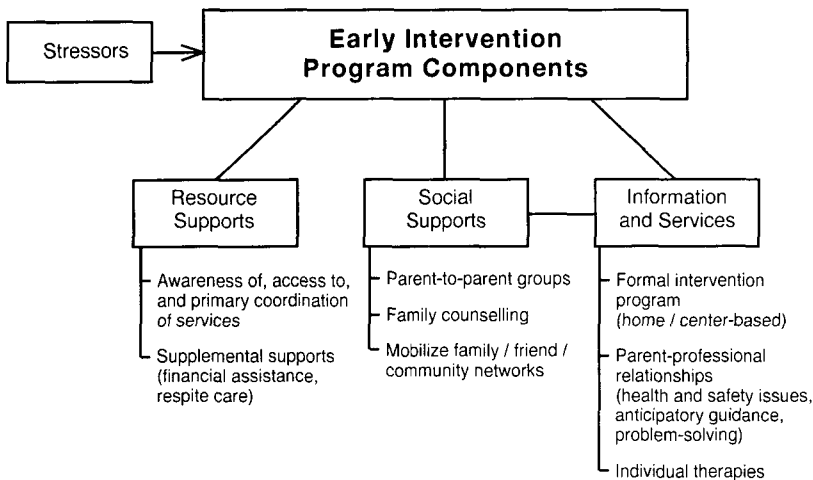


Figure 2. Components of early intervention programs as a response to stressors. Figure taken from "Second Generation Research in the Field of Early Intervention" (p. 9) by M. J. Guralnick. In M. J. Guralnick (Ed.), *The Effectiveness of Early Intervention*, 1997, Baltimore: Brookes. Copyright 1997 by Brookes. Reprinted with permission.

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into the major areas of resource supports, social supports, and information and services, these components appear to be closely attuned to the potential stressors facing families (see bottom portion of Figure 1). Resource supports are perhaps most fundamental of all. Becoming aware of, accessing, and coordinating appropriate educational, health, and social services can be a formidable challenge for even the most adept of families. As a consequence, a service coordinator is often essential to assist eligible families. Fortunately, P.L. 99-457 mandates service coordination.

The provision of social supports for families has a long history, with leadership provided by numerous parent organizations (Santelli, Turnbull, Marquis, & Lerner, 1995). These remarkable support groups are a unique source of information and can be of enormous value in alleviating any interpersonal or family distress that may have arisen. These same groups are able to assist families to involve friends, extended family, and other community-based natural supports to establish a network that minimizes stressors (Cooley, 1994; Shonkoff, 1985). Attention to the cognitive coping styles of parents is important as well because these styles are associated with affective distress and the quality of parent-child transactions (Atkinson et al., 1995). If interpersonal and family distress become excessive, intensive family counseling must be considered.

Unquestionably, the most prominent and most expensive features of the early intervention system are the formal community-based intervention programs found in the third component of Figure 2, the provision of information and services. Offered in the form of some combination of home- or center-based services, these programs tend to be comprehensive yet individualized to specific child and family needs. In this context, parents may be provided with techniques to facilitate parent-child interactions or with a framework to constructively interpret their child's

behavior and development, and children may receive specific developmental or therapeutic interventions. To support this effort, interventionists have developed numerous formal curricula for both children at biological risk and those with established disabilities. Despite the diversity represented in these curricula (Bailey, 1997; Bruder, 1997), the structure and direction they provide appear to be important reasons for their effectiveness (Shonkoff & Hauser-Cram, 1987). It is also important to point out that, for the most part, these formal programs often constitute only a small portion of the overall early intervention system. On average, infants and toddlers with disabilities spend only 7 hours per month participating in formal, community-based early intervention programs (Shonkoff et al., 1992). The variability in the intensity of service provision is actually quite extensive, and in many research-based early intervention programs, the need for more direct child-focused services is emphasized (e.g., Infant Health and Development Program, 1990; Lovaas, 1987). As discussed shortly, although the number of service hours increases as the child reaches preschool age, the intensity of service provision remains one of the most critical issues in understanding early intervention effectiveness, particularly in connection with long-term outcomes.

A substantial proportion of families also seek advice and services outside of the formal early intervention program from primary care physicians, social service providers, occupational and physical therapists, and speech-language pathologists, among others (Shonkoff et al., 1992). The formation of relationships with knowledgeable professionals provides yet another vital and supportive component of the early intervention system. These parent-professional "partnerships" provide a context for discussion around expected developmental outcomes and the child's health and safety, provide anticipatory guidance, and establish a basis for independent assessments of the child's progress

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in relation to educational and therapeutic interventions.

Enrolling the child in formal early intervention programs and establishing relationships with other professionals are clearly *family-orchestrated activities* that are responsive to the child's special needs. As such, for children at risk and those with established disabilities, these activities constitute an important family pattern of interacting that can influence child developmental outcomes. It is the case that the family retains control over this entire process: gathering information, evaluating it, and making decisions as to the extent of their own or of their child's involvement in early intervention programs. Although parents may elect to relinquish that control to professionals at various times, the formation of collaborative parent-professional relationships appears to be an essential element of success. By centering assessment and interventions around family needs, professionals create a framework for expressing their views and successfully negotiating differences in perspectives and values (Bailey, 1987; Duwa, Wells, & Lalinde, 1993). In fact, unless early intervention services are attuned to the needs of families, they can be counterproductive (Affleck, Tennen, Rowe, Roscher, & Walker, 1989).

Finally, if the components of these early intervention systems are thoughtfully coordinated and integrated, the cumulative impact may well minimize any threats to the family's confidence in their ability to address the ongoing needs of their child. Parent-professional partnerships are particularly relevant in this regard. As Cooley (1994) has pointed out, "Professionals who foster cooperative partnerships with families are informally enhancing a family's self-confidence and feelings of mastery and control" (p. 118).

*Summary.* These major early intervention systems components (resource supports, social supports, provision of information and services) exist in increasingly larger numbers of communities and, if properly accessed, sequenced, and co-

ordinated, appear capable of mitigating many of the stressors associated with a child's biological risk and disability status. In turn, reductions in the decline of intellectual development result to the degree described.

As presented in the model in Figure 1, these effects are mediated through a variety of interventions that appear to positively alter the three critical family interaction patterns identified (i.e., quality of parent-child transactions, family-orchestrated child experiences, and health and safety provided by family). The pattern of parent-child transactions in particular appears to be enhanced as a consequence of participation in the early intervention system (Guralnick, 1989; Mahoney & Powell, 1988; Resnick, Armstrong, & Carter, 1988; Seifer, Clark, & Sameroff, 1991; Spiker, Ferguson, & Brooks-Gunn, 1993). The variety of other supports and services that are provided continue to minimize stressors that can interfere with optimal family interaction patterns. Of note are the many recent reports suggesting that parents of children with disabilities experience more stress due to expected and inevitable child-related issues, but that for many families this stress does not appear to contribute to additional parent-related stress or to problems related to family functioning (Dyson, 1993; Gowen, Johnson-Martin, Goldman, & Appelbaum, 1989; Innocenti, Huh, & Boyce, 1992). This state-of-affairs may well be attributed to the supports and services available to families through the early intervention system.

### ***Family or Environmental Risk***

The stressors facing families at high environmental risk, in particular their magnitude, chronicity, and pervasiveness, pose special challenges for the early intervention system. The countless interpersonal problems found in many high-risk families, often compounded by drug or alcohol abuse, the transmission of intergenerational but nonoptimal parenting patterns, and

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the day-to-day encounters in an often hostile environment, create circumstances in which family patterns of interaction are highly resistant to change. In general, the adverse conditions associated with poverty and high-risk status are difficult to counter and present a sobering assessment of the potential influence of preventive intervention programs for children at high risk due to environmental factors (Sameroff et al., 1987).

Despite these barriers, the program components illustrated in Figure 2 appear to adequately characterize the early intervention system for children at environmental risk as well. To be sure, the specifics of these programs differ substantially from those of children at biological risk or those with established disabilities because the source of the stressors can be found primarily in family characteristics. Nevertheless, the early intervention system components of resource supports, social supports, and information and services apply. It is especially evident in these circumstances that successful programs must be comprehensive, seeking to address as many of the stressors (risk factors) as possible that can interfere with appropriate family interaction patterns (e.g., arrange support groups, provide mental health counseling, make emergency financial aid available, develop home programs, provide day care or preschool programs, ensure access to available social services). As noted previously, early interventions address both family characteristics and family interaction patterns. Yet, when accounting for the positive short-term effects of early intervention for children at high environmental risk, it appears that it is the family-orchestrated pattern of enrolling their child in intervention-oriented or quality day care that may be most significant (see Burchinal, Lee, & Ramey 1989; Wasik et al., 1990). Home-visiting programs do not alone seem to be effective (Scarr & McCartney, 1988; Wasik et al., 1990) because numerous other family interaction patterns are left unaltered. Far more intensive home visiting may be

needed to yield short-term effects (Powell & Grantham-McGregor, 1989), but meaningfully influencing parent-child transactions for high environmental-risk groups within the context of early intervention programs remains a challenging problem. Enrollment in quality day care may be the key for these high-risk families, perhaps because of some combination of the unusual intensity of the intervention associated with day care and the highly specific child focus in the intervention-oriented day care program that may help compensate for other family characteristics and family interaction patterns that are difficult to alter. Whether lasting effects for children can be achieved in the absence of meaningful changes in family characteristics or many family interaction patterns remains to be determined.

## **Long-Term Effectiveness of Early Intervention**

Twenty-five years ago, families of vulnerable children confronted what was clearly a fractionated, uncoordinated set of services, often filled with low expectations for children and no meaningful system of social supports for families. Encouraged by many forces and culminating in the passage of P.L. 99-457 (1986), what is now in place in numerous communities is a system characterized by reasonable levels of coordination; knowledgeable professionals; and, in more and more communities, the existence of sophisticated, formal intervention programs. To be sure, most community programs do not represent the quality found in the research-based service programs that have been considered in this paper. Nevertheless, although far from ideal, sufficient resources and supports appear to be available to enable families who enter the early intervention system to benefit, at least in the short-term.

However, it has always been the expectation that the early intervention system would produce long-term effects,

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well worth the extensive resources put into place during the early years. The notions of attachment, sensitive periods, neural plasticity, and primacy of first learning have all been appealed to as the basis for this extraordinary investment (Anastasiou, 1990; Guralnick & Bennett, 1987; Rutter, 1980). Yet, critics of early intervention have argued that little evidence can be found for any long-term impact. By way of example, for children at environmental risk, it has long been acknowledged that any gains in cognitive development diminish quickly over time, often to the point that control and intervention groups are indistinguishable after a few years following the end of the program (Barnett, 1995). Modest (non-cognitive) long-term benefits for children participating in early intervention programs have been cited, such as less grade retention, fewer special education placements, and better school attendance (but see Locurto, 1991). Recent analyses have also strongly suggested that juvenile delinquency rates can be reduced through participation in comprehensive early intervention programs (Yoshikawa, 1994). Nevertheless, the absence of continued effects for cognitive development is of considerable concern.

Similar analyses of the long-term effects of early intervention for children with Down syndrome have not identified any advantages for children participating in early intervention programs (Gibson & Harris, 1988). Even for children with cerebral palsy who participated in a comprehensive early intervention program, once the program ended, gains in cognitive development disappeared within a few months (Palmer et al., 1988). Children at biological risk reveal a similar pattern. Despite the highly intensive 3-year intervention as part of the Infant Health and Development Program (1990), cognitive benefits for the entire sample did not last even 2 years after the program ended (Brooks-Gunn et al., 1994; McCarton et al., 1997).

Despite the visibility accorded the

failures to find long-term cognitive benefits of early intervention for the three primary groups of vulnerable children, as noted in the following discussion a broader perspective reveals that the negative findings are not nearly as consistent or pessimistic. What is needed is a framework that will guide our understanding of and establish reasonable expectations for both short- and long-term outcomes (Zigler & Styfco, 1994). In the following sections, I have attempted to demonstrate that the developmental model presented earlier can provide such a framework. To do so, however, requires understanding the relevance of the constructs of *intensity* and *specificity* in relation to early intervention.

### ***Intensity of Early Intervention***

By examining those studies (meeting criteria noted earlier) that have been able to produce long-term gains attributable to early intervention, it may be possible to identify critical elements and consider their fit within the developmental framework. Specifically, for children with established disabilities, data from an early intervention program conducted by Lovaas and his colleagues (Lovaas, 1987; McEachin, Smith, & Lovaas, 1993) for children with autism reveal substantial advantages in cognitive development for the intervention group, an advantage that has been maintained for participants at mean ages of 7 and 13 years. This early intervention program was unusual in terms of both the subject population (children with autism) and the intensity of the intervention. Children in the experimental (intervention) group received a minimum of 40 hours of intervention services per week in contrast to a maximum of 10 hours per week for the control group for at least 2 years. Because parents were trained to participate in the interventions, the actual intervention time extended to virtually all of the child's waking hours. Moreover, the intervention staff continued to work with children and families through kindergarten and for some, even first

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grade. For children progressing well, intervention was reduced to 10 hours per week during kindergarten, with only a minimal consultant relationship maintained for some families after the child began first grade. However, for those children not progressing well, the intensive intervention continued well into the elementary years. Nevertheless, the average time interval between the end of intervention and follow-up testing was 5 years in the intervention group, providing evidence for long-term impact.

Assuming the replicability of this study, including agreement on the diagnostic characteristics of the sample (Rutter, 1996), there are likely numerous reasons for its effectiveness. The intensity of the information and services, often provided on a one-to-one basis, and the related factor of the comprehensiveness of the program, which involved the child, family, and community, can be cited. Moreover, this level of intensity, provided over a relatively short-term period (2 years), was apparently sufficient to produce not only substantial increases in children's cognitive development but also likely established an entirely different set of future expectations (and confidence) for family, school, and community.

In fact, the importance of intensity in producing even short-term effects (while intervention is in place or shortly thereafter) was revealed in a re-analysis of the Infant Health and Development Program (1990) data for low birthweight, premature children (Ramey et al., 1992). An intensity measure was created by combining the actual participation of families and children in the various components of the intervention. Analyses revealed the existence of a rather dramatic association between level of participation (intensity) in the intervention and children's cognitive development. More specifically, for children who participated in the early intervention program to only a *limited extent*, approximately 20% had IQs of 85 or below, with the vast majority of children in this limited participation group (15%)

obtaining scores below 70. In contrast, for those participating *extensively* in the intervention, only 8% of the children received IQs less than 85 and only 3%, less than 70. These outcomes were independent of the initial status and characteristics of children and families (e.g., birthweight, neonatal health, maternal education). Longer-term follow-up of these "intensity" groups may prove to be instructive.

In addition to intensity based simply on interventions provided per unit of time (density), the Lovaas (1987) intervention for children with autism also was intensive due to its duration. Although beginning when children were approximately 3 years old, the intervention continued at various levels of involvement until children were well into kindergarten and first grade. Duration may indeed be a critical feature of early intervention for the following reasons. First, it simply increases total participation time, a factor associated with producing more substantial initial positive effects on cognitive development. Second, by its very nature, duration is associated with comprehensiveness; that is, more and different intervention components tend to be part of the early intervention program. Third, and perhaps most important, is the fact that for many families stressors continue to interfere with family interaction patterns over time and interventions extended in some form remain necessary.

*Duration and Stressors.* Examining the last issue more closely, if stressors do continue to exert an adverse influence on families over time, then the effects of these stressors will be noticed as a decline in children's cognitive development that appears some time after the end of intervention. As noted, this is what generally happens. Stressors related to high (environmental) family risk are often characterized by chronic difficulties and by an unpredictability and instability that can easily create substantial stress over time. Similarly, for children with established disabilities or those at biological risk, stressors can arise as a consequence of

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unexpected problems (e.g., unanticipated atypical developmental patterns, the emergence of behavioral difficulties, lack of responsiveness to intervention). By providing early intervention across a more extended period, families have an opportunity to encounter a greater variety of problems and transition points and to rely on essential supports and services to assist in their resolution. This circumstance may not only minimize disturbances in family interaction patterns (see Figure 1) but may also instill the level of family confidence and competence essential for accommodating to the inevitable stressors that lay ahead.

This analysis suggests that intensity defined as the level of intervention occurring within a specified time interval (*density*), intensity defined as occurring across a longer period of time (*duration*), and possibly intensity defined as containing more early intervention components (*comprehensiveness*) may well be essential for long-term effectiveness. Although it is difficult to separate out each of these three aspects of intensity, the importance of the intensity construct is perhaps most evident in studies of children at high risk due to environmental factors. Specifically, the recent follow-up of children who participated in the Abecedarian Project revealed that even by 12 years of age, children who participated in the intervention continued to outperform the control group on standardized tests of cognitive development (Campbell & Ramey, 1994). To be sure, some decline in intellectual development over the years occurred for the intervention group, but important long-term effects were nevertheless evident. Of considerable significance is the fact that the duration of the comprehensive intervention was 5 years (infancy through age 5). As noted earlier, less intensive interventions containing primarily parent-child interaction components do not appear to be effective for high environmental risk families, even in the short-term (Scarr & McCartney, 1988; Wasik et al., 1990). It is possible that the long-term success of the

Abecedarian Project may be accounted for in part by children's higher initial cognitive development when entering school and the correspondingly increased positive effects on families (see Benasich, Brooks-Gunn, & Clewell, 1992).

Similarly, focusing on reading achievement, Reynolds (1994) reported that for children living in poverty, long-term positive effects can result if the intervention program extends from the early transition periods to third grade. In this natural group design, important school achievement gains were apparent 2 years following the end of a 5-year comprehensive intervention program beginning in preschool (one year preschool, one year kindergarten, 3 years primary grades). A briefer program during the early years was not nearly as effective (preschool plus kindergarten), but the absence of a preschool component reduced the long-term benefits (even when equating for duration). Accordingly, for the group of children growing up under poverty conditions, both the duration and timing of the program appears to matter. Effectiveness may be improved when more transition points are influenced by the intervention. Whether the effects would be the same if the 5-year program was initiated from birth to 5, as in the Abecedarian Project, is not known. However, evidence from that project suggests that although duration is important, beginning intervention at some point during the first 5 years of life is also vital. Beginning intervention later (i.e., kindergarten through second grade) creates no long-term advantage in comparison to children receiving no intervention whatsoever (Campbell & Ramey, 1994). Clearly, attention must be given to both the timing and intensity of interventions to achieve positive long-term outcomes.

It is important to note that timing may be an especially critical issue for low-birthweight children. Als and her colleagues (Als et al., 1994; Buehler, Als, Duffy, McAnulty, & Liederman, 1995) have argued from a developmental neurobiological perspective and provided strong



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empirical evidence indicating that the provision of family-centered developmental care for children in neonatal intensive care units (NICU) is critical for optimizing children's long-term neurodevelopmental outcome and functioning. For low-birthweight children, perhaps a combination of NICU-based interventions and participation in subsequent intensive early intervention programs will prove to be most effective, especially for families at high environmental risk or for the very low-birthweight preterm infant. This issue of the linkage between intensity and specific characteristics of children and families is discussed next.

### **Specificity**

Despite the importance of the intensity of early intervention as a factor producing long-term positive outcomes, the developmental framework presented earlier would not predict that intensive services would be needed under all risk and disability circumstances. In fact, the interactive nature of the model suggests that the effects of any one stressor or combination of stressors are likely to be moderated by the array of extant stressors associated with family characteristics and with a child's biological risk and disability status. This notion of *specificity* is central to an understanding of contemporary early intervention programs and has important policy implications for providing cost-effective services.

As cast within the developmental framework, the specificity construct can also help us understand why certain *low intensity* early intervention programs can have sustained effects. In particular, the follow-up of children in the Vermont study to age 9 years (Achenbach, Howell, Aoki, & Rauh, 1993) revealed that the low-birthweight children who received the 11 hours of intervention (combined hospital and home program) continued to be indistinguishable from a normal birthweight group, whereas the low-birthweight control group continued their gradual decline

in cognitive development. This decline for the control group is a somewhat counter-intuitive finding given the low intensity of the program and the fact that the children in this study were from middle-class families and generally free of major health or congenital disorders. However, it appears that even for these low environmental-risk families, the rural nature of the setting and scarcity of professional resources made it difficult for families to access and coordinate the needed early intervention services and supports outlined in Figure 2. As a consequence, it is reasonable to suppose that family patterns of interaction were adversely affected by the stressors associated with the child's biological risk, thereby accounting for the observed cognitive decline in the low-birthweight control group. In contrast, the intervention group children and families apparently responded well to the low intensity intervention, being provided with sufficient early intervention supports and services that not only mitigated the stressors initially but gave parents the confidence and competence to solve future problems without disturbing typical family patterns of interaction. Moreover, because of the relatively low environmental risk of these families, family interaction patterns were not perturbed by a constant source of additional stressors over time. Although some of the long-term success of this short duration program can be attributed specifically to interventions occurring directly in the NICU (see Als et al., 1994), positive changes in mothers' satisfaction with their roles as mothers and their self-confidence in carrying out parenting practices were also documented in the Vermont study (Rauh et al., 1988). For the intervention group, better quality parenting also was associated with better child cognitive outcomes during the first 4 years of life (Rauh et al., 1988). Even during the first year, for children at high biological risk, the quality of parent-child interactions is improved through early intervention and is strongly associated with child cognitive development (Resnick et al., 1988).

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## ***Importance of Interactions***

The pattern of findings for long-term effects related to intensity and specificity illustrates most clearly that early intervention programs can and should be uniquely tailored to the prevailing levels of family characteristics and stressors associated with a child's disability or risk status. For many children, early intervention may not be needed in its most intensive (and most expensive) forms where child-related stressors are either insufficient in magnitude or buffered by family characteristics that prevent interference with sound and developmentally appropriate family interaction patterns. A recent finding for children at biological risk illustrates this point. Although differences between children's cognitive development in the experimental and control groups at the end of the 3-year intervention period in the Infant Health and Development Program study was nearly 20 points for mothers with the lowest levels of education (high environmental risk), this program was ineffective for children with family characteristics indicating low environmental risks (Blair, Ramey, & Hardin, 1995). These family characteristics apparently enabled low-risk families either to adjust to stressors through their own internal resources or to seek out appropriate assistance in the community (Blair et al., 1995; Brooks-Gunn, Gross, Kraemer, Spiker, & Shapiro, 1992). Relatedly, to the extent that the intervention families were at lower environmental risk than were the control families in the Rauh et al. (1988) study (a methodological concern in that investigation), it is possible that differences in family characteristics rather than the low intensity intervention were responsible for the outcomes.

The argument offered here is not that early intervention was actually ineffective for the low risk families in the Infant Health and Development Program study, but simply unnecessary at that intensity level. In essence, these families took advantage of needed components of

the prevailing early intervention system (see Figure 2). In contrast, for children at high risk due to family characteristics, the combined biological and environmental risk conditions created an extensive array of stressors requiring a more intensive program. Accordingly, should the contemporary early intervention system be tampered with in any significant way, the prevention or reduction of substantial declines in children's intellectual development occurring across the first 5 years of life, even for relatively low risk groups, would no longer be realized (Guralnick, 1993).

*Designing Interventions.* Taken together, the process of guiding interventions intelligently based on stressors has important implications for policy, research, and practice (Guralnick, 1988, 1991, 1997b). A far more sophisticated system can be put into place through matching the specifics of early intervention program components (e.g., intensity, type of curriculum) with child (e.g., type and severity of disability) and family characteristics (e.g., social supports, financial resources) and family interaction patterns (e.g., parent-child transactions). In this system, some families and children will require only surveillance or minimal supports, even for children with established disabilities; others will require highly intensive, long-term programs to produce important outcomes that are sustained beyond the early years. As a consequence, eligibility for early intervention programs (however defined) should not mean that the child and family has available the entire array of services; individual plans need to be far more discriminating. It is not just a cost issue but, in the absence of a more sophisticated system that matches needs and services, heavy burdens are needlessly placed on families and children.

Do we know enough to make this a reality? Only to some extent. Better risk indices and clinical instruments are needed consistent with the framework described in this paper to help identify stressors and

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their likely or actual effects on family interaction patterns. This is a complicated issue, reflecting the problematic nature of our measures and risk or stress indices and our ability to accurately and nonintrusively evaluate family characteristics and family patterns of interaction (see Shonkoff & Meisels, 1991). This includes developing sensitive assessments of needs for services and supports as perceived by families. Without such instruments and a coherent plan for their use, there is little hope of creating a meaningful match between family and child needs on the one hand and services and supports on the other.

Correspondingly, by focusing on specificity in what is best referred to as second generation research (Guralnick, 1993, 1997b), investigators will contribute studies that are more relevant to practice (i.e., addressing questions regarding for whom and under what conditions does early intervention really make sense?). Research results are now becoming available that relate child and family characteristics (including family interaction patterns), the program components of early intervention (e.g., intensity, type of curriculum), and goals or outcomes of early intervention (including longer-term effects). However, this task remains a formidable challenge for future investigators (Guralnick, 1997a).

## Summary and Conclusions

Early intervention may well be the centerpiece in our nation's efforts on behalf of vulnerable children and their families. A coherent system of supports and services has emerged in the past 25 years in response to the needs of young children and families. On the basis of the analysis presented here, one can see that the early intervention system, if properly organized, is capable of preventing or minimizing the declines in cognitive development that typically occur in the absence of intervention during the first 5 years of a child's life.

Moreover, the early intervention system produces its effects through the mechanisms of mitigating stressors generated by factors associated with family and child risk or child disability status that can adversely affect family interaction patterns and, hence, child development. It appears that the early intervention enterprise can be understood within a developmental model.

These short-term benefits of early intervention are highly reproducible, with effect sizes in the range of .5 to .75 *SD* consistently found for children at risk and for those with established disabilities. Achieving longer-term gains, however, may well require, in many instances, highly intensive interventions, particularly those that are of sufficient duration to extend over various transition points in the child's life. Similarly, we have seen that solving the specificity problem (i.e., understanding the relation between child and family factors, program factors that define the interventions, and types of outcomes desired) may well be the central task for the second generation of research in the field of early intervention. The importance of adjusting the intensity of early intervention as a consequence of the severity or type of a child's disability or degree of risk has served as an important example of the specificity concept, one that is highly relevant to the cost effectiveness of early intervention. Specificity also encourages further examination of the relative contributions of the various components of interventions, particularly the ability of early intervention to influence long-term parent-child interactions and related child development or child-focused features, such as the provision of quality educational or intervention-oriented daycare.

Translating and applying current and future research findings of experimental programs to practice in typical communities within the framework of the model and approach described in the present paper poses additional challenges. "Scaling-up" is always a complex issue; problems obtaining resources and maintaining

quality are most difficult. As discussed, algorithms based on information from existing or newly developed clinical tools capable of evaluating family interaction patterns and taking into account prevailing stressors are critical to the process of determining the nature and intensity of supports and services likely to be optimally beneficial to children and families. The importance of having a framework for the development and application of these clinical tools and the decision-making process cannot be overemphasized.

In this paper I have focused on the effects of early intervention on children's cognitive development. Yet many of the same family characteristics and family interaction patterns that influence children's cognitive development are certain to influence other domains as well, such as children's social competence. Enhancing children's social competence, in particular, has been an expressed goal of early intervention for some time (Guralnick, 1990; Zigler & Trickett, 1978). In fact, the risk factors and associated stressors discussed in this paper for cognitive development have similar associations with important aspects of children's social competence (Patterson, Vaden, & Kupersmidt, 1991) and are likely to be enhanced by many of the same interventions appropriate for the cognitive domain (Guralnick & Neville, 1997). Although unique intervention approaches will certainly be required for each developmental outcome emphasized, the cross-domain features reflected in the developmental approach suggest that more widespread benefits of comprehensive early intervention are likely to result. To be sure, numerous other important issues remain as well, such as whether intervention during the sensorimotor period is essential for ensuring the long-term effectiveness of early intervention, what form interventions must take to produce benefits for children who have previously not responded to even the most intensive of interventions, or how parents experiencing unusual distress or even depression can be best supported by early

intervention programs. Long-term, systematic examination of these and related issues, with the necessary degree of specificity within a developmental framework, are certain to yield information of relevance to all concerned with the well-being of vulnerable children and their families.

## References

- Achenbach, T. M., Howell, C. T., Aoki, M. F., & Rauh, V. A. (1993). Nine-year outcome of the Vermont Intervention Program for Low Birth Weight Infants. *Pediatrics*, *91*, 45-55.
- Affleck, G., & Tennen, H. (1993). Cognitive adaptation to adversity: Insights from parents of medically fragile infants. In A. P. Turnbull, J. M. Patterson, S. K. Behr, D. L. Murphy, J. G. Marquis, & M. J. Blue-Banning (Eds.), *Cognitive coping, families, and disability* (pp. 135-150). Baltimore: Brookes.
- Affleck, G., Tennen, H., Rowe, J., Roscher, B., & Walker, L. (1989). Effects of formal support on mothers' adaptation to the hospital-to-home transition of high-risk infants: The benefits and costs of helping. *Child Development*, *60*, 488-501.
- Als, H., Lawhon, G., Duffy, F. H., McNulty, G. B., Gibes-Grossman, R., & Blickman, J. G. (1994). Individualized developmental care for the very low-birth-weight preterm infant: Medical and neurofunctional effects. *Journal of the American Medical Association*, *272*, 853-858.
- Anastasiow, N. J. (1990). Implications of the neurobiological model for early intervention. In S. J. Meisels & J. P. Shonkoff (Eds.), *Handbook of early childhood intervention* (pp. 196-216). Cambridge: Cambridge University Press.
- Atkinson, L., Chisholm, V., Dickens, S., Scott, B., Blackwell, J., Tam, F., & Goldberg, S. (1995). Cognitive coping, affective distress, and maternal sensitivity: Mothers of children with Down syndrome. *Developmental Psychology*, *31*, 668-676.
- Bailey, D. B. (1987). Collaborative goal-setting with families: Resolving differences in values and priorities for services. *Topics in Early Childhood Special Education*, *7*(2), 59-71.
- Bailey, D. B. (1997). Evaluating the effective-

- ness of curriculum alternatives for infants and preschoolers at high risk. In M. J. Guralnick (Ed.), *The effectiveness of early intervention* (pp. 227-247). Baltimore: Brookes.
- Bailey, D. B., Jr., & Winton, P. J. (1989).** Friendship and acquaintance among families in a mainstreamed day care center. *Education and Training in Mental Retardation, 24*, 107-113.
- Bailey, D. B., & Wolery, M. (1992).** *Teaching infants and preschoolers with disabilities* (2nd ed.). New York: MacMillan.
- Barnett, W. S. (1995).** Long-term effects of early childhood programs on cognitive and school outcomes. In R. E. Behrman (Ed.), *The future of children: Vol. 5. Long-term outcomes of early childhood programs* (pp. 25-50). Los Altos, CA: The Center for the Future of Children, The David and Lucile Packard Foundation.
- Baumrind, D. (1993).** The average expectable environment is not good enough: A response to Scarr. *Child Development, 64*, 1299-1317.
- Beckman, P. J. (1983).** The relationship between behavioral characteristics of children and social interaction in an integrated setting. *Journal of the Division for Early Childhood, 7*, 69-77.
- Beckman, P. J., & Pokorni, J. L. (1988).** A longitudinal study of families of preterm infants: Changes in stress and support over the first two years. *The Journal of Special Education, 2*, 56-65.
- Behr, S. K., & Murphy, D. L. (1993).** Research progress and promise: The role of perceptions in cognitive adaptation to disability. In A. P. Turnbull, J. M. Patterson, S. K. Behr, D. L. Murphy, J. G. Marquis, & M. J. Blue-Banning (Eds.), *Cognitive coping, families, and disability* (pp. 151-163). Baltimore: Brookes.
- Belsky, J. (1984).** The determinants of parenting: A process model. *Child Development, 55*, 83-96.
- Belsky, J., Robins, E., & Gamble, W. (1984).** The determinants of parental competence: Toward a contextual theory. In M. Lewis (Ed.), *Beyond the dyad* (pp. 251-279). New York: Plenum Press.
- Benasich, A. A., Brooks-Gunn, J., & Clewell, B. C. (1992).** How do mothers benefit from early intervention programs? *Journal of Applied Developmental Psychology, 13*, 311-362.
- Benn, R. (1993).** Conceptualizing eligibility for early intervention services. In D. M. Bryant & M. A. Graham (Eds.), *Implementing early intervention* (pp. 18-45). New York: The Guilford Press.
- Berry, P., Gunn, V. P., & Andrews, R. J. (1984).** Development of Down's syndrome children from birth to five years. In J. M. Berg (Ed.), *Perspectives and progress in mental retardation: Vol. 1. Social, psychological, and educational aspects* (pp. 167-177). Baltimore: University Park Press.
- Birenbaum, A., Guyot, D., & Cohen, H. J. (1990).** *Health care financing for severe developmental disabilities*. Washington, DC: American Association on Mental Retardation.
- Blair, C. B., Ramey, C. T., & Hardin, J. M. (1995).** Early intervention for low birth weight, premature infants. Participation and intellectual development. *American Journal on Mental Retardation, 99*, 542-554.
- Bowe, F. G. (1995).** Population estimates: Birth-to-5 children with disabilities. *The Journal of Special Education, 20*, 461-471.
- Boyle, C. A., Decouflé, P., & Yeargin-Allsopp, M. (1994).** Prevalence and health impact of developmental disabilities in US children. *Pediatrics, 93*, 399-403.
- Bradley, R. H., Rock, S. L., Whiteside, L., Caldwell, B. M., & Brisby, J. (1991).** Dimensions of parenting in families having children with disabilities. *Exceptionality, 2*, 41-61.
- Bradley, R. H., Whiteside, L., Mundfrom, D. J., Casey, P. H., Kelleher, K. J., & Pope, S. K. (1994).** Early indications of resilience and their relation to experiences in the home environments of low birthweight, premature children living in poverty. *Child Development, 65*, 346-360.
- Breslau, N., DelDotto, J. E., Brown, G. G., Kumar, S., Ezhuthachan, S., Hufnagle, K. G., & Peterson, E. L. (1994).** A gradient relationship between low birth weight and IQ at age 6 years. *Archives of Pediatric and Adolescent Medicine, 148*, 377-383.
- Bristol, M. M. (1987).** The home care of children with developmental disabilities: Empirical support for a model of successful family coping with stress. In S. Landesman & P. M. Vietze (Eds.), *Living environments and mental retardation* (pp. 401-422). Washington, DC: American Association on Mental Retardation.
- Bronfenbrenner, U. (1979).** *The ecology of*

- human development*. Cambridge: Harvard University Press.
- Brooks-Gunn, J., Gross, R. T., Kraemer, H. C., Spiker, D., & Shapiro, S. (1992).** Enhancing the cognitive outcomes of low birth weight, premature infants: For whom is the intervention most effective? *Pediatrics*, *89*, 1209–1215.
- Brooks-Gunn, J., McCarton, C. M., Casey, P. H., McCormick, M. C., Bauer, C. R., Bernbaum, J. C., Tyson, J., Swanson, M., Bennett, F. C., Scott, D. T., Tonascia, J., & Meinert, C. L. (1994).** Early intervention in low-birth-weight premature infants. *Journal of the American Medical Association*, *272*, 1257–1262.
- Bruder, M. B. (1997).** The effectiveness of specific educational/developmental curricula for children with established disabilities. In M. J. Guralnick (Ed.), *The effectiveness of early intervention* (pp. 523–548). Baltimore: Brookes.
- Bryant D. M., & Graham, M. A. (1993).** Models of service delivery. In D. M. Bryant & M. A. Graham (Eds.), *Implementing early intervention* (pp. 183–215). New York: Guilford Press.
- Bryant, D. M., & Maxwell, K. (1997).** The effectiveness of early intervention for disadvantaged children. In M. J. Guralnick (Ed.), *The effectiveness of early intervention* (pp. 23–46). Baltimore: Brookes.
- Buehler, D. M., Als, H., Duffy, F. H., McAnulty, G. B., & Liederman, J. (1995).** Effectiveness of individualized developmental care for low-risk preterm infants: Behavioral and electrophysiologic evidence. *Pediatrics*, *96*, 923–932.
- Burchinal, M., Lee, M. W., & Ramey, C. T. (1989).** Type of day-care and preschool intellectual development in disadvantaged children. *Child Development*, *60*, 128–137.
- Burchinal, M. R., Roberts, J. E., Nabors, L. A., & Bryant, D. M. (1996).** Quality of center child care and infant cognitive and language development. *Child Development*, *67*, 606–620.
- Campbell, F. A., & Ramey, C. T. (1994).** Effects of early intervention on intellectual and academic achievement: A follow-up study of children from low-income families. *Child Development*, *65*, 684–698.
- Cicchetti, D., & Toth, S. L. (1995).** Developmental psychopathology and disorders of affect. In D. Cicchetti & D. J. Cohen (Eds.), *Developmental psychopathology: Vol. 2. Risk, disorder, and adaptation* (pp. 369–420). New York: Wiley.
- Clarke-Stewart, K. A. (1988).** Parents' effects on children's development: A decade of progress? *Journal of Applied Developmental Psychology*, *9*, 41–84.
- Cochran, M. M., & Brassard, J. A. (1979).** Child development and personal social networks. *Child Development*, *50*, 601–615.
- Cooley, W. C. (1994).** The ecology of support for caregiving families. Commentary. *Journal of Developmental and Behavioral Pediatrics*, *15*, 117–119.
- Crnic, K. A., Greenberg, M. T., Ragozin, A. S., Robinson, N. M., & Basham, R. B. (1983).** Effects of stress and social support on mothers and premature and full-term infants. *Child Development*, *54*, 209–217.
- Crowell, J. A., & Feldman, S. S. (1988).** Mothers' internal models of relationships and children's behavioral and developmental status: A study of mother-child interaction. *Child Development*, *59*, 1273–1285.
- Donahue, M. L., & Pearl, R. (1995).** Conversational interactions of mothers and their preschool children who had been born preterm. *Journal of Speech and Hearing Research*, *38*, 1117–1125.
- Dumas, J. E., & LaFreniere, P. J. (1993).** Mother-child relationships as sources of support or stress: A comparison of competent, average, aggressive, and anxious dyads. *Child Development*, *64*, 1732–1754.
- Duncan, G. J., Brooks-Gunn, J., & Klebanov, P. K. (1994).** Economic deprivation and early childhood development. *Child Development*, *65*, 296–318.
- Dunst, C. J. (1985).** Rethinking early intervention. *Analysis and Intervention in Developmental Disabilities*, *5*, 165–201.
- Dunst, C. J., Trivette, C. M., & Cross, A. H. (1986).** Mediating influences of social support: Personal, family, and child outcomes. *American Journal of Mental Deficiency*, *90*, 403–417.
- Duwa, S. M., Wells, C., & Lalinde, P. (1993).** Creating family-centered programs and policies. In D. M. Bryant & M. A. Graham (Eds.), *Implementing early intervention* (pp. 92–123). New York: Guilford.
- Dyson, L. L. (1993).** Response to the presence of a child with disabilities: Parental stress and family functioning over time. *American Journal on Mental Retardation*, *98*, 207–218.
- Elardo, R., Bradley, R., & Caldwell, B.**

- (1977). A longitudinal study of the relations of infants' home environments to language development at age three. *Child Development*, 48, 595-603.
- Emery, R. E., & Kitzmann, A. M. (1995).** The child in the family: Disruptions in family functions. In D. Cicchetti & D. J. Cohen (Eds.), *Developmental psychopathology: Vol. 2. Risk, disorder, and adaptation* (pp. 3-31). New York: Wiley.
- Feldman, M. A., Case, L., Towns, F., & Betel, J. (1985).** Parent education project I: The development and nurturance of children of mentally retarded parents. *American Journal of Mental Deficiency*, 90, 253-258.
- Florian, L. (1995).** Part H early intervention program: Legislative history and intent of the law. *Topics in Early Childhood Special Education*, 15, 247-262.
- Futterweit, L. R., & Ruff, H. A. (1993).** Principles of development: Implications for early intervention. *Journal of Applied Developmental Psychology*, 14, 153-173.
- Gibson, D., & Harris, A. (1988).** Aggregated early intervention effects for Down's syndrome persons: Patterning and longevity of benefits. *Journal of Mental Deficiency Research*, 32, 1-17.
- Goffman, E. (1963).** *Stigma*. Englewood Cliffs, NJ: Prentice-Hall.
- Goodman, J. F., & Pollak, E. (1993).** An analysis of the core cognitive curriculum in early intervention programs. *Early Education and Development*, 4, 193-203.
- Gorman, K. S. (1995).** Malnutrition and cognitive development: Evidence from experimental/quasi-experimental studies among the mild-to-moderately malnourished. *Journal of Nutrition*, 125, 2239S-2244S.
- Gowen, J. W., Johnson-Martin, N., Goldman, B. D., & Appelbaum, M. (1989).** Feelings of depression and parenting competence of mothers of handicapped and nonhandicapped infants: A longitudinal study. *American Journal on Mental Retardation*, 94, 259-271.
- Guralnick, M. J. (1988).** Efficacy research in early childhood intervention programs. In S. L. Odom & M. B. Karnes (Eds.), *Early intervention for infants and children with handicaps: An empirical base* (pp. 75-88). Baltimore: Brookes.
- Guralnick, M. J. (1989).** Recent developments in early intervention efficacy research: Implications for family involvement in P.L. 99-457. *Topics in Early Childhood Special Education*, 9(3), 1-17.
- Guralnick, M. J. (1990).** Social competence and early intervention. *Journal of Early Intervention*, 14, 3-14.
- Guralnick, M. J. (1991).** The next decade of research on the effectiveness of early intervention. *Exceptional Children*, 58, 174-183.
- Guralnick, M. J. (1993).** Second generation research on the effectiveness of early intervention. *Early Education and Development*, 4, 366-378.
- Guralnick, M. J. (Ed.). (1997a).** *The effectiveness of early intervention*. Baltimore: Brookes.
- Guralnick, M. J. (1997b).** Second generation research in the field of early intervention. In M. J. Guralnick (Ed.), *The effectiveness of early intervention* (pp. 3-20). Baltimore: Brookes.
- Guralnick, M. J., & Bennett, F. C. (Eds.). (1987).** *The effectiveness of early intervention for at-risk and handicapped children*. New York: Academic Press.
- Guralnick, M. J., & Bricker, D. (1987).** The effectiveness of early intervention for children with cognitive and general developmental delays. In M. J. Guralnick & F. C. Bennett (Eds.), *The effectiveness of early intervention for at-risk and handicapped children* (pp. 115-173). New York: Academic Press.
- Guralnick, M. J., & Neville, B. (1997).** Designing early intervention programs to promote children's social competence. In M. J. Guralnick (Ed.), *The effectiveness of early intervention* (pp. 579-610). Baltimore: Brookes.
- Hack, M., Taylor, H. G., Klein, N., Eiben, R., Schatschneider, C., & Mercuri-Minich, N. (1994).** School-age outcomes in children with birth weights under 750g. *The New England Journal of Medicine*, 331, 753-759.
- Halpern, R. (1993).** Poverty and infant development. In C. H. Zeanah, Jr. (Ed.), *Handbook of infant mental health* (pp. 73-86). New York: Guilford.
- Hart, B., & Risley, T. R. (1995).** *Meaningful differences in the everyday experience of young American children*. Baltimore: Brookes.
- Herrnstein, R. J., & Murray, C. (1994).** *The bell curve: Intelligence and class structure in American life*. New York: Free Press.
- Hodapp, R. M., Dykens, E. M., Evans, D.**

- W., & Merighi, J. R. (1992).** Maternal emotional reactions to young children with different types of handicaps. *Journal of Developmental and Behavioral Pediatrics, 13*, 118-123.
- Huston, A. C., McLoyd, V. C., & Garcia Coll, C. G. (1994).** Children and poverty: Issues in contemporary research. *Child Development, 65*, 275-282.
- Hutchins, V. L. (1994).** Maternal and Child Health Bureau: Roots. *Pediatrics, 94*, 695-699.
- Individuals With Disabilities Education Act (IDEA) Amendments of 1997, PL 105-17, Title 20, U.S.C. 1400 *et seq.*
- Infant Health and Development Program. (1990).** Enhancing the outcomes of low-birth-weight, premature infants: A multisite, randomized trial. *Journal of the American Medical Association, 263*, 3035-3042.
- Innocenti, M. S., Huh, K., & Boyce, G. C. (1992).** Families of children with disabilities: Normative data and other considerations on parenting stress. *Topics in Early Childhood Special Education, 12*(3), 403-427.
- Ireys, H. T., & Nelson, R. P. (1992).** New federal policy for children with special health care needs: Implications for pediatricians. *Pediatrics, 90*, 321-327.
- Ladd, G. W., Profilet, S. M., & Hart, C. H. (1992).** Parents' management of children's peer relations: Facilitating and supervising children's activities in the peer culture. In R. D. Parke & G. W. Ladd (Eds.), *Family-peer relationships: Modes of linkage* (pp. 215-253). Hillsdale, NJ: Erlbaum.
- Lee, C. L., & Bates, J. E. (1985).** Mother-child interaction at age two years and perceived difficult temperament. *Child Development, 56*, 1314-1325.
- Lewis, M., & Goldberg, S. (1969).** Perceptual-cognitive development in infancy: A generalized expectancy model as a function of mother-infant interaction. *Merrill-Palmer Quarterly, 15*, 81-100.
- Lewis, M., Feiring, C., & Brooks-Gunn, J. (1987).** The social networks of children with and without handicaps: A developmental perspective. In S. Landesman & P. Vietze (Eds.), *Living environments and mental retardation* (pp. 377-400). Washington, DC: American Association on Mental Retardation.
- Lipkin, P. H. (1996).** Epidemiology of the developmental disabilities. In A. J. Capute & P. J. Accardo (Eds.), *Developmental disabilities in infancy and childhood: Vol. 1. Neurodevelopmental diagnosis and treatment* (2nd ed., pp. 137-156). Baltimore: Brookes.
- Locurto, C. (1991).** Beyond IQ in preschool programs? *Intelligence, 15*, 295-312.
- Lovaas, O. I. (1987).** Behavioral treatment and normal educational and intellectual functioning in young autistic children. *Journal of Consulting and Clinical Psychology, 55*, 3-9.
- Mahoney, G., & Powell, A. (1988).** Modifying parent-child interaction: Enhancing the development of handicapped children. *Journal of Special Education, 22*, 82-96.
- Margalit, M., Raviv, A., & Ankonina, D. B. (1992).** Coping and coherence among parents with disabled children. *Journal of Clinical Child Psychology, 21*, 202-209.
- Martin, S. L., Ramey, C. T., & Ramey, S. (1990).** The prevention of intellectual impairment in children of impoverished families: Findings of a randomized trial of educational day care. *American Journal of Public Health, 80*, 844-847.
- McCarton, C. M., Brooks-Gunn, J., Wallace, I. F., Bauer, C. R., Bennett, F. C., Bernbaum J. C., Broyles, S., Casey, P. H., McCormick, M. C., Scott, D. T., Tyson, J., Tonascia, J., & Meinert, C. L. (1997).** Results at age 8 years of early intervention for low-birth-weight premature infants. The Infant Health and Development Program. *Journal of the American Medical Association, 277*, 126-132.
- McEachin, J. J., Smith, T., & Lovaas, O. I. (1993).** Long-term outcome for children with autism who received early intensive behavioral treatment. *American Journal on Mental Retardation, 97*, 359-372.
- McGauhey, P. J., Starfield, B., Alexander, C., & Ensminger, M. E. (1991).** Social environment and vulnerability of low birth weight children: A social-epidemiological perspective. *Pediatrics, 88*, 943-953.
- McLoyd, V. C. (1990).** The impact of economic hardship on black families and children: Psychological distress, parenting, and socioemotional development. *Child Development, 61*, 311-346.
- Melson, G. F., Ladd, G. W., & Hsu, H-C. (1993).** Maternal support networks, maternal cognitions, and young children's social and cognitive development. *Child Development, 64*, 1401-1417.



- Meyer, E. C., Garcia Coll, C. T., Seifer, R., Ramos, A., Kilis, E., & Oh, W. (1995).** Psychological distress in mothers of preterm infants. *Journal of Developmental and Behavioral Pediatrics, 16*, 412-417.
- Miller, A. C., Gordon, R. M., Daniele, R. J., & Diller, L. (1992).** Stress, appraisal, and coping in mothers of disabled and nondisabled children. *Journal of Pediatric Psychology, 17*, 587-605.
- Miller, S. A. (1988).** Parents' beliefs about children's cognitive development. *Child Development, 59*, 259-285.
- Murphey, D. A. (1992).** Constructing the child: Relations between parents' beliefs and child outcomes. *Developmental Review, 12*, 199-232.
- Neisser, U., Boodoo, G., Bouchard, T. J., Jr., Boykin, A. W., Brody, N., Ceci, S. J., Halpern, D. F., Lochlin, J. C., Perloff, R., Sternberg, R. J., & Urbina, S. (1996).** Intelligence: Knowns and unknowns. *American Psychologist, 51*, 77-101.
- Neser, P. S. J., Molteno, C. D., & Knight, G. J. (1989).** Evaluation of preschool children with Down's syndrome in Cape Town using the Griffiths Scale of Mental Development. *Child: Care, Health and Development, 15*, 217-225.
- Osofsky, J. D. (1995).** The effects of violence exposure on young children. *American Psychologist, 50*, 782-788.
- Palfrey, J. S., Singer, J. D., Walker, D. K., & Butler, J. A. (1987).** Early identification of children's special needs. A study in five metropolitan communities. *Journal of Pediatrics, 111*, 651-659.
- Palmer, F. B., Shapiro, B. K., Wachtel, R. C., Allen, M. C., Hiller, J. E., Harryman, S. E., Mosher, B. S., Meinert, C. L., & Capute, A. J. (1988).** The effects of physical therapy on cerebral palsy. *New England Journal of Medicine, 318*, 803-808.
- Parker, S., Greer, S., & Zuckerman, B. (1988).** Double jeopardy: The impact of poverty on early child development. *The Pediatric Clinics of North America, 35*, 1227-1240.
- Patterson, C. J., Vaden, N. A., & Kuper-smidt, J. B. (1991).** Family background, recent life events and peer rejection during childhood. *Journal of Social and Personal Relationships, 8*, 347-361.
- Pianta, R. C., Marvin, R. S., Britner, P. A., & Borowitz, K. C. (1996).** Mothers' resolution of their children's diagnosis: Organized patterns of caregiving representations. *Journal of Infant Mental Health, 17*, 239-256.
- Powell, C., & Grantham-McGregor, S. (1989).** Home visiting of varying frequency and child development. *Pediatrics, 84*, 157-164.
- Pratt, M. W., Kerig, P., Cowan, P. A., & Cowan, C. P. (1988).** Mothers and fathers teaching 3-year-olds: Authoritative parenting and adult scaffolding of young children's learning. *Developmental Psychology, 24*, 832-839.
- Public Law 99-457. The Education of the Handicapped Act Amendments (1986).
- Ramey, C. T., Bryant, D. M., Wasik, B. H., Sparling, J. J., Fendt, K. H., & LaVange, L. M. (1992).** Infant Health and Development Program for low birth weight, premature infants: Program elements, family participation, and child intelligence. *Pediatrics, 89*, 454-465.
- Ramey, C. T., & Campbell, F. A. (1984).** Preventive education for high-risk children: Cognitive consequences of the Carolina Abecedarian Project. *American Journal of Mental Deficiency, 88*, 515-523.
- Rauh, V. A., Achenbach, T. M., Nurcombe, B., Howell, C. T., & Teti, D. M. (1988).** Minimizing adverse effects of low birth-weight: Four-year results of an early intervention program. *Child Development, 59*, 544-553.
- Resnick, M. B., Armstrong, S., & Carter, R. L. (1988).** Developmental intervention program for high-risk premature infants: Effects on development and parent-infant interactions. *Journal of Developmental and Behavioral Pediatrics, 9*, 73-78.
- Resnick, M. B., Eyster, F. D., Nelson, R. M., Eitzman, D. V., & Bucciarelli, R. L. (1987).** Developmental intervention for low birth weight infants: Improved early developmental outcome. *Pediatrics, 80*, 68-74.
- Reynolds, A. J. (1994).** Effects of a preschool plus follow-on intervention for children at risk. *Developmental Psychology, 30*, 787-804.
- Richmond, J., & Ayoub, C. C. (1993).** Evolution of early intervention philosophy. In D. M. Bryant & M. A. Graham (Eds.), *Implementing early intervention* (pp. 1-17). New York: Guilford.
- Ross, G., Lipper, E. G., & Auld, P. A. M. (1990).** Social competence and behavior problems in premature children at school

- age. *Pediatrics*, 86, 391-397.
- Rubin, S., & Quinn-Curran, N. (1985).** Lost, then found: Parents' journey through the community service maze. In M. Seligman (Ed.), *The family with a handicapped child: Understanding and treatment* (pp. 63-94). New York: Grune & Stratton.
- Rutter, M. (1980).** The long-term effects of early experience. *Developmental Medicine and Child Neurology*, 22, 800-815.
- Rutter, M. (1996).** Autism research: Prospects and priorities. *Journal of Autism and Developmental Disorders*, 26, 257-275
- Sameroff, A. J. (1993).** Models of development and developmental risk. In C. H. Zeanah, Jr. (Ed.), *Handbook of infant mental health* (pp. 3-13). New York: Guilford.
- Sameroff, A. J., & Chandler, M. J. (1975).** Reproductive risk and the continuum of caretaking casualty. In F. D. Horowitz, M. Hetherington, S. Scarr-Salapatek, and G. Siegel (Eds.), *Review of child development research* (Vol. 4, pp. 187-244). Chicago: University of Chicago Press.
- Sameroff, A. J., Seifer, R., Barocas, R., Zax, M., & Greenspan, S. (1987).** Intelligence quotient scores of 4-year-old children: Social-environmental risk factors. *Pediatrics*, 79, 343-350.
- Santelli, B., Turnbull, A. P., Marquis, J. G., & Lerner, E. P. (1995).** Parent to parent programs: A unique form of mutual support. *Infants and Young Children*, 8(2), 48-57.
- Scarr, S. (1992).** Developmental theories for the 1990s: Development and individual differences. *Child Development*, 63, 1-19.
- Scarr, S., & McCartney, K. (1988).** Far from home: An experimental evaluation of the mother-child home program in Bermuda. *Child Development*, 59, 531-543.
- Schnell, R. (1984).** Psychomotor development. In S. Peuschel (Ed.), *The young child with Down syndrome* (pp. 207-226). New York: Human Sciences.
- Seifer, R., Clark, G. N., & Sameroff, A. J. (1991).** Positive effects of interaction coaching on infants with developmental disabilities and their mothers. *American Journal on Mental Retardation*, 96, 1-11.
- Sharav, T., & Shlomo, L. (1986).** Stimulation of infants with Down syndrome: Long-term effects. *Mental Retardation*, 24, 81-86.
- Shonkoff, J. P. (1985).** Social support and vulnerability to stress: A pediatric perspective. *Pediatric Annals*, 14, 550-554.
- Shonkoff, J. P., & Hauser-Cram, P. (1987).** Early intervention for disabled infants and their families: A quantitative analysis. *Pediatrics*, 80, 650-658.
- Shonkoff, J. P., Hauser-Cram, P., Krauss, M. W., & Upshur, C. C. (1992).** Development of infants with disabilities and their families. *Monographs of the Society for Research in Child Development*, 57(6, Serial No. 230).
- Shonkoff, J. P., & Meisels, S. M. (1991).** Defining eligibility for services under P.L. 99-457. Implementation of P. L. 99-457, Part H [Special issue]. *Journal of Early Intervention*, 15, 21-25.
- Smith, B. J., & McKenna, P. (1994).** Early intervention public policy: Past, present, and future. In L. J. Johnson, R. J. Gallagher, M. J. LaMontagne, J. B. Jordan, J. J. Gallagher, P. L. Hutinger, & M. B. Karnes (Eds.), *Meeting early intervention challenges* (pp. 251-264). Baltimore: Brookes.
- Sontag, J. C., & Schacht, R. (1994).** An ethnic comparison of parent participation and information needs in early intervention. *Exceptional Children*, 60, 422-433.
- Spiker, D., Ferguson, J., & Brooks-Gunn, J. (1993).** Enhancing maternal interactive behavior and child social competence in low birth weight, premature infants. *Child Development*, 64, 754-768.
- Spitz, H. H. (1986).** *The raising of intelligence: A selected history of attempts to raise retarded intelligence*. Hillsdale, NJ: Erlbaum.
- Stayton, V. D., & Karnes, M. B. (1994).** Model programs for infants and toddlers with disabilities and their families. In L. J. Johnson, R. J. Gallagher, M. J. LaMontagne, J. B. Jordan, J. J. Gallagher, P. L. Hutinger, & M. B. Karnes (Eds.), *Meeting early intervention challenges: Issues from birth to three* (2nd ed., pp. 33-58). Baltimore: Brookes.
- Taylor, L., Zuckerman, B., Harik, V., & Groves, B. M. (1994).** Witnessing violence by young children and their mothers. *Journal of Developmental and Behavioral Pediatrics*, 15, 120-123.
- Trute, B., & Hauch, C. (1988).** Building on family strength: A study of families with positive adjustment to the birth of a developmentally disabled child. *Journal of Marital and Family Therapy*, 14, 185-193.
- Turnbull, A. P., & Turnbull, H. R. (1978).** *Parents speak out: Views from the other side of the two-way mirror*. Columbus, OH: Merrill.

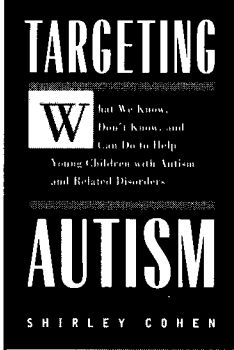
- Vaughn, B. E., Goldberg, S., Atkinson, L., Marcovitch, S., MacGregor, D., & Seifer, R. (1994).** Quality of toddler-mother attachment in children with Down syndrome: Limits to interpretation of strange situation behavior. *Child Development, 65*, 95-108.
- Wachs, T. D. (1992).** *The nature of nurture.* Newbury Park, CA: Sage.
- Wachs, T. D., & Gruen, G. E. (1982).** *Early experience and human development.* New York: Plenum Press.
- Waisbren, S. (1980).** Parents' reactions after the birth of a developmentally disabled child. *American Journal of Mental Deficiency, 84*, 345-351.
- Wasik, B. H., Ramey C. T., Bryant, D. G., & Sparling, J. J. (1990).** A longitudinal study of two early intervention strategies: Project CARE. *Child Development, 61*, 1682-1696.
- Werner, E. E. (1995).** Resilience in development. *Current Directions in Psychological Science, 4*, 81-85.
- Wikler, L. M. (1986).** Family stress theory and research on families of children with mental retardation. In J. J. Gallagher & P. M. Vietze (Eds.), *Families of handicapped persons* (pp. 167-195). Baltimore: Brookes.
- Woods, P. A., Corney, M. J., & Pryce, G. J. (1984).** Developmental progress of preschool Down's syndrome children receiving a home-advisory service: An interim report. *Child: Care, Health and Development, 10*, 287-299.
- Yeargin-Allsopp, M., Murphy C. C., Oakley, G. P., Sikes, R. K., & the Metropolitan Atlanta Developmental Disabilities Study Staff. (1992).** A multiple-source method for studying the prevalence of developmental disabilities in children: The Metropolitan Atlanta Developmental Disabilities Study. *Pediatrics, 89*, 624-630.
- Yoshikawa, H. (1994).** Prevention as cumulative protection: Effects of early family support and education on chronic delinquency and its risks. *Psychological Bulletin, 115*, 28-54.
- Zigler, E., & Styfco, S. J. (1994).** Head Start: Criticisms in a constructive context. *American Psychologist, 49*, 127-132.
- Zigler, E., & Trickett, P. K. (1978).** IQ,

social competence, and evaluation of early childhood intervention programs. *American Psychologist, 33*, 789-798.

- Zigler, E., & Valentine, J. (Eds.). (1979).** *Project Head Start: A legacy of the war on poverty.* New York: The Free Press.

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